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COLLEGE OF LAW AND GOVERNANCE STUDIES

SCHOOL OF LAW

**TECHNOLOGY TRANSFER LAWS ON UNIVERSITY – INDUSTRY
LINKAGE IN ETHIOPIA: THE CASE OF ETHIOPIAN LEATHER
INDUSTRY**

By **Abrham Ayalew Yimer**

June, 2017 (2009 E.C.)

Addis Ababa, Ethiopia

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A Thesis submitted to Addis Ababa University, College of Law and Governance Studies, School of Law, in Partial fulfillment of the Requirements for the Degree of Master of Laws (LL.M) in Business Law

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I, the undersigned, declare that this thesis is my original work and that all sources of materials used have been appropriately acknowledged.

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Dedicated

to

Seblewongel

&

Enuka

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ACRONYMS

AASTU Addis Ababa Science and Technology Policy

AAU - Addis Ababa University

AAU-AAiT - Addis Ababa University-Addis Ababa Institute of Technology

BA/BSC - Bachelor of Arts/Bachelor of Sciences

BDA - Bayh-Dole Act

CEO - Chief Executive Officer

EIPO - Ethiopian Intellectual Property office

ELIA - Ethiopian Leather industries Association

ELLPTI - Ethiopian Leather and Leather Products Institute

ESDP - Education Sector Development Program

FDI - Foreign Direct Investment

FDRE - Federal Democratic Republic of Ethiopia

GDP - Gross Domestic Product

GTP - Growth and Development Plan

IDS - Industry Development Strategy

IP - Intellectual Property

IPRs - Intellectual Property Rights

IT - Information Technology

LDCs - Least Developed Countries

LIDI - Leather Industry Development Institute

MA/MSC - Master of Arts/Master of Sciences

MIDROC – Al -Muwakaba for Industrial Development and Overseas Commerce

MoST - Ministry of Science and Technology

MoU - Memorandum of Understanding

NIS - National Innovation System

NUs - National Universities

OAU - Organization of African Unity

OECD - Organization for Economic and Cooperation and Development

PHD - Doctor of Philosophy

R&D - Research and Development
S&T - Science and Technology
SAP - Structural Adjustment Program
SMEs - Small and Medium Enterprises
STI - Science, Technology and Innovation
STIP - Science, Technology and Innovation Policy
STP - Science and Technology Policy
TBIC - Technology Business Incubation Center
TOT - Transfer of Technology
TRIPs - Trade Related Intellectual Properties
TT- Technology Transfer
TTOs - Transfer of Technology Offices
TVET - Technical and Vocational Education and Training
UI - University-Industry
UIC - University – Industry Cooperation
UIL - University – Industry Linkage
UILTTD - University-Industry Linkage and Technology Transfer Directorate
UILTTO - University Industry Linkage and Transfer of Technology Office
UILZFs - University Industry Linkage Zonal Forums
UIPs - University Intellectual properties
UITT - University-Industry Technology Transfer
US - United States
USA - United States of America
USD - United States Dollar
USTOT - United States Transfer of Technology
WWII - Second World War

ABSTRACT

The initial purpose of this thesis is to explore the Ethiopian TOT laws on UIL in light of the country's leather industry. By doing so, it tries to understand the status of TOT and UIL under the prevailing legal frameworks. TOT and UIL issues under the FDRE Constitution, the Patent Proclamation, current Investment Proclamation, Higher Education Proclamation, the repealed TOT Regulation and the MoST Procedural Directive for the Linkage of Education and Training, Research Institutions and Industries are explored. Moreover, national policies, among others STIP, Education and IPRs policies along with AAU and AASTU policies are also analyzed in depth. The inquiry reaches on that there is no comprehensive legal framework on TOT in general and UIL in particular. Rather some issues of TOT are scattered in several laws in the prevailing legal environment and not adequate. Moreover, there is no due policy concern and backup for inland TOT and UIL.

The leather industry is among the key manufacturing sectors in Ethiopia because it can link and fasten the linkage between industry and agriculture, it is labor intensive and it has a comparative and competitive advantage in the export market. Consulting with several scholarly works, policies and interviews, this thesis noticed that low technological status is the critical challenge in the Ethiopian leather industry. The challenge is characterized by poor educational qualification of employees, low status of R&D units, out dated and poorly planted automations, expensive imported machineries, spare parts and chemicals. On the other hand, it is proved that universities are starting to fulfill the technological needs of the subsector. The experiences of AAU and AASTU have proved the assertion. Both universities opened leather-specific courses. It has also proved that the universities can have a potential to improve the R&D units, they can develop machineries, spare parts and chemicals at least in laboratory level.

However, the link between universities and industries is a loose relationship manifested with informal mechanisms which aims at fulfilling short term needs. Generally, the thesis identified that the industries are not making universities as their key partners and the linkage between them is insignificant and needs more efforts to be strengthened. Moreover, leather industries don't have their own policies to manage their link with universities. Even if UIL has given lesser emphasis in STIP and no legal backup and poor state of UIL in practice, it is also found that AAU and AASTU are formulating their own institutional policies to strengthen their links with universities. Experiences of the pioneering nations assessed in this thesis show that UIL can be encouraged and enhanced mainly through the instrumentality of specific laws.

Generally, it is proved that there has to be a comprehensive law on TOT in which inland TOT should get due treatment with foreign TOT. Furthermore, there has to be a specific law for UIL. Or otherwise, under the umbrella of the general TOT law, the issue of UIL should be addressed in a separate section.

CHAPTER ONE

PROPOSAL OF THE RESEARCH

1.1. Background of the Research

In the contemporary economic setup of the globe technology is key power in a development of a nation. Technology can be produced in its source and hosted by any institution or country in need of it. Universities are among the major powerhouses for knowledge and technology. The wealth of knowledge generated within universities can be transferred to industry so that society in general and local businesses in particular, can benefit from university scientific and technological expertise. The linkage between universities and industries occurs through different ways.¹ The linkage will have several goals.²

Technologies originated from universities have immense contributions in the development of nations.³ In developing countries, universities can play a role in building capabilities and indigenous knowledge sources.⁴ For example, in Tanzania, the number of universities is increased and they are trying to go in line with the practical realities of the nation.⁵ Technology transfer (TOT/TT) by United States (US) universities has long history.⁶ Nevertheless, dramatic changes and huge results from the University-Industry Linkage (UIL) came after the 1980's following the enactment of several UIL laws.⁷ The changes are the results of the laws just because the latter define and govern the relationships, responsibilities and accountabilities of the stakeholders in the linkage and the mechanisms of settling disputes.⁸ In Japan, universities were operating without helping the real life of Japanese industries and there was a "great wall" between the two.⁹ But finally the shield has broken and universities are now the innovative powerhouses for Japan thanks to the several TOT laws for the facilitation of UIL.¹⁰

¹ Addis Ababa University Technology Business Incubation Center Establishment Document, 2013, p. 5. According to this document, student – industry internship, employment of students by companies, collaborative research agreements, industry sponsored researches, consultancy, trainings and others are some channels of university – industry linkages.

² Disseminate new and useful knowledge, promote practical applicability of university inventions, provide revenue to support further research, commercialize technologies, creating competitive environment for companies and assist development of a country are among others.

³ Risaburo Nezu, Technology Transfer, Intellectual Property Rights and University-Industry Partnerships: The Experience of China, India, Japan, Philippines, the Republic of Korea, Singapore and Thailand, World Intellectual Property Organization, 2007, p. 4.

⁴ Astrid Szogs, Technology Transfer and Technological Capability Building in Informal Firms in Tanzania, Lund University, (unpublished), 2010, p. 4.

⁵ Erasmus Kaijage, "University - Industry Linkage in Tanzania and its impact on SMEs' Development", **Business Management Review**, Vol. 14, 2010, p. 22.

⁶ Marina Lamm, Technology Transfer: United States Policy and Laws, , p. 8.

⁷ Ibid. According to this study, the linkage resulted in the advancement of technology, productivity, economic contribution, job creation, formation of new industries and patent application and protection.

⁸ Ibid.

⁹ Risaburo Nezu, cited above at note 3, p. 10.

¹⁰ Id., p. 13.

In Ethiopia, the number of universities and enrollment has increased. However, university research has not shown parallel growth.¹¹ There is also a huge gap between the research activities and the national development needs.¹² Universities are not taking the leading role and are lagging behind the industries.¹³ Even if there has been a continuous contact between universities and industries and individual academic staff members and the private sector, this effort has not been made for the research outputs to make a significant impact on the society.¹⁴

1.2. Statement of the Problem

Manufacturing industries, like leather, are considered as strategic subsectors for the development of Ethiopia.¹⁵ The leather industry has its own massive comparative advantage to the country's competitiveness in the global market just because of the untapped livestock and raw material potential. The subsector also consumes hundred thousands of working power. Even if there is a decline in foreign currency earnings in an alarming rate, the leather subsector is still securing a notable foreign currency in each fiscal year. Moreover, the subsector has contributed 6 % share in the country's Gross Domestic Product (GDP) in 2014 which is higher than any other manufacturing industry.¹⁶

Ethiopia has adopted Industry Development Strategy (IDS) in 2002. It focuses on transforming the country's agriculture-dependent economy in to manufacturing industries by on labor intensive, capital saving and export based manufacturing industries like leather subsector. That is why the leather industry has employed nearly 16, 000 employment currently,¹⁷ and intended to employ about 336,000 citizens during the Growth and Transformation Plan (GTP-II) period.¹⁸ However, 81% of the employees in the leather industry are 10th grade graduates or below.¹⁹ TVET graduate employees stand second accounting 14% of the total.²⁰ There are only 10 BA/BSC holders in every firm and only two MA/MSC holders for every three firms.²¹ There is only one PHD holder for 16 firms in the industry.²² This reflects that the industry is focused on labor that holds poor educational qualification. And it can be said that the low qualification of

¹¹ Jeremy de Beer and others, **Innovation and intellectual Property; Collaborative Dynamics in Africa**, UCT Press, South Africa, 2014, p. 323.

¹² Science, Technology and Innovation Policy of the Federal Democratic Republic of Ethiopia, 2012, p. 9.

¹³ Id., p. 13

¹⁴ Henry Etzkowitz and Matthieu Roest, **Transforming University-Industry-Government Relations in Ethiopia**, International Organization for Knowledge Economy and Enterprise Development, Sweden, 2008, p. 94.

¹⁵ Industry Development Strategy of Ethiopia of the Federal Democratic Republic of Ethiopia, 2002. According to the Strategy Document, the sectors are expected to be labor intensive, export based and serve as bridges with the agriculture sector by using raw materials.

¹⁶ Ethiopian Science and Technology Information Center, Technology Capability Assessment, 2015, p. 45, available on www.stic.gov.et/technology-need-assessment (last visited on February 27, 2017).

¹⁷ Ibid.

¹⁸ Growth and Transformation Plan - II of the Federal Democratic Republic of Ethiopia, 2015/16-2019/20, p. 29.

¹⁹ Ethiopian Science and Technology Information Center, cited above at note 16, p. 63 – 66.

²⁰ Ibid.

²¹ Ibid.

²² Ibid.

employees shows the industry is using traditional techniques and has lack of technological assimilation, transformation and exploitation capacity.

The above facts indicate that the industry needs skilled labor who are graduates of engineering & technology and who can work on production line knowledgably.²³ The subsector also needs even social and applied natural sciences with skilled labor in health service and medical science.²⁴ Skilled status of Research and Development (R&D) units in the leather industry is another key area which is highly related with skilled labor and technological infrastructure. Research results show that in the leather subsector, the level of R&D is very low. More precisely, only 20% of the firms in the industry engage in R&D activities.²⁵ Hence, industries are expected to build and functioned R&D units. At the same time, universities and their professors are also expected to engage their students in industry internship and involve in the upgrading of industries' R&D skilled status. With respect to material technologies, Ethiopian leather industry has outdated and poorly planted automations, expensive imported machineries, spare parts and chemicals. Because the subsector is an age old industry in Ethiopia, most of the tanneries, for example, are acquired their initial investment a long time ago and are still in their early years. Moreover, due to poor chemical industry sector in the country, tanneries imported chemicals with expensive price.

As far as the level of production capacity, from all the firms in the leather subsector, only 32% of them have realized their full production capacity.²⁶ The reason for this insufficient production include lack of adequate skilled manpower, unscheduled plan for training, increased in the cost of imported inputs including foreign technologies and the like.²⁷ Coming to the export performance of the subsector, it is targeted to generate export earning of United States Dollar (USD) 707 million at the end year 2019/20.²⁸ But still this target doesn't seem to be achieved like the predecessor targets as the subsector secures only USD 116.2 million in the first year of the plan.²⁹ Surprisingly, only 16% of the firms in the subsector is exporting products while the huge rest are non-exporting firms.³⁰ This shows that the industry has to become in a full capacity to export so as to gain even a higher export earnings from the targets.

Coming to the universities' side, they are legally obliged to become institutions to conduct researches in order to contribute valuable share for the development of the nation.³¹ Moreover, promotion and enhancement of research and technology transfer is among the objectives of

²³ Id., p. 68.

²⁴ Id., p. 70. According to this study, 65 % of the subsector needs more engineering and technology graduates from universities. 10 %, 20 % and 5 % of the leather industries need natural science, social science and medical science graduates respectively.

²⁵ Ibid. (p. 71)

²⁶ Id., p. 73.

²⁷ Id., p. 75.

²⁸ Growth and Transformation Plan – II, cited above at note 18, p. 139.

²⁹ Ministry of Industry official website, www.MoI.gov.et.

³⁰ Ethiopian Science and Technology Information Center, cited above at note 16, p. 77.

³¹ Higher Education proclamation, 2009, Preamble, Proc. No. 650, **Fed. Neg. Gaz.**, Year 15, No. 64.

higher education³² and any research in the universities is expected to focus on TOT.³³ Accordingly, universities are endeavoring to foster TOT especially with manufacturing industries. That is why they make industries as their key stakeholders. But still many countless research results often stay on shelves of the universities instead of being tested and disseminated in to industries. In addition, members of the academia are not willing to apply for patent protection on their innovative research results rather favors publishing in different journals and science magazines which make their works simply the public domain and consequently the loss of their commercial value.³⁴ This is simply because of the lack of a sustainable institutional linkage between the universities and the industries which is facilitated and governed by legal frameworks and lack of awareness.

As far as the UIL in the leather subsector is concerned, only 25% of the leather industry has established linkages with universities.³⁵ However, formal and functional link is established only with Addis Ababa University (AAU) and Addis Ababa Science and Technology University (AASTU). This shows that the linkage is in a very low stage and has to be strengthened. And to facilitate and strengthened the linkage, there should be a clear policy and legal framework like in US and Japan. The other most important issue here is Leather Industry Development Institute (LIDI) is highly favoring to coordinate with foreign counterpart institutions. Through this cooperation, foreign experts are coming for studies, technical assistances, trainings and consultations. But, only 38% of the firms establish linkage with overseas firms.³⁶ Hence, even if the Science, Technology and Innovation Policy (STIP) primarily advocates foreign TOT through international cooperation, most alarmingly the state of foreign cooperation is becoming loosened and such a linkage makes the subsector dependent in foreign technologies. Moreover, the technologies transferred through this overseas cooperation are of only abstract management techniques rather than the hunted-after technical knowledge that could be applied to future real practices in to the firms' production system.³⁷

The leather industry in Ethiopia, is working with low educated labor, inefficient and outdated technology,³⁸ low technological assimilation, transformation and exploitation capacity and weak competitiveness.³⁹ This indicates that the subsector needs to be linked with universities. More specifically, because of the industry is focusing towards exporting value added leather products,

³² Id., Art 4/2.

³³ Id., Art 24/1.

³⁴ This indicates that, even if IPRs have been identified in many countries as a mechanism that provides the necessary incentives for the commercialization of university research results, researchers are passing their works simply to the public domain and consequently the later lost its commercial value. This is simply because of the lack of a sustainable institutional linkage between the universities and the industries which is facilitated and governed by legal frameworks. Moreover, there is also lack of awareness in the academic community about the utilization of IP protection.

³⁵ Ethiopian Science and Technology Information Center, cited above at note 16, p. 89.

³⁶ Ibid.

³⁷ Deborah Brautigam and others, The Role of Foreign Investment in Ethiopia's Leather Value Chain, 2011, p. 2.

³⁸ Deborah Brautigam and others, Flying Geese in Ethiopia's Leather Industry, Understanding Asian/Chinese Impact on the Leather Value Chain in Ethiopia, 2011, p. 17.

³⁹ Ethiopian Science and Technology Information Center, cited above at note 16, p. 92-113.

the subsector begs for trained man power and skilled status of R&D units. Moreover, it has been observed that establishing external linkage in the sub sector increases the production capacity by 24% and the possibility of a firm to produce at full capacity. Hence, the need for strengthening and even to make institutionalize the linkage between the industry and universities and having the governing policy legal framework for the realization is a prime concern.

Ethiopia has ratified new STIP in 2012. The Policy puts eleven critical policy issues. These are identified based on the national STI problem analysis and assessment of the characteristics of countries selected as benchmarks for their best practices. TOT is considered as an orbit for each and every STI matters in the Policy. However, it is foreign TOT which is considered as the backbone for the overall policy issues. Indeed, development, promotion and commercialization of useful indigenous knowledge and technologies are among the objectives of the Policy.⁴⁰ But, the over all directions are concerned with foreign TOT. Hence, domestic TOT has been given an equal policy priority. As far as UIL is concerned, it's true that the issue is the one among the eleven concerns under the umbrella of "universities, research institutes, TVET institutions and industry linkage". However, the STIP doesn't put UIL as an independent policy direction considering its unique features.

In Ethiopia, there is no legal framework which is derived from the Policy that regulates, facilitates and governs TOT in general and UIL in particular in proclamation or regulation hierarchy. Indeed, Ministry of Science and Technology (MoST) has decreed a procedural Directive for the linkage of education and training, research institutions and industries in 2003. But, since it is simply a procedural directive, it can't have the ability to govern the huge issue of TOT. Hence, the country is expected to have a legal framework to govern TOT in general and UIL in particular. The relationships, responsibilities and accountabilities of the stakeholders in the linkage should be defined and governed by laws. Mechanisms of settling disputes, issues related with funds, incentives, institutional and operational schemes should also be stipulated under a legal framework so as to strengthen the linkage. That is why this thesis is devoted to examine the country's prevailing policy and legal regime as well as the practical realities so as to draw a clear image about the status of TOT and UIL.

1.3. Research Questions

This thesis will be guided by the following questions;

- 1- Should university - industry linkage be regulated in Ethiopia? If so, what are the aspects to be regulated?
- 2- Is technology supply the problem for Ethiopian leather industry? If so, are the universities able to cater the need?
- 3- What is the state of transfer of technology and university - industry linkage in the Ethiopian leather industry?
- 4- What is the extent of recognition of transfer of technology and university - industry

⁴⁰ Science, Technology and Innovation Policy, cited above at note 12, p. 4.

linkage under the prevailing Ethiopia's legal and policy framework?

- 5- To what extent are TOT and UIL in the leather subsector regulated by institutional rules and policies of AAU and AASTU?
- 6- Is there adequate institutional framework to facilitate TOT from universities to industry?

1.4. Objectives and Significance of the Research

The general objective of this thesis is to examine the status and recognition of TOT and UIL in the prevailing laws and policies of Ethiopia in light of the leather industry. Its specific objectives are

- Examine technology, TOT and UIL in the leather subsector.
- Ascertain whether UIL be regulated in Ethiopia and if it can be regulated identify the aspects to be regulated.
- Examine the state of TOT and UIL in the Ethiopian leather industry.
- Identify the impacts of polices of universities and institutional frameworks in fostering the UIL.

Up on attaining its objectives, the thesis will add its own contribution on the existing works in the area of TOT laws. Most importantly, the work can be taken as a pioneering legal research in the area of UIL regulatory aspects. Moreover, it will give insights for legal researchers to have a look in to the implications of TOT laws on the subsectors of the manufacturing industry other than the leather industry. It can also be used as a reference for researchers, policy and lawmakers and others in the area of TOT in general and UIL in particular.

1.5. Scope and Limitations of the Research

The thesis focuses on TOT laws on UIL in Ethiopia in light of the leather subsector. In doing so, the work endeavors to examine the status of technology, TOT and UIL in the leather subsector. Accordingly, the thesis solicits data from the Ethiopian Leather Industries Association (ELIA) and LIDI. This is done because from all 65 leather industries situated in Ethiopia, above 98% of them are members of the Association. At the same time, since the LIDI is established with the objectives to facilitate the development and transfer of leather and leather products industries' technologies and to enable the industries become competitive and bring rapid development, any TOT and technological cooperation platforms are expected to be done through the help of the Institute.

From the side of universities, the thesis analyzes the state of TOT and UIL in AAU and AASTU in light of the leather subsector. It is done purposefully just because the leather industry is establishing formal and active linkages only with these two universities. Most importantly, both universities are offering courses in Leather Technology and Footwear Engineering respectively. Interestingly, according to some studies, 69% of the leather firms are located in Addis Ababa and

22% of them are situated in Oromia region, mostly around Mojo.⁴¹ Hence, AAU and AASU are surrounded by leather industries.

The thesis assesses the nation's and the two universities' policies and TOT laws with special focus on the status of TOT and UIL. Moreover, it tries to explore, analyze and draw a comparative understanding for the issue by referring the experiences of Tanzania, US and Japan. It is proved that UIL is a recent phenomenon and governmental regulatory intervention is done in handful of nations. Of all, the legislative transformation on UIL in US and Japan are shining and well developed in the literature world. Since the 2000s developing countries have followed the US suit of having legal framework on UIL. Interestingly, as Ethiopia has made these two countries' Patent and Trademark Offices as its strategic allies for getting several millions of patent information in every year through the EIPO,⁴² it is wise to discuss their experiences concerning the UIL. Furthermore, since Ethiopia is a developing nation, the experiences of its counterpart, Tanzania, is a paramount importance.

Getting adequate published works especially legal researches on TOT and UIL is not an easy task. That is why doing a legal research in the area of TOT and UIL in particular is not an easy task for a lawyer. Moreover, analyzing the very technical issues in the area of engineering and technology in the leather industry is difficult for a legal researcher. Above all, finding a country to have a good experience specifically in leather industry through the instrumentality of UIL is very much difficult. It is because the available literature is much focusing on the general understandings about UIL but not on the synergy between universities and specific sector of industry.

1.6. Methodology

The thesis uses data from primary and secondary sources based and it employs both qualitative and quantitative. It also uses doctrinal and empirical methods with comparative analysis. By using doctrinal analysis, the work tries to arrive at a clear understanding about the status of TOT and UIL under the prevailing legal frameworks. Accordingly, the Federal Democratic Republic of Ethiopia (FDRE) Constitution, the Patent proclamation, current Investment Proclamation, Higher Education Proclamation, the repealed TOT Regulation and the MoST Procedural Directive for the Linkage of Education and Training, Research Institutions and Industries are explored. In addition, national policies, among others STIP, Education and IPRs policies along with sectorial policies enacted by universities are also analyzed in depth. Moreover, the thesis examines numerous books, journal articles, research works, newspapers and other media outlets, internet sources are used in the thesis so as to draw clear theoretical understandings about technology, TOT and UIL.

⁴¹ Ethiopian Science and Technology Information Center, cited above at note 16, p. 65.

⁴² Girma Bejiga, Use of Intellectual Property system for research and development institutions and business competitiveness: The Ethiopian Experience, 2014, p. 32.

Empirical data amassed from MoST, LIDI, ELIA, EIPO, AAU and AASTU through interviews so as to get the status TOT and UIL. As far as the comparative analysis is concerned, the experiences of Tanzania, US and Japan, which can be highly helpful to reveal the importance of TOT laws in the UIL are assessed. US and Japan are selected based on the relevant reference to the Ethiopian situation because they are efficient as they governed their university industry relations using efficient technology transfer laws. The situation in Tanzania is much more similar with Ethiopia, but still has exemplary experiences. Among others, its Science and Technology Policy is wise to how the nation can build its own independent STI capacity because it gives a prime recognition for inland TOT. Its universities have their own policies which focus on strengthening UIL and more interestingly formulated in light of the nation's development policies. The infant realities in development of universities and business in Tanzania is similar with the Ethiopia's one.

CHAPTER TWO

THEORETICAL CONTEXT OF TECHNOLOGY TRANSFER AND UNIVERSITY INDUSTRY LINKAGE

2.1. Conceptual Understanding of Technology Transfer

2.1.1 Conceptualizing Technology

Even though there is a consensus on the importance of technology for socio-economic development of a nation, that there is no universal agreement on the definition of the term technology. Some scholars have considered technology as a commodity, which can be easily transmitted and diffused from one source to another through licensing or selling.⁴³ Other researchers understand technology as a knowledge, which can be transformed via research and other creative processes into new product, process and new marketing method for practical purposes.⁴⁴ This conceptualization of technology illustrates the possibility of TT via knowledge exchange between universities or research institutes and firms that can actually introduce innovation in to the market.

Starting from dictionary meanings, Merriam-Webster Online Dictionary offers a meaning to technology as a practical application of knowledge, a manner of accomplishing a task and specialized aspects of a practical field.⁴⁵ In another dictionary meaning, technology is appeared with a meaning as “*the scientific method and material used to achieve a commercial or industrial objective.*”⁴⁶ According to the Encyclopedia Britannica, technology can be defined as the systematic study of techniques for making and doing things.⁴⁷

Besides from the dictionary meanings, literatures also have reflected broad understandings on technology. The most common view of technology is a “tool”, and then discussions proceed as to just what type of tool qualifies as technology.⁴⁸ While older definitions emphasize technique of production, more recent definitions are much broader in that they even include marketing and

⁴³ Ethiopian Science and Technology Information Center, cited above at note 16, p. 30.

⁴⁴ Ibid.

⁴⁵ Merriam Webster Online dictionary Definition of ‘Technology’, Available on <https://www.merriam-webster.com> (last visited on February 27, 2017).

⁴⁶ American Heritage Dictionary of the English Language, Definition of ‘Technology’, available on <https://ahdictionary.com> (last visited on February 27, 2017)

⁴⁷ Encyclopedia Britannica, Definition of ‘Technology’, available on <https://www.britannica.com/.../Encyclopaedia-Britannica.../Fifteenth-ed.>

⁴⁸ Rajbeer Singh, Technology Foresight for Competitive Dairy Industry A Case of India, 2009, p. 153 also available on shodhganga.inflibnet.ac.in/bitstream/10603/.../13/14_chapter%206.pdf. According to this work, fundamentally, a technology is an idea, practice, or object resulting from research as well as a tool that embodies the technology. Similarly, the work gives a meaning to technology as a set of knowledge contained in technical ideas, information or data, personal technical skills and expertise, and equipment, prototypes, designs or computer codes. In addition, it refers technology as to new tools, methodology, processes, and products and as such, is primarily an instrument used for changing the environment.

financial management, for instance, in defining technology.⁴⁹ Recent understanding of the concept of technology further relates with identifying the component attributed to the concept and its unifying characteristics.⁵⁰ That scrutinizes technology as the most complex learning process.

Moreover, some literatures have a very broad definition for technology. According to these works, technology includes not only process technology (the narrow and traditional view of technology) but product technology as well as financial, marketing technologies and quality control. According to Van Wyk, technology can be process, product, management and quality control.⁵¹ This discussion is also shared by other researchers. They described technology as the combination of resources, knowledge and know-how used to obtain goods/services.⁵² They further say that technology is a set of information used in order to accomplish certain tasks as well as the useful enforcement action of knowledge and expertise in a particular operation.⁵³

Therefore, we can understand that technology is considered as a very broad concept with several components and hence, information, knowhow, knowledge, skill, tool/material, method and information are its major constituents.

2.1.2. Conceptual Issues on Technology Transfer (TT)

Man creates and develops technologies, among others, in laboratories, research institutes and universities. These technologies must be transferred to appropriate application in right setting with suitable society and consumers. Often, technology is developed outside an organization or as a separate function of the organization. The organization that creates a technology does not bring it to the market. If the inventing organization is a university, the university usually does not have the resources or expertise to produce and market the products from that technology. Above all, TT laws of most nations of the world, especially the developed ones like US, strongly encourage developers of technology to transfer the technology to a private firm for commercialization. This necessitates TT from a developer to a user. Hence, we can understand

⁴⁹ Ali Shamsavari and others, Technology and Technology Transfer: Some Basic Issues, 2002, p. 1. Also available on <http://eprints.kingston.ac.uk/6629/1/Shamsavari-A-6629>. (last visited on February 27, 2017)

⁵⁰ Ethiopian Science and Technology Information Center, cited above at note 16, p. 30. In this regard, this work has identified different components of technology such as “object-embodied technology (Techno ware), human embodied technology (Humano ware), record embodied technology (Info ware) and organization embodied technology (Organo ware).”

⁵¹ Rias Van Wyk, “Management of Technology: New Frameworks,” Technovation, Vol. 7, 1988, p. 341. Hence, technology is defined as specialized knowledge applied to achieve a practical purpose. In other words, scientific knowledge is applied to develop a product or service in order to satisfy an existing or new need.

⁵² Mihaela Diaconu and Amalia Dutu, “Transfer of Technology – Mechanism of Modern University with Community Connection,” Scientific Bulletin – Economic Sciences, Vol.13, 2014, p.22.

⁵³ Ibid. According to them, technology can be considered as a product which makes the subject of trade, since it is a very useful tool for providing economic development to achieve strategic competitive advantage by actors in the competitive market.

that TOT is the movement of technology from an originator's environment to a user's environment.⁵⁴

To broaden the conceptualization of TT, it is wise to consult its different meanings and discussions from several sources. The world's leading legal lexicographer, Black's Law Dictionary gives lexical definition for the phrase TT. It defines TT as the sale or licensing of IP and as the field involving the sale and licensing of IP.⁵⁵ Business dictionary on its part gives a meaning to TT as the assignment of technological IP, developed and generated in one place, to another through legal means such as licensing or franchising.⁵⁶ It seems more elaborative and advanced meaning than appeared in Black's Law because for the technology to be transferred there has to be a legal backing. Hence, TT should be legal so that it should be allowable or enforceable by being in conformity with the law of the land and the public policy.⁵⁷

There is a widespread consensus in literature on the definition of TT differs substantially from one discipline to the other.⁵⁸ However, there are also communal conceptual understandings which gained shared consensus among scholars. In essence, TT can be said that, among others, the activity through which the results of basic and applied research from the research developers (universities, research institutes, and laboratories) arrive in private organizations or other structures of society and contribute to the latter's development. Above all, TT is not about selling some hardware to a client who is then left with the task of using it as s/he deems fit. Rather TT is the imparting of knowledge, skills and methodologies involved in the whole production cycle.⁵⁹ It is also the process of developing practical applications for the results of scientific research.⁶⁰ It includes, but not limited to, the disclosure of results from research and development, the licensing or assignment of IPRs related to such results, exchange of information, education and training, and joint ventures.⁶¹

If it is discussed from the universities' research point of view, TT is crucial for the innovation that drives a healthy economy, for the development of new technologies and as well as to generate revenues to support the university's mission.⁶² With TT, the university helps accelerate innovation activities and to support the process of obtaining competitive advantage for both

⁵⁴ L.I. le Grange and A.J. Buys, A Review of Technology Transfer Mechanisms, 2002, p. 82. also available on <http://sajie.journals.ac.za> (last visited on February 27, 2017)

⁵⁵ Bryan A. Garner, Black's Law Dictionary, 9th ed., 2009

⁵⁶ Business Dictionary, Definition of 'Technology Transfer,' available on <http://www.businessdictionary.com> (last visited on February 27, 2017)

⁵⁷ Ibid. The other interesting issue that we can grasp from the meaning given in the Dictionary is the introduction of the concept of commercialization of technology. As to the Dictionary, TT is also a process of converting scientific and technological advances into marketable goods or services. This indicates us TT is worth to be stretched so that to cover even the process of introducing a technology into the marketplace i.e. commercialization.

⁵⁸ Rajbeer Singh, cited above at note 48, p. 155.

⁵⁹ Ibid.

⁶⁰ Ibid.

⁶¹ Ibid.

⁶² Ibid.

industrial and academic environment by cooperating with the industry.⁶³ For industry, TT is the best way to acquire basic technological research results. The research activity carried out through the linkage may be also considered an important tool for identifying scientific talent. More importantly, TT from universities can boost global economic growth and regional economic development.⁶⁴

2.2. Theoretical Understandings of University – Industry Linkage

2.2.1. General Overview on UIL

The wealth of knowledge generated within universities can be transferred to industry so that society in general and local businesses in particular, can benefit from university scientific and technological expertise. Industrializing knowledge through UIL has become an increasing area of attention for researchers. Studies are focusing on a number of different variables and analytic frameworks to account for UIL as an empirical and theoretical phenomenon.⁶⁵ UIL as a topic of research has been investigated using a number of theoretical and methodological approaches and from various academic fields as well as inter-organizational and network approaches.⁶⁶

Sources witnessed that both in developed and developing countries technologies originated from universities have immense contributions in the socio economic development of nations.⁶⁷ In the context of developing countries, it is needless to say that universities can play an important role as an indigenous knowledge sources. Local universities in developing countries have to complement international knowledge transfers as they are local knowledge providers. In most countries, it is witnessed that public funding of science in universities is decreasing and due to this universities tend to rely on non-governmental fund sources.⁶⁸ This phenomenon makes universities to develop the behavior of academic capitalism with which they exercise market and market like experiences in order to secure external funding, particularly for research.⁶⁹ At the same time, enterprises find an increasing importance of university knowledge because their industrial production is becoming increasingly knowledge-based.⁷⁰

Lack of efficient institutions in developing countries - where legal systems are often loose - makes it difficult to conduct effective transactions of knowledge and to conclude contracts on research cooperation between universities and industries.⁷¹ Because of this, most of the relations

⁶³ Mihaela Diaconu and Amalia Dutu, cited above at note 52, p.26.

⁶⁴ Ibid.

⁶⁵ Taran Thune, Formation of research collaborations between universities and firms: Towards an integrated framework of tie formation motives, processes and experiences, Norwegian Business School, (Unpublished), 2006, p. 32.

⁶⁶ Ibid.

⁶⁷ Risaburo Nezu, cited above at note 3, p. 4.

⁶⁸ Daniel Schiller and Javier Revilla Diez, University Industry Linkages; Potential and realization in developing countries: Thai experiences, 2007, p. 39.

⁶⁹ Taran Thune, cited above at note 65, p. 39.

⁷⁰ Daniel Schiller and Javier Revilla Diez, cited above at note 68, p. 39.

⁷¹ Ibid.

entered into are informal and have to be based on mutual trust.⁷² Nevertheless, even the importance of such informal interactions should not be underestimated, as this kind of relationship may form the spring board for the development of more sophisticated cooperative relations. This calls the government to intervene through regulations that allow UIL flourish.

With the ongoing economic reforms there has been a dramatic change in the economic and business environment of the globe confronted by industries, academia and public laboratories should be there in support of industries. Now a day protection is getting replaced with competition, controls are giving way to liberalization, and import substitution is replaced with export promotion and globalization.⁷³ So, firms need new knowledge, ideas, specialists and researchers. Fast paced global competition and technological change also add significance to the firm's links to university for not only discovery of knowledge but also its industrialization.⁷⁴ On the other side, universities are a breeding ground for ideas, technologies, free thinking and development. Thus, the role of university as a source of new knowledge has even become more important than in the past. This indicates that the need for strong interaction between industries and universities.

The knowledge economy thesis, central in today's policies, states that the main source of productivity and competitiveness in modern economies is knowledge, both as an input, but increasingly as production itself.⁷⁵ Thus within the knowledge economy, the university takes center stage in economic and industrial policy.⁷⁶ Moreover, the role of academia in social and economic development of a nation has received fresh motivation largely in recent years as knowledge is widely recognized as a production factor that bears on the economy and competitiveness.⁷⁷ However, acting in isolation, academia cannot achieve its primary goals of knowledge creation and dissemination. Synergies between academia and industry secures and influence additional resources for higher education, promote innovation and TOT, and ensure

⁷² Ibid.

⁷³ Abraham Abebe, "University- Industry Linkage Practices, Determinants and Challenges Theoretical and Empirical Article Review: Lessons for Effective and Successful Collaboration," **International Journal of Research in Management, Economics and Commerce**, Vol. 6, 2016, p. 2.

⁷⁴ Boo-Young Eom and Keun Lee, Determinants of Industry-Academy Linkages and Their Impacts on Firm Performance: The Case of Korea as a Late-comer in Knowledge Industrialization, 2009, p.1

⁷⁵ Loet Leydesdorff, The Knowledge-Based Economy: The Potentially Globalizing and Self-Organizing Dynamics of Interactions among Differently Codified Systems of Communication, p. 5. Available at <http://www.leydesdorff.net/codification>, (last visited on March 6, 2017)

⁷⁶ Taran Thune, cited above at note 65, p. 31. According to him, "knowledge based economic growth is seen as dependent upon production, dissemination, reconfiguring and use of knowledge. Knowledge in this regard is seen as both scientific knowledge as well as knowhow, or competence vested in nations' and firms' human capital. To strengthen both scientific knowledge and general competence, policy makers are increasingly redefining higher education and research policies to provide for knowledge based economic growth."

⁷⁷ Gasper Mphongwa, "Academia-industry-government linkages in Tanzania: trends, challenges and prospects", **Accademic Journal**, Vol. 8, 2013, p.1.

that graduates have the skills and knowledge required to effectively contribute to the workforce.⁷⁸

University-industry partnership is a relatively new phenomenon that emerged during the past century and has strongly expanded in scope and number over recent decades. The issue of TT from university to industry has been on the agenda of academics and practitioners since the mid-1980s in connection with several changes, among others the rise in venture capital and the Bayh-Dole Act in the US.⁷⁹ Nevertheless, UIL covers a large range of diverse realities in both teaching and research, from the traditional to recent areas.⁸⁰

2.2.2. Channels or Linking activities of UIL

Some works argue that the commercialization of patents and knowhow from academia to industry is a complex process with an extremely wide variety of forms and their modalities.⁸¹ Generally, traditional forms of linkages include student industrial placement, staff exchanges, industry-sponsored projects and the like.⁸² Other methods of partnership include R&D, training and curriculum development, and consultancy. Furthermore, enterprises may commission a specific research project, or sponsor a university researcher in an area of interest. Through model development, technology incubation, the creation of spinoff companies for commercialization, licensing and royalty agreements and other related-activities are also devices of UIL. In terms of teaching and training, academia-industry activities include offering long and short term professional courses on a fee-basis to respond to the particular skill and training needs of industry.⁸³

In terms of activities, the most common approach to discerning between different activities is by looking at the institutional arrangement for linkage. Contractual arrangements, resources, scope and length of agreement are important institutional dimensions for categorizing different types of channels in a UIL.⁸⁴ Moreover, according to some literatures, UIL categorized in to four distinct groups- UI joint research (including joint publishing), contract research (such as consulting and

⁷⁸ Ibid.

⁷⁹ Astrid Szogs, cited above at note 4, p. 32.

⁸⁰ Abraham Abebe, cited above at note 73, p. 2. According to him, traditional such as student placement schemes, staff exchanges, consultancy services, continuing professional development, joint R&D and recent areas such as small enterprise development (the creation of spin-offs for the joint commercialization of R&D products and the development of consortia for collaborative R&D at the international level.”

⁸¹ Bijan Pretnar, Commercialization of Patents and Know-how from Academia to Industry, Joint ventures, avoiding the pitfalls, contractual issues, (.....), p.1. available at www.uil-sipo.si/uploads/media/Pretnar.pdf, (last visited on March 6, 2017)

⁸² Gasper Mpehongwa, cited above at note 77, p. 1.

⁸³ In a nutshell, the following are some of the interaction channels that are frequently mentioned in various articles and traditionally exercised- consultancy, studentships, employment of graduates by firms, sponsored university positions, use of university facilities and equipment, R&D contracts, R&D consortia and cooperative research, joint ventures, part-time teaching, academic spin-off firms, co-authoring of papers, informal networking, technology transfer schemes, patenting and technology licensing agreements, employee exchanges, sabbaticals, publications, establishment of campus laboratories in research parks, conferences, joint supervision of masters and Ph.D. students.

⁸⁴ Taran Thune, cited above at note 65, p. 50.

financing of university research), mobility (staff movement between universities and industry, joint supervision of students during industry placement and internship) and training (such as training of firm staff at universities, lecturing by industry staff on selected topics).⁸⁵

But all the above descriptive categories do not say much about the nature of UIL. According to some authors, creating a typology of UIL have proved difficult, as universities and firms interact in such a variety of ways.⁸⁶ That is why giving categorization for the devices of UIL in the analytical job which is not an easy task. Nevertheless, various sources prefer to categorize the channels in two pots –formal and informal linkages. A formal tie has an established agreement specifying the commitments and payment of fees by the involved agents. Formality is hence seen as related to resource involvement and extent of commitment.⁸⁷ It could be organized formally with liaison offices and TTOs and in some cases establishes science parks on or near campuses to facilitate such interaction.⁸⁸ Whereas informal linkage activities are regarded as the most common form of UIL, and can be seen as “non-contractual barter arrangements”⁸⁹ Moreover, many authors emphasize that the relation between formal and informal interactions is one of sequence rather than excluding alternatives, by emphasizing that formal agreements almost always grow out of existing informal relationships.⁹⁰

2.2.3. UIL and Economic Transformation

TOT from universities to industrial environment is a useful tool with which new technologies and products reach the market causing economic and social development. In a simple understanding, when companies and universities work in tandem to push the frontiers of knowledge, they become a powerful engine for innovation and economic growth in a country. Universities act as important drivers of economic development.⁹¹ According to experts, nowadays university is the institution that creates and disseminates knowledge and new ideas that can form the basis of innovation and source of knowledge for technology development with industry support to ensure local and regional economic development.⁹² TT and commercialization of university research can be important elements of the industrial development strategy of a country with a positive impact on increasing the number of jobs.⁹³ Moreover, universities are increasingly considered to be central actors in the economic

⁸⁵ Abraham Abebe, cited above at note 73, p. 6.

⁸⁶ Taran Thune, cited above at note 65, p. 43.

⁸⁷ Id., p. 45.

⁸⁸ Gasper Mpehongwa, cited above at note 77, p. 1. According to him, industry and academia may set up leadership, dedicated posts, clear strategic direction, and policies for managing the effective governance of the linkages

⁸⁹ Taran Thune, cited above at note 65, p. 45. According to him, the emphasis on bartering entails that social exchange is seen as central in UIL, in which academic and industrial scientists exchange knowledge, but also equipment, research materials, and even students.

⁹⁰ Ibid.

⁹¹ Shahid Yusuf and Kaoru Nabeshima, **How Universities Promote Economic Growth?**, World Bank, USA, 2007, p. 20.

⁹² Mihaela Diaconu and Amalia Dutu, cited above at note 52, p.24.

⁹³ Abraham Abebe, cited above at note 73, p. 2.

development processes of all countries. In recent times, their direct involvement with industry has increased, and policies have been designed to promote university–industry networking.⁹⁴ Traditionally a university has three responsibilities - teaching, research and providing services to society. The third responsibility involves contributing to social and economic development through increased interaction with businesses. Accordingly the main activities that correspond to this mission are highly involves in the scope of TT.⁹⁵ Given that the number of universities is increasing and financial support from the state is in decline, entrepreneurial approaches are contributing to the economic development.⁹⁶ According to some authors, entrepreneurial university becomes an organizational version of civic society, one that mediates between state and market.⁹⁷ In developing countries, UILs are important means to transfer local knowledge and to supplement the acquisition and adaptation of international knowledge and technologies. If their competitiveness is increased, economic and technological development will gain momentum. Moreover, the emergence of a knowledge-based economy highlighted the importance of technological innovation and its underlying R&D activities as the engine of growth.⁹⁸

Beyond the teaching-research-entrepreneurial classification, some authors have advocated for shifting the focus toward creating developmental universities which collaborate with external agents, (including firms) not necessarily with a focus on commercialization and profit-making but rather with the broader purpose of contributing to social and economic development.⁹⁹ Along these lines, a specific role for universities in developing countries would be to foster innovation and learning in the informal sector, which represents the main source of income for a large proportion of the population.¹⁰⁰ The aim would be to promote a shift toward more formal, innovative, and inclusive businesses, which would ultimately drive economic growth and employment.

2.2.4. Factors affecting TT of UIL

The successful commercialization of university technologies requires significantly more than a good idea or new technology. Developing a successful UIL can be determined by several factors.¹⁰¹ In a nutshell, major factors such as national expectations about the fundamental purpose of academic research, national R&D budgets, funding mechanisms and project selection criteria, career incentives for academic and industry researchers, the sociology of academic and

⁹⁴ Ibid.

⁹⁵ Mihaela Diaconu and Amalia Dutu, cited above at note 52, p.25.

⁹⁶ Ibid.

⁹⁷ Ibid.

⁹⁸ Loet Leydesdorff, cited above at note 75, p.8.

⁹⁹ Claes Brundenius, Bengt-Ske Lundvall and Judith Sutz, The Role of Universities in Innovation Systems in Developing Countries: Developmental University Systems–Empirical, Analytical and Normative Perspectives, 2009, p. 311.

¹⁰⁰ Ibid.

¹⁰¹ Henry Etzkowitz and Chunyan Zhou, “Introduction to special issue Building the entrepreneurial university: a global perspective,” **Science and Public Policy**, Vol. 35, 2008, p.629.

corporate R&D, corporate business strategies and management practices and others can affect TT from universities to industries.¹⁰²

The success in university TT is not solely dependent upon the availability of funds or the university policies and strategies, but also on the university's surrounding community's entrepreneurial climate and its own inherent fertility.¹⁰³ TT requires continuous communication between technology developer and receiver.¹⁰⁴ TTO is also a major factor in successful TT from research institutes or universities.¹⁰⁵ Moreover, it is argued that sharing of royalty with creator of technology is a main factor in commercialization of technology.¹⁰⁶ This factor is mostly entertained by specific legal frameworks for TT. Most of the time, the financial risk is the critical factor to be considered in TT and it can be decreased by sharing R&D cost and facilities.¹⁰⁷ In addition, TT through UIL can only be achieved by the successful absorption of knowledge which is determined by the absorptive capacities of national firms.¹⁰⁸ Hence, a firm can enhance its absorptive capacity by training its personnel, by carrying out R&D, and by using advanced manufacturing equipment.¹⁰⁹

Last but not least, in order to attract industry involvement, universities must have people capable of building and managing partnerships. Collaborations only work well when they are managed by people who cross boundaries easily and who have a deep understanding of the two cultures they need to bridge.¹¹⁰ University program need to be strongly orientated toward helping solve the scientific and technological challenges that companies care about. That means breaking down barriers inside the university and engaging faculty who have industry experience is a must.¹¹¹

Of all the above factors, the regulatory system of a given country can be considered as a crucial determinant factor in affecting TOT from universities to industries.¹¹² As it can be witnessed from the successful experiences of some countries, the policy regimes for TT got stimulus with legislations and the later has resulted in a widespread involvement of universities in TT.¹¹³ The BDA of 1980 in US has significantly contributed in the impressively rising results in university

¹⁰² Robert Kneller, "University-Industry Cooperation and Technology Transfer in Japan Compared with the United States: Another Reason for Japan's Economic Malaise," **Journal of International Law**, Vol. 24, 2003, p. 334.

¹⁰³ Rajbeer Singh, cited above at note 48, pp. 172-173.

¹⁰⁴ Ibid. It has received consensus that higher level of contact, interaction and commitment with clients of technology help in understanding about their needs

¹⁰⁵ Id., p. 176.

¹⁰⁶ Id., p. 178.

¹⁰⁷ One important point that should be noted here is that, conservative universities provide only low risk services such as consultancy, technical services and training courses, seminars and workshops for the industry personnel. Therefore, researchers are unable to deal with issue of financial risk involved in TT.

¹⁰⁸ Haydn Belfield, Making industry-university partnerships work: lessons from successful collaborations, 2012, p. 7, available at www.sciencebusiness.net, (last visited on March 6, 2017)

¹⁰⁹ Ibid.

¹¹⁰ Ibid.

¹¹¹ Ibid.

¹¹² Gasper Mpehongwa, cited above at note 77, p. 33.

¹¹³ Rajbeer Singh, cited above at note 48, p. 181.

patenting and licensing activity. It essentially clarified the nature of the processes that need to be in place to bring university technology into the marketplace and it fostered the TTOs, hence realize the objective of TT.¹¹⁴

2.2.5. Motivations in UIL

Motivations for interaction are frequently presented as benefits expected from of UIL. The expected benefits from the UIL are seen from both sides –from the universities and industries. Studies surveyed in this thesis clearly show that UILs have been mutually beneficial to both. Firms from US and Japan that collaborated with universities were more innovative, introduced new products, developed new processes and emerged globally competitive.¹¹⁵ Universities also benefited as the academic excellence and industrial collaborations went together. Universities that enjoyed high ranking in the world were the ones that collaborated with industry more.¹¹⁶

In many literatures, access to the research frontier and keeping an eye on new knowledge and opportunities are regarded as general motivations for firms.¹¹⁷ Problem solving or assistance with general and specific problems is another motivation for firms. Gaining access to complementary technological knowledge, getting skilled workers, providing training to existing or future employees, gaining access to the university's facilities and equipment are also other motivations.¹¹⁸ Delegating R&D activities, cost sharing and access to public research funding and incentives are mentioned in literatures, though not as frequently. Access to highly trained manpower is referred to as the most important reason for why firms interact with universities. Moreover, some authors point at increasing good will and visibility of the firm among the university graduates as essential motivations.¹¹⁹ Obtaining prestige or enhancing the company's image and being good local citizens or fostering good community relations can be also cited a great motivation in the side of industries.¹²⁰

Several main reasons are also claimed to motivate universities to link with firms. Securing additional funding for research, access to R&D equipment, access to relevant industrial research and research problems are among the primary motivations. Other motivations are increasing relevance of education and provide employment opportunities for students, and fulfilling the service mission of universities. Some literatures tend to argue that increasing political legitimacy by showing that the institutions contribute to economic development is cited as a crucial motivation for university.¹²¹ In addition, some authors claim that UIL can reduce governments'

¹¹⁴ Id., p. 180.

¹¹⁵ NS Siddharthan, University - Industry Collaborations: Asian Experience,.....p.15, available at <http://fgks.in/images/pdf/papers/200.pdf>, (last visited on March 6, 2017)

¹¹⁶ Ibid.

¹¹⁷ Taran Thune, cited above at note 65, p. 41.

¹¹⁸ Jose Guimón, Promoting University-Industry Collaborations in Developing Countries, 2013, p.4.

¹¹⁹ Taran Thune, cited above at note 65, p. 41.

¹²⁰ Abraham Abebe, cited above at note 73, p. 11.

¹²¹ Taran Thune, cited above at note 65, p. 42.

responsibility for the economic support of university research.¹²² Furthermore, in many countries, research institutions have created reward systems where by the inventor receives a share of any profits made when licensing or spinning off inventions.¹²³

What is more is the fact that law shapes incentives to make TOT occur effectively. The experiences of some nations show that laws influence motivations to ensure that promising academic discoveries are developed into beneficial products and services. Here also the US BDA has significantly contributed in the impressively rising results in university patenting and licensing activity. It essentially clarified the nature of the processes that need to be in place to bring university technology into the marketplace and it fostered the TTOs, hence realize the objective of TT.¹²⁴

2.2.6. Models concerning the UIL

Literatures say that there are different models widely used as theoretical framework for understanding academia-industry linkages. Although there is no clear classification for the models of UIL, the harvest of economic writings gives an elaboration of some models. The explanations are used to understand the conceptual frameworks as to how UIL are to be developed. Nevertheless, National Innovation System (NIS) and the Triple Helix Models are often portrayed models in several literatures.

Within the NIS framework, innovation is viewed as a collective process in which firms do not innovate in isolation but within a larger system involving firms, universities, research centers, government agencies and other actors.¹²⁵ The model considers all aspects of the economic and institutional structure of a country that influence the development, diffusion and use of innovations.¹²⁶ The model originated when Christopher Freeman and Bengt-Ake Lundvall analyzed the historical account of the rise of Japan in the late 1980s.¹²⁷ In the NIS literature, one of the roles of universities is to channel their knowledge to firms, and they function as knowledge diffuser by producing quality students and by interacting with firms through

¹²² Abraham Abebe, cited above at note 73, p. 11. According to him, moreover, industrially sponsored research provides students with exposure to real world research problems and it also provides university researchers a chance to work on an intellectually challenging research programs.

¹²³ Jose Guimón, cited above at note 118, p.4.

¹²⁴ Rajbeer Singh, cited above at note 48, p. 180.

¹²⁵ John Ssebuwufu and others, Strengthening University Industry Linkages in Africa: A Study on Institutional Capacities and Gaps, 2012, p.16. Available at www.heart-resources.org/.../strengthening-university-industry-linkages-in-africa-repo. (last visited on March 17, 2017)

¹²⁶ Gasper Mpehongwa, cited above at note 77, p. 2.

¹²⁷ Boo-Young Eom and Keun Lee, cited above at note 74, p.1. According to this work, Freeman defines the NIS as a network of institutions in the public and private sectors whose activities and interactions initiate, import, modify, and diffuse new technologies. Lundvall defines it as the elements and relationships which interact in the production, diffusion, and use of new, and economically useful, knowledge and are either located within or rooted inside the borders of a nation state. He broadens the concept of Freeman to include economic structure and institutional set-up that affect searching, learning, and adapting.

cooperative programs.¹²⁸ Moreover, the model considers the firm as having the leading role in innovation as it funds, coordinates and commercialize technology.¹²⁹

The second and widely developed model in recent times is the Triple Helix Model. It is mainly and successively developed by Etzkowitz and Leydesdorff in 1997 and views innovation as a product of interaction between three main actors - academia, industry and government. According to Etzkowitz, universities, firms, and governments each “take the role of the other” in triple helix interactions even as they maintain their primary roles and distinct identities.¹³⁰ “The university takes the role of industry by stimulating the development of new firms from research, introducing ‘the capitalization of knowledge’ as an academic goal. Firms develop training to ever higher levels and share knowledge through joint ventures, acting a bit like universities. Governments act as public venture capitalists while continuing their regulatory activities”¹³¹ This means, universities, in their own part, are beginning to act like firms by capitalizing knowledge and starting up new commercial entities. On the other hand, firms are beginning to act like universities by investing in research laboratories of universities. The government is also assuming a regulatory role in supporting development of industry relevant research, and TT to industry. Hence, the interaction between the three strands of the “helix” creates the unique and distinctive characteristics of an innovation system (interchangeability).

The triple helix focuses on the university as a source of entrepreneurship and technology.¹³² But at the same time the Model cleared the roles expected from government and industry as well.¹³³ Hence, government is the ultimate guarantor of societal rules of the game as it is responsible for providing the rules of the game and industry is the primary source of productive activities.¹³⁴ One important issue to be addressed here is that, the triple helix becomes manifest in the establishment of TT departments at universities, the creation of incubators for technology based enterprises, and the establishment of science parks.

¹²⁸ Ibid.

¹²⁹ Ibid. In other words, universities and research organizations are generators of knowledge while firms are mainly knowledge users.

¹³⁰ Henry Etzkowitz, **The Triple Helix: University – Industry – Government Innovation in Action**, Routledge, USA, 2008, p.1.

¹³¹ Ibid.

¹³² Henry Etzkowitz and Loet Leydesdorff, “The dynamics of innovation: from National Systems and “Mode 2” to a Triple Helix of university–industry–government relations,” **Research Policy**, Vol. 29, 2000 p. 114.

¹³³ Henry Etzkowitz and others, “The Future of the University and the University of the Future: Evolution of Ivory Tower to Entrepreneurial Paradigm,” **Research Policy**, Vol. 29, 2000, p. 324.

¹³⁴ Henry Etzkowitz, cited above at note 131, p. 8. According to him, in this model, academia focus on establishing institutional interface structures including industry liaison or TTOs, business and technology incubators, and fostering entrepreneurialism through various policies and incentives.

CHAPTER THREE

COMPARATIVE UNDERSTANDINGS ON TECHNOLOGY TRANSFER AND UNIVERSITY INDUSTRY LINKAGE

3.1. General Overview

In this chapter, the thesis is going to discuss the experiences of countries concerning their TT laws on UIL. By doing so, it picks the experiences of Tanzania, US and Japan so as to draw a comparative understanding on the subject matter. The entire literature on the laws of TOT and the effectiveness of UIL has argued that the US pledged the best role model for its legislative transformation on UIL. In US, dramatic changes and huge results from the UIL came after the 1980's following the enactment of several TT laws. Laws define and govern the relationships, responsibilities and accountabilities of the stakeholders in the linkage, the mechanisms of settling disputes.¹³⁵ Following the US experience, during the 1990s most Organization for Economic and Cooperation and Development (OECD) countries introduced similar legislation, and since the 2000s many low and middle income countries have followed the same suit.¹³⁶

Regardless of their differing contexts, over the last twenty years, Asian governments have been giving increasing attention to the effectiveness of their NIS, in particular the relationship between universities and industry.¹³⁷ Of all other Asian experiences, the Japanese practice is taken as the pioneer and the most effective model for the developing world. Following the US widespread influence in the global practice, patenting and licensing were remained the main policy issues in University-Industry Technology Transfer (UITT) regime. But, after the rise of technological Japan and Korea, several TT channels are becoming the contenders in the policy issue of UIL and patenting and licensing stay as components of a broader set of UIL.

Since Ethiopia is a developing nation, the experiences of its counterpart, Tanzania, is a paramount importance. Both countries are starting to walk on the path of free market economy since the beginning of 1990s. The industries and universities are infant in Tanzania. There is a loose UIL and there is no legal framework on UIL. Hence these situations are similar with the situations of Ethiopia. Moreover, Tanzania's Science and Technology Policy is wise to how the nation can build its own independent STI capacity because it gives a prime recognition for inland TOT. Its universities have their own policies which focus on strengthening UIL and more interestingly formulated in light of the nation's development policies.

¹³⁵ That is why no any writing in UIL has appeared without discussing the experience of the US. In all literatures, the effects of TT laws on UIL, the rationale for academic entrepreneurship, the evolving role of universities in the commercialization of research and the entire economy of a nation and other issues have been discussed in light of the US practice.

¹³⁶ Jose Guimon, cited above at note 118, p. 7.

¹³⁷ Moreover, for the past half a century, the East Asian economies fashioned a uniquely successful industrial development practice in which the focus was clearly on S&T as the primary productive forces.

3.2. Technology Transfer and UIL in the United States

Soon after 2010, following the 30th year anniversary of the most known USTOT law, the 1980 BDA, literatures about the issue of UIL have been increased. Several scholars have discussed the historical backgrounds of UILs in the US and the effects of that Act in the country's TT regime and the globe as well. The place of universities in the US innovation system and their role in the economy is well demonstrated. The role of IP regime in patenting and licensing of university innovations and the place of university creations in the firms' transformation and global competition have been also discussed in depth. Different aspects of academic entrepreneurship and commercialization of university knowledge are profoundly illustrated. Along with the fruits of the BDA which aims at fastening patenting and licensing, other growing concerns in the area of UIL are also coming to the front page in the literature world.

The history of TT in US has different pictures before and after the 1980s. Although the topic has received considerable attention from scholars, university administrators, industrial managers, and policy makers since 1980, University-Industry Cooperation (UIC) in US has a long history, across the 20th century.¹³⁸ In response to increased international competition, policy-makers focused on the gaps in TT for academic discoveries with potential industrial relevance.¹³⁹ In literature, much of the discussion since 1980 has focused on university patenting and licensing of inventions as a means to support collaboration and UITT. A number of US universities emphasized patenting and licensing of research results as the most important channel for TT and research collaboration, as well as for revenues. This is because of the BDA which aims highly at fastening patenting and licensing. But it is evident that research collaborations between US university and industry have relied on many channels of technology and knowledge exchange activities.¹⁴⁰

3.2.1. The Turning point – The enactments of Technology Transfer Laws

Most scholars have agreed that the game in TT in general and UIL in particular in US have changed dramatically after the legal innovations – the enactments of several TT laws. The rapid growth of academic TT was encouraged by changes in federal laws and regulations.¹⁴¹ Indeed, there is a greater level of IP protection and the policy makers believe this protection plays an important role in encouraging innovation, technological change and facilitating economic growth.¹⁴² From the beginning, the founders of that country believed IPRs protection is a vital tool so as to foster invention and investment.¹⁴³ However, there was little conversion of

¹³⁸ Shahid Yusuf and Kaoru Nabeshima, cited above at note 91, p. 165.

¹³⁹ Id., p. 163.

¹⁴⁰ Ibid.

¹⁴¹ Henry Etzkowitz and others, "Pathways to the entrepreneurial university: towards a global convergence", **Science and Public Policy**, Vol. 35, 2008, p 691.

¹⁴² Kamil Idris, **Intellectual Property; A Power tool for economic growth**, WIPO,, pp. 79 and 80.

¹⁴³ The Constitution of the United States (1787), Article I, Section 8. According to this section, the founders gave specific grants of power to Congress in order to promote the progress of science and the useful arts, by securing for

inventions in to commercial useful products due to the minimal patent and license practice.¹⁴⁴ That is why the Congress of the US was concerned about those challenges and the global competitiveness.¹⁴⁵ During those periods, various initiatives resulted in laws designed to encourage increase innovation related activities in the business community and to remove barriers to technology development, thereby permitting market forces to operate.¹⁴⁶ In addition, laws promoting cooperative R&D and joint ventures involving the federal government, industry, and academia had become cornerstones for many changes.¹⁴⁷

Of all TT laws of that nation, it is the BDA, formally named Patent and Trademark Amendment Act of 1980, is a vital law.¹⁴⁸ There were many attempts to increase the flow of technology from universities prior to 1980, but none have been as successful as or as important as the BDA.¹⁴⁹ It coined the US as the pioneer of introducing new regulations to stimulate the patent activity of universities and to enable commercialization of research products.¹⁵⁰ Throughout the 20th century, American universities were the nation's most powerful vehicles for the diffusion of basic and applied research results. These activities were central to the rise of American technological success broadly and to the growth of knowledge based industries.¹⁵¹ In light of this fact, it is mostly argued that, the BDA contributed to significant changes in how universities commercialize and diffuse technologies developed in their research laboratories and elsewhere in campus.¹⁵²

The legislation is intended to use patent ownership as an incentive for private sector development and commercialization of federally funded R&D.¹⁵³ Specifically the Act instituted a uniform

limited times to authors and inventors the exclusive right to their respective writings and inventions, through measures such as the issuance of patents and copyrights in the Constitution.

¹⁴⁴ Companies also couldn't get exclusive rights and taxpayers didn't benefit from the government funded researches.

¹⁴⁵ Marina Lamm, cited above at note 6, p. 12.

¹⁴⁶ Wendy Schacht, The Bayh Dole Act: Selected Issues in Patent Policy and the Commercialization of Technology, 2003, p.7.

¹⁴⁷ Ibid.

¹⁴⁸ United States Code (1980), No. P.L. 96-517. The Act amended Patent Acts of 1790, 1836, 1922, 1952. See also Henry Etzkowitz and Ashley Stevens, "Inching toward industrial policy: The university's role in government initiatives to assist small, innovative companies in the US", science studies, Vol. 8, 1995, p. 13. The Act named after its sponsors, Senator Birch Bayh of Indiana and Bob Dole of Kansas. Indeed, along with those legislators, university officials were also lobbied the enactment of the Act as they intended to locate the universities in the central location of the US's economy.

¹⁴⁹ Robert Rhines, Consequences of the Bayh-Dole Act, 2005, p. 3, also available at studylib.net/doc/consequences-of-the-bayh-dole-act-6.901-final-paper-profe, (Last Visited on March 22, 2017) According to this work, literatures argue that BDA is one of the most influential pieces of legislation to impact the field of IP law in the 20th century.

¹⁵⁰ Jose Guimon, cited above at note 118, p. 7.

¹⁵¹ Anthony So and others, "Is Bayh-Dole Good for Developing Countries? Lessons from the US Experience?", PLoS Biology, Vol. 6, 2008, p. 2.

¹⁵² Rosa Grimaldi and others, 30 Years After Bayh-Dole: Reassessing Academic Entrepreneurship, 2011, p. 5.

¹⁵³ Wendy Schacht, cited above at note 146, p. 7. See also, US Code (1980), cited above at note 148, Sec. 202.

patent policy and removed many restrictions on licensing¹⁵⁴ as it replaced a web of institutional patent agreements that had been negotiated between individual universities and federal agencies with a uniform policy.¹⁵⁵ Many important new discoveries of the universities passed into the public domain and consequently had no commercial value.¹⁵⁶ Surprisingly, only few government-owned patents were introduced to the industry.¹⁵⁷ Hence, BDA changed the way these government funded patents were handled and there was an explosion of university patenting following 1980 as it gives patent rights to universities.¹⁵⁸

In terms of revenue, since the passage of the Act, US academic patenting, licensing, and associated revenues have increased.¹⁵⁹ As a result, researchers vested with key patents took advantage of exclusive licenses to start spinoff companies.¹⁶⁰ BDA has a positive impact to universities because exclusive licensing creates incentives to commercialize these inventions.¹⁶¹ Above all, universities expected to share commercialization revenues with inventors.¹⁶² The institutional reforms with the establishment of Transfer of Technology (TTOs) have encouraged universities to elaborate their own internal specific regulations and implement mechanisms supporting academic entrepreneurship.¹⁶³ Simultaneously, the private sector is provided with the incentive to develop the inventions created because it can purchase the exclusive rights to produce the inventions from university.¹⁶⁴ On the other positive note, the BDA required different

¹⁵⁴ Haward Bremer, “US Laws Affecting the Transfer of Intellectual Property”, **Intellectual Property Management in Health and Agricultural Innovation**, 2007, p. 266, also available online at www.ipHandbook.org, (Last Visited on March 22, 2017). See also United States Code (1980), cited above at note 147, section 200.

¹⁵⁵ Shahid Yusuf and Kaoru Nabeshima, cited above at note 92, p.165. Its provisions expressed Congressional support for the negotiation of exclusive licenses between universities and industrial firms for the results of federally funded research and it reduced the power of federal funding agencies to oversee the terms of licensing agreements between research performers and licensees. Prior to this Act, the government retained ownership of all patents granted using government money through its funding agencies. The government also retained the right to license the inventions to the private sector, which it did nonexclusively. Thus, universities were creating new and exciting technology using government funds that were never reaching the industry or the public.

¹⁵⁶ Marina Lamm, cited above at note 6, p. 14.

¹⁵⁷ Henry Etzkowitz and Ashley Stevens, cited above at note 148, p. 19. In 1978, when the BDA put on the table of the Senate Judiciary Committee for discussion before its enactment, the Committee found that the government held title over 28,000 patents and had licensed fewer than 4%.

¹⁵⁸ Robert Rhines, cited above at note 149, p. 1.

¹⁵⁹ BDA accelerated this growth by clarifying ownership rules, by making these activities bureaucratically easier to administer, and by changing norms toward patenting and licensing at universities.

¹⁶⁰ Anthony So and others, cited above at note 152, p. 2. See also United States Code (1980), cited above at note 148, section 202. Accordingly, the Act allowed universities to own the patents arising from federal research grants. It also permits a university, small business, or non-profit institution using federal funds for research to produce an invention to retain the title on any patent issued for such inventions.

¹⁶¹ Robert Rhines, cited above at note 149, p. 3. See also Marina Lamm, cited above at note 6, p. 15.

¹⁶² Marina Lamm, cited above at note 6, p. 15

¹⁶³ Rosa Grimaldi and others, cited above at note 152, p.7

¹⁶⁴ Robert Rhines, cited above at note 149, p. 3.

agencies that funded US R&D to adopt more consistent policies about ownership of patents arising from federal funding.¹⁶⁵

But still some of the literatures are hesitating to acknowledge the Act as a champion of the changes. They asked that “to what extent is the BDA the basic cause of the rise of university patenting and licensing?”¹⁶⁶ According to such line of arguments, it is misleading to use only data about the growth of academic patents, licenses, and licensing revenues as evidence that BDA facilitated commercialization of university inventions in the US.¹⁶⁷ Such writers say that this is because of the lack of clarity in sampling and relevance of the data amassed.¹⁶⁸ According to them, the narrow focus on licensing of patented inventions ignores the fact that most of the economic contributions of public sector research institutions have historically occurred without patents through dissemination of knowledge, discoveries, and technologies by means of journal publications, presentations at conferences, and training of students.¹⁶⁹ Moreover, they claim that the Act, while important, was not determinative, rather there are several additional factors for the stimulation in the UIL in US and it is difficult to separate their effects from those of BDA.¹⁷⁰

3.2.2. The Fruits of Policy and Legal Innovations

In general, the image of TOT in US has been changed soon after the transformation in policies and legal infrastructures. Especially the passage of the BDA was seen as an important ingredient in a broader shift in US policy toward stronger IPRs. There is also a widespread consensus that this legislation is an important trigger for a re-evaluation of the role of the university in society in that country.¹⁷¹

As extensively discussed above, one of the major factors in the reported success of the Act is conveying of ownership of IP. This change resulted in patent and licensing spheres.¹⁷² Prior to the 1980s, only 250 university innovations received patents in a year, but after the enactment of the BDA over 3000 patents were received by universities only in 2005.¹⁷³ Here one important point worth to be noticed is there is also an increase in the number of universities engaged in

¹⁶⁵ Rosa Grimaldi and others, cited above at note 152, p. 5.

¹⁶⁶ Shahid Yusuf and Kaoru Nabeshima, cited above at note 91, p. 163.

¹⁶⁷ Ibid.

¹⁶⁸ Ibid.

¹⁶⁹ Anthony So and others, cited above at note 151, p. 2.

¹⁷⁰ David Mowery, Richard Nelson, Bhaven Sampat, and Arvids Ziedonis, The effects of the Bayh-Dole Act on US University Research and Technology Transfer: An analysis of Data from Columbia University, the University of California, and Stanford University, 1998, p. 26, also available at <https://pdfs.semanticscholar.org/d37f/d648dc787ff47eba601d8e19fa9dfdac29b.pdf> (Last visited on March 22, 2017). For example, they raised the increased federal funding for basic biomedical research, expanded research in biotechnology, specific court rulings.

¹⁷¹ Rosa Grimaldi and others, cited above at note 152, p. 8.

¹⁷² It provides an incentive for universities to take the time and effort to pursue a patent and to license. This has led to a significant increase in academic patenting. Empirically, following the passage of the BDA, the number of patents granted to universities increased dramatically.

¹⁷³ Marina Lamm, cited above at note 6, p.16.

TT.¹⁷⁴ This shows that with the passage of the Act, new universities saw the incentive to patent and began doing so. Due to this, the share of university patents in the whole US patent system has also shown an increment.¹⁷⁵ Before the passage of the BDA, there was no practice of licensing the patented university inventions.¹⁷⁶ But, with the increase in patenting, US universities expanded their efforts to license the patents.¹⁷⁷ Licensing revenues of universities increased from \$183 million to \$318 million in the three years from 1991 to 1994 alone.¹⁷⁸ It is understandable that exclusivity is what motivates firms to invest financial and human resources in technology development.

Here one important issue to be addressed is the development of research and entrepreneurial universities in US after the BDA.¹⁷⁹ At the same time, after the enactment of the BDA, universities, in the path of their entrepreneurial line, have increased the volume of their research.¹⁸⁰ According to several scholarly works, the BDA has contributed a lot in the area of conflict resolution.¹⁸¹ From the beginning, ownership and the rights to developing technology are probably the most contentious issues in the preparation of agreements between universities and industrial companies. Conflicts of interests may arise relation licensing or selling of rights, participation of researchers in spinoffs, their time allocation between academic and educational responsibility and commercial interest. According to the extensive discussion given by Etzkowitz and his colleagues, instead of a conflict of interest, a confluence was defined, with free flow of personnel and ideas between the universities and industries after BDA.¹⁸² Moreover, US universities have developed sectorial policies and guiding rules to regulate specific issues.¹⁸³

It can be obvious that the adherence towards formal way of TT is also another positive consequence of the BDA. The fact that universities are licensing their legally protected IPRs shows by itself that the formal way of linkage became overriding after the BDA. In addition, by the late 1980s, according to some writings, almost every university had its own professionally staffed TTO so that to accelerate technology patenting and licensing. Hence, the growth in all measures of formal TT performance has been remarkable, given that it started from essentially nothing in 1980.¹⁸⁴ In another positive effect of the BDA, there is recognition with the fact that

¹⁷⁴ Ibid. Accordingly, only 24 universities engaged in TT before 1980 and the number boosts up to 200 universities in 2005.

¹⁷⁵ David Mowery and others, cited above at note 170, p. 10. In a data appeared in this work stated that university patents are accounted from less than 1% in 1975 to almost 2.5% in 1990.

¹⁷⁶ It is discussed in the previous section of this thesis that in 1978, the government held title over 28,000 patents and had licensed only fewer than 4%.

¹⁷⁷ Marina Lamm, cited above at note 6, p.17. According to her, nearly 5,000 new licenses signed only in 2005.

¹⁷⁸ David Mowery and others, cited above at note 170, p.11.

¹⁷⁹ Henry Etzkowitz and others, cited above at note 141, p. 688. According to them, academic entrepreneurship is widely accepted and universities increasingly identify themselves with the entrepreneurial university perspective even as they deepen their commitment to teaching and research.

¹⁸⁰ Louis Tornatzky, Building State Economies by Promoting University-Industry Technology Transfer, 2000, p. 7. Moreover, the incorporation of academic science into new products and processes is also increasing

¹⁸¹ Kenichi Hatori, Industry-university collaboration in Japan: From the side of a university,..., p. 10.

¹⁸² Henry Etzkowitz and others, cited above at note 141, pp. 687 and 688.

¹⁸³ Risaburo Nezu, cited above at note 3, p. 31.

¹⁸⁴ Henry Etzkowitz and Ashley Stevens, cited above at note 148, p.21.

the university TT affects industry growth and product development as well as the country's economy.¹⁸⁵ Economic analysis confirms that especially in some industries, such as pharmaceuticals, the proportion of new products with a direct link to university research is quite high.¹⁸⁶

3.3. Technology Transfer and UIL in Japan

3.3.1. The Story of heavy loss of Competitiveness in Japanese Industries

The 1990's witnessed the stagnation in overall economy of Japan in general and the heavy loss of competitiveness in the industry in particular. As Etzkowitz and colleagues discussed, Japan faced a similar crisis to the one that took place in the US during the 1970s.¹⁸⁷ The country had fallen behind industrial nations and its GDP was declined during those ten years.¹⁸⁸ That is why economists coined those ten years "A lost Decade".¹⁸⁹

Literatures couldn't agree on the possible reasons for the sluggish economic situation.¹⁹⁰ Even if manufacturing has been a key element of Japan's economy since post-WWII, it lost its competitiveness in the 1990's.¹⁹¹ During that period, the production activities of its manufacturing industries were increasingly outsourced abroad.¹⁹² The Japanese innovation system also has lost its competitiveness. There was also a long tradition with which a firm conducts R&D largely at its own in-house research center, and collaborations with universities have not been put to active use which hindered UIL.¹⁹³

¹⁸⁵ Marina Lamm, cited above at note 6, According to her, for example, in 1997, 333 start-up companies were formed which is an increase of 34% from the previous year. In 2000, licensing of innovations by US universities and other nonprofits added about \$40 billion to the US economy, created about 260,000 jobs. In 2005, 527 new products introduced into the market and totally 3,641 new products introduced from 1998 through 2005. 628 new spinoffs created in 2005 and in general 5,171 spinoffs created since 1980 to 2005. In 2008, 648 new commercial products introduced, 5,039 total license executed and 595 new companies formed.

¹⁸⁶ Louis Tornatzky, cited above at note 180, p. 9. See also Wendy Schacht, cited above at note 146, p. 15. According to Schacht, surprisingly, among the 462 new companies created in 2004, above 74% of the firms were located in the same state as the university.

¹⁸⁷ Henry Etzkowitz and others, cited above at note 141, p. 685.

¹⁸⁸ Ibid.

¹⁸⁹ Fumio Hayashi and Edward Prescott coined those ten years "a lost decade" in their article "The 1990s in Japan: A lost decade, 2002.

¹⁹⁰ Motohashi Kazuyuki, Economic Analysis of University-Industry Collaborations: The role of new technology based firms in Japanese national innovation reform, 2004, p. 1. And also see Tamim Bayoumi, The morning after: Explaining the Slowdown in Japanese growth in the 1990s, 1999, p. 18. They claim that financial failures in general and huge bank lending and nonperforming loans in particular are the causes for the problem. See also Fumio Hayashi and Edward Prescott, cited above at note 190, p. 2. Hayashi and Prescott rejected the above assertion by saying that the problem is not a breakdown of the financial system, as corporations large and small were able to find financing for investments and they say there is no evidence of profitable investment opportunities not being exploited due to lack of access to capital markets. Rather they appear to argue that as the fall in productivity and the reduction of the statutory workweek length (average hours worked per week) from 44 hours to 40 hours as the prime factors for the economic disaster.

¹⁹¹ United States Department of Commerce, Japan's manufacturing competitiveness strategy: Challenges for Japan, opportunities for the United States, 2009, p.20.

¹⁹² Henry Etzkowitz and others, cited above at note 141, p. 685.

¹⁹³ Motohashi Kazuyuki, cited above at note 190, p. 3.

It was only as late as the 1990s that Japanese society became serious about establishing mutually supportive relations between the research institutions and universities. The direct cause of this change was the heavy loss of competitiveness by overall Japanese firms to the US, Korea, China and countries that were industrializing at accelerating speeds.¹⁹⁴ At the same time and following the government's radical reform schemes, companies began to show increasing interest in utilizing the knowledge of universities rather than doing all of their research on their own.¹⁹⁵ They started to believe in formal and positive relationships with universities.¹⁹⁶ Then a shift to a knowledge-based economy was sought, in which universities would play a greater role¹⁹⁷ which clearly shows the path of Triple-Helix Model.

3.3.2. The Tragedy of Falling behind foreign Universities

Japan has a distinctive higher education system in which national, private and local public category of universities is coexisted.¹⁹⁸ Even if the system moved into a huge stage of development in 1960s, a period characterized by rapid economic growth for the country, it has also fallen in the 1990's as the economy goes down. Scholars gave two reasons for the tragedy, internal and external reasons.

The main internal reason is related with National Universities (NUs). Even if NUs account for at least 75% of university R&D in Japan, they were not willing to collaborate with the industry.¹⁹⁹ They are state-owned and have shielded from the pressures of the private sector and they have shown little interest in working with business.²⁰⁰ Particularly after 1945, they harbored strong anti-business sentiment, believing that large business had been responsible for driving Japan into the painful war.²⁰¹ Although the sentiment was gradually eroded and some sort of collaborations happened, the cooperation occurred informally²⁰² and was invisible and non-contracting basis until the mid-1990s.²⁰³ Hence, it was rare for such universities to offer services and technologies to companies in order to help them to resolve technical problems.

¹⁹⁴ Risaburo Nezu, cited above at note 3, p. 5. Under the pressure of global competition, utilizing the most advanced knowledge developed by universities in a speedy fashion became a matter of the highest priority for Japan.

¹⁹⁵ United States Government Printing Office, Economic Report of the President, The role of Intellectual property in the Economy, 2006, p. 1.

¹⁹⁶ Motohashi Kazuyuki and others, cited above at note 190, p.18.

¹⁹⁷ Henry Etzkowitz and others, cited above at note 141, p. 685.

¹⁹⁸ Fumi Kitagawa, "Universities-Industry Links and Regional Development in Japan: Connecting Excellence and Relevance?" Science, Technology and Society, Vol. 14, 2009, P. 4. According to him, national universities are established and primarily funded by the national government, but their legal status since April 2004 has been that of National University Corporations with independent legal existence. Local public universities are established and primarily funded by local authorities with the power to award degrees.

¹⁹⁹ Robert Kneller, cited above at note 102, p. 29.

²⁰⁰ Risaburo Nezu, cited above at note 3, p. 10. See also Henry Etzkowitz, and others, cited above at note 141, p. 686. According to Henry Etzkowitz and others, prior to this reform, NUs were branches of the Japan's Ministry of Education, Culture, Sports Science and Technology (MEXT) and their faculty members were civil servants.

²⁰¹ Risaburo Nezu, cited above at note 3, p. 5.

²⁰² Henry Etzkowitz and others, cited above at note 141, p. 688.

²⁰³ Fumi Kitagawa, cited above at note 198, p. 12.

Moreover, universities in Japan had little stake in TOT process as they couldn't receive royalties or to hold equity startups.²⁰⁴ Due to low awareness in applying for IPRs, university scientists have attached to write and publish academic papers than to transferring technology to the private sector or applying for patent protection.²⁰⁵ After WWII and till the late 1990s, research commercialization and income from industry through knowledge transfer activities had remained marginal to many academic communities. Moreover, university researchers, and especially the administrations of the universities, played a passive role.²⁰⁶ In addition, there were only a few private universities had research centers.²⁰⁷

There are also several external reasons for the falling of Japanese universities. During the American occupation of WWII, Japan incorporated higher education ideas developed in the US to modernize its higher education.²⁰⁸ Because of that, Japanese higher education system boasts elements incorporated from the US on top of its German origin. That is why, the entire literature in Japanese UIL has compared the innovation and TT performance of that country with that of the US counterpart. This is because not only Japan adopted the US higher education system, but also it follows the same suit to energize its UIL as the US did in early 1980's. Some say, Japanese universities have a long tradition of close informal ties with industry.²⁰⁹ But it is believed that, that was an old gift exchange system which was highly dominated by donation system.²¹⁰ Moreover, state-owned universities were treated as part of the government and they and their professors were not allowed to operate as independent entities.²¹¹ Because of this unique legal arrangement, they had no legal status, and did not have the capacity to write a contract or own patents.

Before the late 1990's reforms, there was a huge gap between Japanese and American universities in terms of influence on industrial innovation and the latter outperform Japanese universities in this regard.²¹² Prevailing global perceptions hold that Japanese universities are inferior to their western counterparts in terms of research, just as the most advanced research in Japan is widely believed to occur not in universities, but in the research laboratories of leading

²⁰⁴ Risaburo Nezu, cited above at note 3, p. 5.

²⁰⁵ Id., p. 8.

²⁰⁶ Henry Etzkowitz and others, cited above at note 141, p. 688.

²⁰⁷ Robert Kneller, cited above at note 103, p. 30.

²⁰⁸ Masayuki Kondo, 21st century innovation systems for Japan and the United States; Lessons from a Decade of Change. University-Industry Partnerships in Japan, 2009, p. 4.

²⁰⁹ John Walsh and others, 'Promoting University-Industry Linkages in Japan: Faculty Responses to a Changing Policy Environment' **Prometheus**, Vol. 26, 2008, p. 1.

²¹⁰ Risaburo Nezu, cited above at note 3, p. 26. According to him, traditionally, large Japanese companies made donations to individual university professors, mainly for the purpose of keeping working relations and soliciting informal consultancy, but most importantly to recruit good students that are under the supervision of the university professors. See also Robert Kneller, cited above at note 103. According to Kneller, in the late 1990s, donations accounted for about 85% of total industry-sponsored research in NUs and the rest is government funded research

²¹¹ Risaburo Nezu, cited above at note 3, p. 10. They normally did not have a legal status which would allow them to claim ownership over the results of their research activities, employ researchers, write contracts with private companies and take on legal obligations. Rather, they were deemed part of the government itself and were obliged to follow a meticulous process to obtain permission to work with the private sector.

²¹² John Walsh and others, cited above at note 209, p. 10.

private firms.²¹³ Surprisingly, large Japanese corporations relied on collaborations with US universities rather than with Japanese universities.²¹⁴ This is because in the view of Japanese business, Japanese universities are much less responsive to the needs of business, slow to act and less experienced in managing IPRs.²¹⁵ Rising competition with other Asian nations and their universities had also another external threat.²¹⁶

The situations forced the government to place higher education high on the national policy agenda in order to maintain strategic competitiveness.²¹⁷ Several reforms are heralded with specific TT legal frameworks to strengthen the innovation system and UILs. Institutional frameworks like TTOs have boomed. New types of budgetary funds and project-based research funds established served to strengthen competition among universities.²¹⁸ The government intends to create world class universities that can help a country's escape from economic depression²¹⁹ and continues to help universities pursue more globalized education systems in an effort to boost the competitiveness of Japanese higher education.²²⁰ Many Japanese universities, in their own part, are considering and reviewing their policies to find the right track and break the shield to come out from their caves. Finally, the country succeeded and creates competent universities in the global academic arena. Nowadays, Japan has several universities which have gotten a valuable place in world's universities ranking.

3.3.3. The Secret behind the awakening of Japanese Universities and Industries

The entire literature assessed in this thesis has undoubtedly agreed that the legal reforms backed by strong policy shifts are key factors in the Japanese UITT system. Since the mid-1990s, Japan has instituted a series of policy reforms after studying the US laws and programs. Then it started to pass its own equivalent laws almost 20 years after the US's reform. So, in black and white, the secret behind the awakening of Japanese universities and industries was the enactment of successive TT laws.²²¹

From the mid-1990s-2004, Japan has announced several major TT laws to regulate specific areas of concern to promote closer cooperation between universities and firms and to encourage universities to commercialize their research results. The nation enacted the 1995 S&T Basic Law²²² and the 1998 Act on the Promotion of TOT from Universities to Private Business Operators.²²³ The other important piece of TT legislation was the 1999 Law of Special Measures

²¹³ Masayuki Kondo, cited above at note 208, p.6.

²¹⁴ Ibid.

²¹⁵ Risaburo Nezu, cited above at note 3, p. 11.

²¹⁶ Masayuki Kondo, cited above at note 208, p. 8.

²¹⁷ Id., p. 7.

²¹⁸ Ibid.

²¹⁹ Ibid.

²²⁰ *The Asian Review*, (Tokyo), "Japan to help universities boost global competitiveness", September 27, 2014.

²²¹ Henry Etzkowitz and others, cited above at note 141, p. 685.

²²² Japan Act (1995), No. 130.

²²³ Japan Act (1988), No. 52. This law also called Law of TLOs and it promoted the establishment of TLOs in universities independent of, but affiliated with particular universities. According to the law, technology licensing organizations (TLOs) as a business for arranging assignments, licenses and other activities of intellectual property to

to Revive Industry.²²⁴ This law was fully apparent with the US BDA and that is why it is coined as the “Japanese BDA” in several literatures. The law has the same effect like its US counterpart as it has allowed universities to retain invention rights resulting from government-funded researches. The Act made the way easier for firms to obtain licenses to national inventions.²²⁵ Moreover, most authors agree that entrepreneurship in Japanese universities has changed radically following the introduction of an equivalent to the US BDA and that is why it is said that the law is an important piece of legislation.²²⁶

As the series of reforms took place in TT legal regime, Japan continued to come up with another version of vital TT law to encourage UILs - The Law to Strengthen Industrial Technology Capability in 2000.²²⁷ Along with this TT legislation, Japan has also amended its National Public Service Law in the same year.²²⁸ The recent is the 2003 University Incorporation Law.²²⁹ Indeed, the very purpose of this law goes well beyond facilitating UIL. Rather it aims to make NUs more responsive to the changing needs of society by giving them more freedom of conduct on the one hand, but, at the same time, making them more accountable for creating value in Japanese society.²³⁰

Moreover, in addition to the above successive legislations, Japan has also implemented several basic plans, programs, initiatives, projects and guidelines to be accompanied with the legal reforms.²³¹ In addition, the country has enforced successive five years S&T Basic Plans since 1996 following the passage of the S&T Basic Law to stimulate the UILs. Furthermore there was the Plan for the Creation of New Markets and New Jobs, initiated by METI in 2001 which included a goal of establishing 1,000 university startups in three years and that was reached in 2004.²³²

appropriate private institutions, which rights are owned by university professors and researchers, and private and public universities.

²²⁴ Japan Act (1999), No. 31.

²²⁵ John Walsh and others, cited above at note 209, p. 2.

²²⁶ Tatsuya Ito and others, “Does university entrepreneurship work in Japan?: A comparison of industry-university research funding and technology transfer activities between the UK and Japan”, **Journal of Innovation and Entrepreneurship**, Vol. 5, 2016, p. 5.

²²⁷ Japan Act (2000), No. 44. The law establishes procedures under which university researchers can obtain permission to consult for establish and even manage companies to develop their technologies by legalizing compensated consulting and holding of management positions in private companies, provided permission was obtained in advance in the case of management positions. The law allowed the university scientists to work after office hours with pay, and to take up to three years off to commercialize discoveries and then return to their faculty positions.

²²⁸ John Walsh and others, cited above at note 209, p. 2. The law allows professors and university researchers to take management positions in university startups and to join Scientific Advisory Boards of for-profit firms.

²²⁹ Japan Act (2003), No. 112. The law gives NUs independent legal status as administrative units within the Japanese government structure.

²³⁰ Risaburo Nezu, cited above at note 3, p. 14.

²³¹ Ibid.

²³² John Walsh and others, cited above at note 209, p. 3.

3.3.4. The Results of the Legal Transformation

As a result of the above series of legal reforms, Japan has witnessed several results in its UIL. Along with the increase in patent, license and royalty income, universities are also characterized with entrepreneurial culture, changing in their sentiments about the cooperation, encouraged in commercialization of research results.²³³ Universities have begun to place a particular emphasis on creating new startups, joint research projects are highly increasing and hundreds of special research centers have been created in universities.²³⁴ Government agencies created effective institutional frameworks for the promotion of UIL.²³⁵ At the same time, companies are moving toward more formal working relations based on contracts in exchange for financial support. The changing nature reflects the wider industrial transformation of the nation and universities are playing more significant roles as economic resource.

With respect to patents, the number of patents has increased dramatically, from 6,570 in 2011 to 25,945 in 2016.²³⁶ This number is an intense increase from the 76 patents in 1996.²³⁷ To develop commercialization activity, universities started building infrastructure, in the form of TLOs responsible for IP management and TT.²³⁸ Japan also witnessed the flourishing of spinoffs following its legal reforms.²³⁹ Hence, there was a sharp increase in the number of startups.²⁴⁰ Furthermore, the number of collaborative research between universities and industries has also increased, especially since the mid-1990s in Japan.²⁴¹

²³³ United States Department of Commerce, cited above at note 191, p. 4. See also Masayuki Kondo, cited above at note 208, p.25. Japanese competitiveness ranking is around the 25th while Japanese science ranking is 2nd and Japanese technology ranking is within top 10.

²³⁴ United States Department of Commerce, cited above at note 191, p. 3. MEXT created 274 centers of excellence between 2002 and 2004 in universities to cultivate a competitive academic environment among Japanese universities by giving targeted support to the creation of world standard research and education bases.

²³⁵ John Walsh and others, cited above at note 209, p. 1.

²³⁶ Tatsuya Ito and others, cited above at note 226, p.7.

²³⁷ Risaburo Nezu, cited above at note 3, p. 11. See also Tatsuya Ito and others, cited above at note 226, p.18. According to Ito and others, one important concern to be noticed here is that, even if universities currently possess too many patents, but they also relatively low income from patents suggesting an inadequate return on investment. So, review of patent strategy, i.e. select patents which are truly innovative and will generate a significant commercial benefit for the final commercialization is a must and this in turn will be a good example for other countries.

²³⁸ Tatsuya Ito and others, cited above at note 226, pp. 4 & 5. Beginning with five in 1998, the number of approved TLOs had risen to 41 by 2005 and by 2009 a total of 47 TLOs were approved by the government.

²³⁹ Masayuki Kondo, cited above at note 208, p. 20. Nearly 70% of founders of spinoff companies were faculty members and doctorate, masters and undergraduate students. According to him, the spinoff companies seem to occupy a middle ground between universities and industry. Only 16.1% of spinoff companies intend to become manufacturer. Others intend to conduct R&D, collaborate with universities, sell technologies or products, product manufacturing, contract research and design in one form or another, or ask other companies to manufacture their products.

²⁴⁰ Fumi Kitagawa, cited above at note 198, p. 13. According to him, before 1998, there were only 17 spinoffs, in 1997 below 200, in 2007 around 1800.

²⁴¹ John Walsh and others, cited above at note 209, p. 4. According to them, joint research projects are increasing from about 1,500 in 1995 to about 6,500 in 2003. UI cooperative research centers located in universities are also increasing from three in 1987 to around 60 by 2001.

3.4. University – Industry Linkage in Tanzania

3.4.1. UIL and African Countries

There are two different groups of scholars concerning on the issue of innovation in developing countries. The first one favors TOT from abroad.²⁴² The other argument emphasizes the importance of building independent indigenous capabilities through a more internally driven process.²⁴³ The argument states that foreign firms entering in a developing country market are not interested in establishing an R&D infrastructure. Rather they come to amass profit by taking the advantage of local resources and labor force.²⁴⁴ In this second argument, therefore, the role of universities in LDCs comes in to picture. Indeed, universities in developing countries can play a role in building capabilities in the innovation system.²⁴⁵ Hence, universities emerge as crucial players in innovation systems and as providers of not only human capital, but also of entrepreneurs.²⁴⁶

In Africa, technological capabilities are often not well developed, and firms are typically characterized by very low levels of technological capabilities.²⁴⁷ African nations are intertwined in numerous problems. However, there are solutions, among others, from their universities if the later have appropriately linked with industries.²⁴⁸ Specially, through research and extension services, African universities can play a central role in producing technical solutions to local challenges.²⁴⁹ Despite African nations expend small amount of budgets on R&D, their universities are contributors to enhancement of research.²⁵⁰ However, universities lack networks with the productive sector.²⁵¹ Nevertheless, African governments lack an enabling environment for linking universities towards a more entrepreneurial role.²⁵²

In literatures, it is frequently discussed that in developing nations in general in African countries in particular, universities are hosting numerous challenges. There is an inherent mismatch between the research orientations of firms and universities.²⁵³ As a result, many African universities produce insignificant research outputs.²⁵⁴ Universities mostly rely on basic

²⁴² Astrid Szogs, cited above at note 4, p. 3. This pole of argument highlights the importance of exploiting and adapting technologies that have been developed abroad.

²⁴³ Ibid. According to this study, the pro-foreign TOT literature has been clearly focused on the acquisition of skills and technologies from developed countries. However, the impact of technology FDI depends on a variety of factors. One of the most important ones being the local firms' absorptive capacity as it is discussed in the previous chapter of this thesis.

²⁴⁴ Gasper Mpehongwa, cited above at note 77, p.6.

²⁴⁵ Astrid Szogs, cited above at note 4, p. 4.

²⁴⁶ Ibid.

²⁴⁷ Id., p. 25.

²⁴⁸ Erasmus Kaijage, cited above at note 5, p. 3.

²⁴⁹ John Ssebuwufu and others, cited above at note 125, p.7.

²⁵⁰ Id., p. 15.

²⁵¹ Id., p. 51.

²⁵² Id., p. 18.

²⁵³ Erasmus Kaijage, cited above at note 5, p. 2.

²⁵⁴ John Ssebuwufu and others, cited above at note 125, p. 18.

researches.²⁵⁵ In many African universities, there is often a lack of financial and human resources and capabilities to produce research results that can be converted into economic returns through patents, spinoffs or other means like contracting.²⁵⁶ Even if there is an increase in students' numbers, enrolment in sciences and engineering is low.²⁵⁷ There is a migration of intellect academicians to wealthier parts of the world.²⁵⁸ Moreover, universities don't have their own policies.²⁵⁹ Few African universities manage technology incubators or science parks.²⁶⁰ Their collaboration tends to be more informal and focus on the firms' recruitment of university graduates for staffing, internships, and consulting.²⁶¹

Firms in Africa, in their own part, oriented in excessive focus on fast commercial results and are driven by the need to maximize profits.²⁶² Low technological capability and low interest in technological innovation are their manifestations.²⁶³ This in turn limits their demand for the external knowledge that universities could provide. However, nowadays, many industries acknowledge cooperation with universities.²⁶⁴ Despite the poor state of UIL and universities face considerable constraints that affect their economies, universities endeavor to build stronger linkages with the productive (priority) sector of their respective economies.²⁶⁵ They started provide the knowledge, know-how and the skilled labor force that is vital for industry innovation.²⁶⁶ However, the initiatives need to be scaled up and supported.²⁶⁷

3.4.2. UIL in Tanzania

Tanzania is cited as a nation with age old UI relation.²⁶⁸ For the better part of 1960s and 1970s, the linkage among academia, industry and government was guided by a policy.²⁶⁹ However, serious consideration on the possibility of broader UIL came about in the 1980s, when the first National STP was enacted in 1985 and revised in 1995.²⁷⁰ In 1990, the country has reformed its economic policy direction towards free market path.²⁷¹ Moreover, in addition to the revision on

²⁵⁵ Jose Guimón, cited above at note 118, p. 4.

²⁵⁶ Id., p. 5.

²⁵⁷ Erasmus Kaijage, cited above at note 5, p. 4.

²⁵⁸ John Ssebuwufu and others, cited above at note 125, p. 18.

²⁵⁹ Ibid.

²⁶⁰ Id., p. 12.

²⁶¹ Jose Guimón, cited above at note 118, p. 3.

²⁶² Erasmus Kaijage, cited above at note 5, p. 2.

²⁶³ Jose Guimón, cited above at note 118, p. 5.

²⁶⁴ University World News, Enhancing university-industry linkages for 'rising Africa', Posted on May 23, 2015, available on, www.universityworldnews.com/article.php?story=20150523091500358, (last visited on April 24, 2017).

²⁶⁵ John Ssebuwufu and others, cited above at note 125, p. 13.

²⁶⁶ Erasmus Kaijage, cited above at note 5, p. 2.

²⁶⁷ Gasper Mpehongwa, cited above at note 77, p. 3.

²⁶⁸ Id., p. 3. According to this study, the collaboration among academia, industry and government in that country in research and innovation is traced back to German colonial rule in the early 1900s. The cooperation also recognized during the years (1967-1990) when the nation was following the path of Socialism.

²⁶⁹ Ibid.

²⁷⁰ Ibid.

²⁷¹ Astrid Szogs, cited above at note 4, p. 91.

the national STP, the nation has endorsed several sector specific policies and strategies.²⁷² Some of them have recognized and encouraged UIL and some are not.²⁷³ As far as the STP is concerned, its major concern is to establish relative priorities programs for generating new knowledge and to determine strategies for the application of S&T development in Tanzania.²⁷⁴ Interestingly, the Policy was wise to how the nation can build its own independent STI capacity.²⁷⁵ The Policy is, however, silent on how universities would create linkages with industry.²⁷⁶

Apart from the national policies, some universities have their own sectorial policies.²⁷⁷ These policies are, among others, focus on strengthening UIL.²⁷⁸ For instance, University of Dar Es Salaam has “Corporate Strategic Plan”.²⁷⁹ Here an important lesson is, this Plan was formulated in the light of government policies.²⁸⁰ Indeed, this can be an exemplary experience for other African universities. Because universities in LDCs are expected to reflect the practical realities of the nation and support the development endeavors of their respective governments. In addition, Sokoine University of Agriculture has enacted its own “Corporate Strategic Plan on UIL”. The Plan mentions that the university has signed several Memoranda of Understandings with local, regional and international organizations.²⁸¹

Since 1990s, because of the economic reforms and the revised STP as well as other policy and institutional reforms, Tanzania witnessed increase of universities and S&T research and training institutions.²⁸² Old universities like the University of Dar Es Salaam and Sokoine University of Agriculture have expanded in terms of programmes and enrolment.²⁸³ The private sector started

²⁷² Erasmus Kaijage, cited above at note 5, p. 4.

²⁷³ Ibid. The National Higher Education Policy of 1999 was found to be silent on UIL. Even if it provided the general policy framework for higher education in Tanzania, it lacks a strategy as to how the implied linkages would take place. The Sustainable Industrial Development Policy (SIDP) 1996 – 2020 articulates the framework for the country’s industrial development with short, medium and long-term perspectives. The policy recognizes that there was a very weak link between R&D institutions like universities and the productive sector of the economy. But there is no any direction put towards the enhancement of UIL.

²⁷⁴ Gasper Mpehongwa, cited above at note 77, p. 3.

²⁷⁵ Ibid. One of the objectives stated in the Policy is “promote scientific and technological self-reliance in support of economic activities through the upgrading of R&D capabilities. The other Policy objectives which are directly related with technological independency are “promote and encourage the public and private productive sectors in developing S&T and establish and/or strengthen national S&T institutions.” Apart from mentioning the general directions for the country’s S&T platform, it stated that universities should lead the way in advancing the frontiers of knowledge through basic and applied research.

²⁷⁶ Erasmus Kaijage, cited above at note 5, p. 4. In addition, even if the Commission for S&T is mentioned in the policy as the coordinating body for an effective TOT, but there is no clear institutional framework is suggested through which universities would clearly establish a link with industry.

²⁷⁷ Id., p. 6.

²⁷⁸ Ibid.

²⁷⁹ Ibid.

²⁸⁰ Ibid.

²⁸¹ Id., p. 8.

²⁸² Astrid Szogs, cited above at note 4, p. 91.

²⁸³ Erasmus Kaijage, cited above at note 5, p. 22.

to flourish and became the engine of the economy.²⁸⁴ Following the STP, a number of firms geared toward coordinating with universities.²⁸⁵ The enrollment in higher education became increase. In the university-wise assessments, specifically, the two oldest universities have good examples of well-crafted linkages with the productive sector.²⁸⁶ Most importantly, they are cited as models for other universities in Tanzania since they have their own sectorial policies.²⁸⁷

Nevertheless, the prevailing situation in Tanzanian UIL is similar with the above discussed reality of developing countries. Despite there are policies in few universities, generally there are no clear strategies to guide university units as to how linkages should be formulated.²⁸⁸ As a result, the kinds of linkages that exist are more dependent on the personal interests of the peoples in offices.²⁸⁹ This limits the researchers to access partners and new ideas.²⁹⁰ Many unites in universities are neither proactive nor aggressive in forging links with industry.²⁹¹ Universities are still having the negative mentality not to cooperate which gaps them from industry. On the other side, some of the firms are not sure of the kind of benefit they could enjoy from UIL.²⁹² Other business practitioners look down on academicians as theoreticians with no relevant or practical experience in how to solve practical problems faced by industries and hence nothing to offer to them.²⁹³

3.4.3. Hindering factors on UIL in Tanzania

There are several factors raised for the weak cooperation between university and industry in Tanzania. Some people explained that the historical factors, such as the centralized economic and education system for over two decades, are the critical hindering cause on UIL.²⁹⁴ As a result of the discouragement on the private sector, the economy is still characterized with small or medium sized private sector.²⁹⁵ With regard to newly established high learning institutions and universities, most of them are young having started in either 1990s or 2000s.²⁹⁶

The other most important related with inadequacy of STP and absence of legal frameworks. It is discussed that the STP is silent on how universities would create linkages with industry.²⁹⁷ Most importantly, Tanzania doesn't have legal framework to regulate UIL.²⁹⁸ The other problem is

²⁸⁴ Gasper Mpehongwa, cited above at note 77, p. 3.

²⁸⁵ Ibid.

²⁸⁶ Id., p. 6.

²⁸⁷ Erasmus Kaijage, cited above at note 5, p. 6.

²⁸⁸ Id., p. 23.

²⁸⁹ Ibid..

²⁹⁰ Gasper Mpehongwa, cited above at note 77, p. 4.

²⁹¹ Erasmus Kaijage, cited above at note 5, p. 23.

²⁹² Ibid.

²⁹³ Ibid.

²⁹⁴ Gasper Mpehongwa, cited above at note 77, p. 5. The centralized economic system prevented the establishment and development of private institutions and overemphasized the role of the government.

²⁹⁵ Ibid. This indicates that such firms do not have financial muscles to partner with the academia.

²⁹⁶ Id., p. 6.

²⁹⁷ Erasmus Kaijage, cited above at note 5, p. 23.

²⁹⁸ John Ssebuwufu and others, cited above at note 126, p. 52.

related with the quality of researches.²⁹⁹ In some extreme cases, curriculums of some programs are not informed by relevant requirements of the desires of the industry.³⁰⁰ Apart from this, the weak incentive scheme is also another challenge.³⁰¹ Most importantly UIL in Tanzania have remained traditional, primarily informal.³⁰² Formal linking mechanisms are not employed well.³⁰³

3.4.4. What should African countries do to encourage UIL?

Indeed, challenges faced by developing nations are different based on their respective contexts. Hence, they require multidimensional solutions. This subsection, therefore, discusses several solutions reflected in literatures with a special focus on the Tanzanian experiences. According to Mpehongwa, the first solution is, the Tanzanian academia should grow with business enterprises.³⁰⁴ Erasmus Kaijage has also firmly supported this assertion.³⁰⁵ The reality in other African nations is also similar with the Tanzania's one.³⁰⁶ Similarly, African universities are small and growing.³⁰⁷ Hence, Mpehongwa argued that this situation should be looked as an opportunity for the academia to design small collaboration initiatives involve little resources that would grow to serious engagements.

In the US and Japanese experiences, public policy and law can influence UIL. The same can hold water to the developing nations.³⁰⁸ Governments, through the instrumentality of their policies, can have direct role in providing funds to universities and R&D projects, and giving incentives (such as tax refunds and awards or recognitions) to the successful actors.³⁰⁹ Moreover, policy can enable governments to provide the necessary infrastructure and intermediate organizations such as TTOs, science parks, and business incubators.³¹⁰ In addition, governments may grant permission for researchers to launch research-related enterprises in the compounds of their

²⁹⁹ Erasmus Kaijage, cited above at note 5, p. 4.

³⁰⁰ Ibid. One can concretized this assertion when realizing that education, law, social sciences and business courses accounted for 83% of the entire students enrolled in the 2010/11 academic year, while science (agriculture, engineering, medicine, natural science, and IT (accounted for only 17%).

³⁰¹ Jose Guimón, cited above at note 119, p. 6. Accordingly, universities often don't provide the incentives to align their research agendas with market demands, and therefore are not very relevant to the needs of local enterprises

³⁰² Gasper Mpehongwa, cited above at note 77, p. 5.

³⁰³ Id., p. 7. Based on this study, infrastructure, including laboratories, science parks, technology incubators and testing facilities that could attract productive sector in seeking partnership are not well deployed in Tanzanian universities.

³⁰⁴ Ibid.

³⁰⁵ Erasmus Kaijage, cited above at note 5, p. 23. According to him, between 1990 and 1999, the SMEs sector made a significant contribution of about 32% to Tanzania's GDP. Despite their significant importance, small firms are less likely to appreciate the importance of UIL than large firms because of their low level of exposure and literacy of their management.

³⁰⁶ Id., p. 3. In most economies not many industries use high-level technology and characterized by micro, small and medium industries. Interestingly, most of them are great innovative potential but are not very well nurtured or the subject of research.

³⁰⁷ Gasper Mpehongwa, cited above at note 77, p. 5.

³⁰⁸ Astrid Szogs, cited above at note 4, p. 91.

³⁰⁹ Id., p. 1.

³¹⁰ Gasper Mpehongwa, cited above at note 77, p. 8.

universities.³¹¹ Furthermore, governments can stimulate collaboration through soft measures, such as providing specific support services to firms/universities in the search for partners by conducting forums to promote networking and raise awareness of the importance of collaboration.³¹²

Above all, encouraging UIL through legal frameworks becomes a key solution especially after the US BDA. Following the US experience, during the 1990s most OECD countries introduced similar legislation, and since the 2000s many low and middle income countries like China, Brazil, Mexico, South Africa, Malaysia and Philippines have followed the same suit.³¹³ Even if governments play an important role in creating a conducive for strengthening UIL by putting in place appropriate legislations, many governments in Africa have not yet turned their pledges into concrete actions.³¹⁴

Establishing a technology fund is another way to stimulate and enhance sustainable collaboration among academia-industry and government.³¹⁵ Moreover, universities in Africa should establish platforms for the industry so that to make education more relevant and actively participate in curriculum development.³¹⁶ Moreover, legally founded and independent TTOs are also solutions to foster the current low level of UIL in Africa.³¹⁷ Furthermore, governments can further shape UILs by developing science parks in universities and increasing university spinoffs.³¹⁸ Governments are also expected to set a platform for dialogue between universities and academia.³¹⁹

³¹¹ Jose Guimón, cited above at note 118, p. 6.

³¹² Astrid Szogs, cited above at note 4, p. 1.

³¹³ Jose Guimón, cited above at note 118, p. 7.

³¹⁴ John Ssebuwufu and others, cited above at note 125, p. 52.

³¹⁵ Gasper Mpehongwa, cited above at note 77, p. 5. He stated that the fund scheme may provide resources and finances such as loans. Accordingly, he advised that, developing nations are advised to have strong funding schemes to finance UILs.

³¹⁶ Id., p. 8. According to Mpehongwa, the private sector can also support educational and training provision by employing and offering sponsorship to graduates and providing assistance to projects

³¹⁷ Jose Guimón, cited above at note 118, p. 7. According to his discussion, TTOs provide a wide range of services related with patent, licensing agreements, search for partners and funding sources, and training and support in the creation of university based spinoffs

³¹⁸ Ibid.

³¹⁹ University World News, cited above at note 264. According to the article, generally, any dialogue between industry and universities should be based on a clear understanding of the comparative advantage on each side, which is a foundation of shared purpose, where each partner is clear about what assets they will bring to the table.

CHAPTER FOUR

TECHNOLOGY TRANSFER LAWS ON UNIVERSITY - INDUSTRY LINKAGE IN ETHIOPIA: THE CASE OF ETHIOPIAN LEATHER INDUSTRY

4.1. Policy Frameworks for Technology Transfer and UIL in Ethiopia

4.1.1. General Overview

Science and Technology Policy (STP) is an integrated sum of principles, strategies, objectives and actions adopted by a government in response to the realization of a country's weak S&T capacity, on the one hand, and the critical role of S&T for development, on the other hand. It can be crafted in national, subnational, company and university level.³²⁰ National STP, most of the time, is required to develop long-term national S&T potential and capability so as to generate and apply S&T for socio-economic development.³²¹ In some countries the policies of central governments with respect to UILs are complemented by those of subnational authorities, whether provincial, county, or municipal. This policy decentralization sets the stage for competition to attract and retain industries, especially those that generate numerous localized links, employment, exports and added value.³²²

In Ethiopia, most universities are new, with low reputation and far located from the central part of the country in which there is a high dense of industries.³²³ Hence, they are not in a position to engage in problem-based research or to forge links with industry. This is because, along with the national policies, subnational governments, through their own policies, can influence on fostering the UIL of those "disadvantaged" universities as the latter would strengthen the local economic conditions.³²⁴ The policies can employ the directions for providing incentives to attract industry that could twist into a major cluster or several linked mini clusters around those universities. Moreover, because of advances in IT and some sort of readiness of industries to look farther afield for research support, long distance collaboration among researchers and UILs is becoming more common.³²⁵

³²⁰ Shahid Yusuf and Kaoru Nabeshima, cited above at note 91, p. 9.

³²¹ Ibid.

³²² Id., p. 12

³²³ This is because a globalizing economy has ambiguous implications for location because being at or near an existing or potential industrial hub remains a significant advantage.

³²⁴ Dr Sintayehu W/Mikael, Addressed to Triple Helix Conference, 2006, Transforming University-Industry-Government Relations in Ethiopia, 2008, p. 23.

³²⁵ Shahid Yusuf and Kaoru Nabeshima, cited above at note 91, p. 13.

Under the frameworks of governmental policies, universities and companies, on their own part, can develop policies to enhance their role in the STI of a nation.³²⁶

4.1.2. The 1993 Science and Technology Policy

Evolutionary journey to have a national STP in Ethiopia has started in 1993 when the country issued its first National STP. Due to this, Ethiopia is known as the one among the first African nations to have national STP after the OAU adopted the Lagos Plan of Action on S&T in 1980.³²⁷ The major objectives of the policy were building capability to generate, select, import, develop, disseminate and apply appropriate technologies and improving the knowledge, culture and the scientific and technological awareness of the peoples of Ethiopia.³²⁸ Hence, its objectives show that the policy was formulated in response to the realization of the country's weak S&T capacity, on the one hand, and recognition of the role of S&T for development, on the other. Foreign TOT was the cornerstone for the Policy. However, it didn't give due concern for inland TOT in general and to UIL in particular. Hence, this scored as the big miss of the Policy. Moreover, the Policy had not been followed by the appropriate legal instruments for its implementation.

4.1.3. The Current Science, Technology and Innovation Policy of Ethiopia

The current STIP has enacted in 2012. The Policy takes the national vision of alleviating poverty and joining middle income earning countries as of 2017 E.C. as a spring board.³²⁹ The vision of the Policy is “to see Ethiopia entrench the capabilities which enable rapid learning, adaptation and utilization of effective foreign technologies by the year 2022/23”. The Policy puts eleven critical policy issues which are identified based on the national STI problem analysis and assessment of the characteristics of countries selected as benchmarks for their best practices.³³⁰ The Policy gives brief reflections to each of the eleven policy directions and jotted down the necessary strategies under each policy directions. Moreover, while the previous policy did not give a concern for innovation, the current STIP gives due attention for innovation manifested even in its naming/title, too.

³²⁶ According to Yonas Tefera, Team Leader of University-Industry Linkage, Leather Industry Development Institute, (Addis Ababa, 28/07/2009). According to him, Ethiopian leather industries don't have their own company policy to conduct UIL. Hence, only universities have their own policies to govern their relation with industry and the issue of TOT. As is discussed in chapter three of this thesis, entrepreneurial universities flourishing in US and Japan that actively seek connections with the business sector are adopting a number of policies and guidelines to enhance UIL. Most of the directions in those policies are covering the areas of managing conflict of interest, time allocations and use of facilities to conduct research, patenting, licensing and royalty sharing issues. Even if notable changes are not registered, the oldest Tanzanian universities have followed the same suit.

³²⁷ Economic Commission for Africa, African Union and African Development Bank Group, **Innovation, Competitiveness and Regional Integration**, Economic Commission for Africa, Ethiopia, 2016, p. 85.

³²⁸ Science and Technology Policy of the Transitional Government of Ethiopia, 1993.

³²⁹ The vision of the Policy is “to see Ethiopia entrench the capabilities which enable rapid learning, adaptation and utilization of effective foreign technologies by the year 2022/23”.

³³⁰ These are, technology transfer, human resource development, manufacturing and service providing enterprises, research, financing and incentive schemes, national quality infrastructure development, universities, research institutes, TVET institutions and industries linkage, intellectual property system, science and technology information, environmental development and protection, and international cooperation.

4.1.3.1. The Place of TT and Research in the Policy

When read from its vision, mission and objectives, TOT is a spinal cord of the STIP. According to the Policy, the issue of TOT should primarily focus on devising a system of learning, adapting and utilizing as well as disposing of imported technologies in order to meet national demand.³³¹ Accordingly, the Policy's prime concern is foreign TOT. The policy directions and strategies are, in black and white show that the Policy primarily emphasizes the need to transfer foreign technologies. Moreover, the Policy heralds that foreign TT is a backbone for the country's STI system not only for a contemporary basis but also for the infinite future. Hence, this indicates that little emphasis is given to internal TT through which indigenous technological innovative expertise are transferring from inland homes of technology to the industry.³³² Indeed, one of the objectives of the Policy is develop, promote and commercialize useful indigenous knowledge and technologies. But, unlike the Tanzanian STP, the overall direction and dully given attention is to foreign TT and inland TT has not gotten a due concern in the policy as it deserves.

The Policy also declares that it has gotten fertile experiences from the South East Asian nations. But it neglects the realities of those nations in their STI developments. Not going far, the experience of the industrialized Japan has given us more lessons. The Japanese experience shows that the East Asian nations energize their internal innovation capacity, accumulate and commercialize it consistently with their own respective problem.³³³ Unlike the Japanese, Ethiopian policy makers gave a prime policy concern to foreign TOT rather not for indigenous TOT. Indeed, in Ethiopia, as the STIP also underlines, the national capability to learn, adapt and utilize foreign technology is at a very low stage. And indeed, capability may be enhanced through foreign TOT. The main assumption behind the direction as to the focus on foreign TOT is that technologies that are useful for the country's ongoing socio-economic development are available in the market and that transferring these technologies will be a crucial instrument to reduce the technology capability gaps between the advanced nations and that of Ethiopia.³³⁴

Of course, it may be sound that giving a due policy concern for foreign TOT so as to develop fast in the contemporary global setup.³³⁵ Moreover, for the country like Ethiopia which is characterized with urgent development problems, it is wise enough to import effective and

³³¹ The Policy admits that most TT activities carried out in the country are not in line with the envisaged technology demands of the development programs. In general, the national capability to learn, adapt and utilize foreign technology is still at a very low stage.

³³² Interview with Ato Awol Hussien, Director of Policy Research and Future Planning, Ministry of Science and Technology, (Addis Ababa, 27/07/2009 E.C.). He stated that the claim is also raised by different organs in different policy discussion meetings. Hence, the concern got a popular understanding.

³³³ Japan has reoriented its policy directions towards the focus to indigenous knowledge and technologies cultivated in universities and laboratories as a prime concern. Moreover, it defined the legal frameworks which regulate the legal status of inland technology developers, IPR schemes, institutional infrastructures for TOT, funding schemes and other related issues. At the end of the day, utilizing the most advanced knowledge developed by inland technology developers, like universities, in a speedy fashion became a matter of the highest priority for Japan

³³⁴ Interview with Ato Awol Hussien, cited above at note 332.

³³⁵ Interview with Professor Admassu Tsegaye, Interview with Professor Admasu Tsegaye, President, Addis Ababa University, (Addis Ababa, 10/07/2009 E.C.).

efficient foreign technologies.³³⁶ However, in order to take foreign technologies, the country must first build even the capacity to search, select, adapt and utilize. The Ethiopian society and industry, as recipient of foreign technology, must be capable of acquiring, assimilating, exploiting, and transforming body of imported technology. Even if absorptive capacity can be built through both foreign and domestic TOT, it is mainly achieved through inland knowledge base and using domestic technological capabilities.

Here, one important notice should be underlined is that, it doesn't mean that foreign TOT should be neglected, rather, at the same time the country should import foreign technologies as long as its technological absorptive capacity permits to do so.³³⁷ Otherwise, it can be meaningless. That is why, there is a sluggish efficiency of foreign TOT and most of the foreign technologies that the country has imported from abroad are, most of the time, inefficient because of, among others, feeble absorptive capacity. Outrageously, there was no even a single TOT agreement registered during 1995-2005³³⁸ and this means, arguably, there is no technological FDI in the country in that decade. Even if the situations are changing and there are some a handful of foreign TOT agreements are registered by the Ethiopian Investment Commission,³³⁹ still there is an alarming clue to rethink the priority policy direction in the TOT arena.³⁴⁰ This statuesque, in the long run, will undoubtedly make the nation dependent on imported technologies as it sacrifices the utilization of the domestic resources of knowledge. In support of this assertion, the ex-Minister of Education, Dr. Sintayehu addressed a decade ago as follows;

“developing countries shouldn't borrow technology. Africans should also think to create knowledge, in this era of globalization, to be free from dependence knowledge should be generated from the land of Africa”³⁴¹

Hence, there was a possibility to put the internal TOT in the front pages of the STIP as a primary concern.³⁴²

³³⁶ Interview with Ato Awol Hussien, cited above at note 332.

³³⁷ Interview with Professor Admassu Tsegaye, cited above at note 335.

³³⁸ Yohannes Hailu, Legal and Institutional Framework for Transfer of Technology in Ethiopia, (Unpublished), 2015, p. 88.

³³⁹ Id., p. 93. According to Yohannes, the Ethiopian Investment Commission has managed to register about 23 TOT agreements 2003-2015.

³⁴⁰ Here a critical point worth to be noticed is, even if the STIP primarily advocates foreign TOT, most alarmingly, for instance in the leather subsector, the state of foreign cooperation is becoming loosen and such a linkage makes the subsector dependent in foreign technologies. Moreover, it is discussed that the technologies transferred through the overseas cooperation are of only abstract management techniques rather than the hunted-after technical knowledge that could be applied to future real practices in to the firms' production system.

³⁴¹ Dr. Sintayehu W/Mikael, cited above at note 324. His speech indicated that there was a new policy direction in the minds of the then policy makers which is different from the 1993 policy direction in which indigenous knowledge can be a prime concern of the upcoming policy. But, after 6 years, in 2012, the new STIP also reaffirmed that the policy primarily focuses on foreign technology transfer.

³⁴² Surprisingly, the objectives seen in the draft document of the STIP were entirely advocated for the domestic TOT. To this effect, the front specific objective read in the draft policy document was “to build national capability to generate and apply scientific knowledge and appropriate new, indigenous and emerging technologies that are useful

The other direction stipulated in the Policy which is directly related with TOT is the issue of research. According to the Policy, an effective national research system is of a paramount importance in order for the country to have effective learning, transferring, adaptation and utilization of foreign technology. Here also the prime agenda concerning research is foreign TOT. However, the research direction should not only look for foreign technologies, rather it should have a prime focus on resolving practical problems. The Ethiopia's technological demand is not only searching, selecting, adapting and utilizing foreign technology. Rather, the nation and its economy demands conducting an innovative research and incubating problem-solving technology to the existing needs. Otherwise, the research system will also be bothering and dependent only in searching, selecting, adapting and utilizing foreign technologies.

Not going too far, Ethiopian leather industries are tending to make use of low technology products, operating at low technical efficiency and poor skill and knowledge status with little interest in investing in R&D. This led us to conclude that searching, selecting, adaptation and utilization of foreign technology for local contexts is very low. Because of small markets and low purchasing power in the nation, many global firms are unlikely to develop specialized products for Ethiopia. In this context, universities may, therefore, be well-placed to takeover this role – to be leaders in technology midwifery and solution providers for Ethiopian firms and producers in the capacity building of searching, selecting, adapting and utilizing of not only foreign technologies but also the inland technologies as well. Therefore, the Policy needs to recognize the research environment in universities and research institutes, the capacity of a country's domestic firms to absorb external knowledge and the availability of resources in the country for research and innovation.³⁴³

In another main direction, human resource development, the Policy stated that in order to search, select, diffuse, adapt and use technologies from other countries, competent local technicians, engineers and scientists are needed. This clearly affirms that the Policy is still focuses only on capacity building to transfer foreign technologies. In other words, the country's human resource development agenda should be producing local technicians, engineers and scientists to hunt for foreign technologies. Hence, the Policy neglects the importance of having a competent human power not only to look for foreign technologies, but also, primarily, to be capable of innovation and creativity without being dependent on foreign technologies. This indicates that the issue of creating independent innovative manpower is neglected.³⁴⁴

Another contentious area, which is still related with the issue of TOT, in the Policy is the direction concerning manufacturing and service providing enterprises. According to the Policy, due attention is given for building TT capability in manufacturing and service sectors thereby

to the realization of national and global socio-economic development objectives and rational utilization and conservation of resources.” This clearly indicated that the policy makers were intending to make internal TOT the one among the main policy priorities in the nation's STI framework.

³⁴³ Jeremy de Beer and others, cited above at note 11, p. 316.

³⁴⁴ Surprisingly, the Policy puts a direction to the national education and training system should put in place to emphasis on producing engineers and natural scientists in manufacturing and service providing enterprises, qualified in understanding and utilizing appropriate foreign technologies.

searching, selecting, adapting and utilizing appropriate and effective foreign technologies. Hence, the manufacturing and service sectors are only expected to beg foreign technologies and the capacity building programs are also endeavoring to make capable the sectors so as to search, select, adapt and utilize foreign technologies.³⁴⁵ Hence, here also the Policy smashed the possibilities of TOT linkages between the manufacturing and service sectors and the local technology powerhouses.

Generally, since policy is the prime foundation in the contemporary system of governance and society as well and it is essential that leaders show their commitment to the improvements of the lives of their people, the Ethiopian STIP should be re-crafted in a way that the above discussion has advised in the area of TOT, research, human power development and manufacturing and university collaborations. Interestingly, according to Ato Awol, there is a consensus among the policy makers on the amendment of the Policy by addressing the emerging concerns about inland TOT and UIL after conducting a research to this effect.

4.1.3.2. The Place of UIL in the Policy

Even if the STIP doesn't put UIL as an independent policy direction, the issue is elaborated under the umbrella of "universities, research institutes, TVET institutions and industry linkage" which is the one among the eleven critical directions stipulated in the Policy. Moreover, one of the strategies to achieve the policy direction in the area is creating conducive environment for university academia and students to engage in TT activities in industry. Therefore, it can be said that, UIL has gotten a concern in the Policy, but it can be concluded that the linkage is not well identified in the Policy.

Here two critical points are waiting to be analyzed. The first one is the fact that prime focus of this policy direction is still transfer of foreign technologies. In black and white the Policy puts a direction for the collaboration of universities, research institutes, TVET institutions and industry is to support and facilitate the searching, selecting, adaptation and utilization of foreign technologies. This indicates that the Policy is not endeavoring to encourage independent internal innovative capacity through collaboration of these actors. Hence, here also, the Policy neglects the fact that the relationship among the actors is not only an important means to transfer local knowledge but also a vital mechanism to supplement the acquisition and adaptation of international knowledge and technologies.

The second point is related with the kind of Model which is reflected in the Policy. In the Ethiopian STIP, it is familiar to see the phrase "national innovation system" (NIS) in several parts of the Policy. But, it is difficult to conclude easily that the Policy is framed based on NIS Model or other approach as there is no clear indication to this end. In the STIP, universities are not the only core actors rather there are also other actors in the NIS. Most importantly, the Policy

³⁴⁵ The main policy direction is also support enterprises to become focal points for searching, learning, transferring, and adapting foreign technologies. Moreover, the financing and incentive schemes expected to be established to support activities on searching, learning, adapting and utilizing of foreign technologies.

considers universities to provide an advisory role to industry. Since the Policy directs the collaboration of universities and industry is to support and facilitate foreign TOT, it neglects the importance of universities in the creation of independent innovative capacity and at the same time it contravenes and misunderstands the very concept of TOT because it tends to make universities simply pipes of foreign technology to the industry.³⁴⁶ Moreover, the innovation system of the country seems to be the one which advises interacting in a large system involving several concerned actors including universities and seems to take firm as a focus point, which resembles the NIS Model. The practice also somehow dictates the same.³⁴⁷ This assertion also maintained by some researchers who argue that NIS is adopted in the formulation of the Policy.³⁴⁸

However, in Ethiopia many new universities have been founded and the old ones have been re-oriented to the path of research and entrepreneurial universities. And they are undoubtedly taking a special podium in the nation's innovation and developmental arena. Therefore, it is advisable that the Ethiopian STIP should base its principles in line with the Triple Helix Model in order to have a clear theoretical background.³⁴⁹ Once the Policy has reflected this Model, then it would be understandable that UIL should be given a special and independent treatment by departing from TEVT and research institutions. Since, the relationship, behavior, channel, aim, subject matter, parties in the UIL is unique by itself from the cooperation of research institutions and TVETs with the industry, the UIL has to be treated differently in the Policy like we have witnessed in US and Japan.³⁵⁰ One important issue to be addressed here is that, even if the Policy advocates the NIS approach, the practical realities in universities show that the Triple Helix Model is in place. The Ethiopian universities are taking the role of industries as they are establishing UIL directorates responsible for TOT, business-like firms in their compound, for example the technology incubation centers and university enterprises.

³⁴⁶ Interview with Dr. Eng. Wondwossen Bogale, Director of University Industry Linkage and Transfer of Technology Office, Addis Ababa University, (Addis Ababa, 27/07/2009 E.C.).

³⁴⁷ Interview with Ato Awol, cited above at note 332. He stated that, in practice also the focus in the collaboration is on industries. Hence, not only from the Policy directions, but also from the realities at hand, one can conclude that NIS Model is the governing approach in the nation's STI arena.

³⁴⁸ Jeremy de Beer and others, cited above at note 11, p. 317.

³⁴⁹ Generally, this Model views innovation primarily as a product of interaction among three main actors - academia, industry and government and focuses on the university as a source of entrepreneurship and technology.

³⁵⁰ Interview with Professor Admasu Tsegaye, cited above at note 335, and Dr. Eng. Wondwossen Bogale, cited above at note 347, have supported the assertion. Moreover, according to Ato Awol, this claim is also raised by different organs in different policy discussion meetings.

In Ethiopia, a decade after the first STP has ratified, there was a widespread movement to reconsider the then Policy. Among others, the 2006 policy-oriented “Triple Helix Conference” titled with “Transforming University-Industry-Government Linkage in Ethiopia” was a notable one.³⁵¹ The policy-oriented Conference proved a useful forum in conceptualization of the role of universities (there were only 9 public universities) in the innovation system and the Ethiopian economy. Surprisingly, there was also an initiative to have Ethiopian Triple Helix Association. In that conference, it was recognized that there was a diverging conceptual reflections among the Ethiopian policy makers and the prominent business sector leaders as to the selection of the suitable policy approach to the then upcoming STIP in Ethiopia.³⁵² Nonetheless, at the end of the day the new STIP has come in force with the NIS approach, perhaps arguably.

4.1.3.4. Big miss – the need for legal infrastructure

Among the basic drawbacks inspected in the implementation of the 1993 STP, the frontline was the absence of legal basis in TOT. With the coming in to force of the new STIP, there was an expectation to have a legal infrastructure not only for the regulation of the relationship among the various actors of the national S&T system, but also for the implementation of each and every detail of the eleven critical policy directions, especially TOT, Research and UIL are the main directions waiting for a quick legal backups.³⁵³ But there is no any legal infrastructure for TOT in general and UIL in particular yet. Surprisingly, the STIP itself neglects the importance of

³⁵¹ The conference took place at the United Nations Conference Centre in Addis Ababa on 29th - 31st May 2006. It was unique not only organized and chaired by the ‘midwife’ of the Triple Helix Model Professor Henry Etzkowitz but also because for the first time the concept of “Triple helix” is introduced in the land of Africa. At the time when this policy-oriented conference was took place, there were only 9 universities in charge and more 16 were under construction in Ethiopia. Therefore, looking for the enhanced role of university in development of the innovation system and in knowledge-based society was the ripe agenda at the then time. Moreover, it was high time to review the 1993 STP, taking into consideration the functions and interactions of the stakeholders of the national system of innovation.

³⁵² Ex-President Girma W/Georgis Addressed to Triple Helix Conference, 2006, Transforming University-Industry-Government Relations in Ethiopia, 2008, p. 22 and Dr Sintayehu W/Mikael, cited above at note 324. Ato Girma and Dr. Sintayehu W/Mikael in their keynote speeches addressed the importance of Triple Helix Model to Ethiopia which sees innovation mainly as a product of interaction among university, industry and government and each take the role of the other to the future of Ethiopian STI system which is the fundamental feature of Triple Helix Model. MIDROC Ethiopia CEO, Dr. Arega Yirdaw was also highly advocates the Triple Helix with his paper projected in the conference. He declared that “the private sector will constructively engage with the academia and the policymakers to help the ‘Triple Helix’ concept become a reality in Ethiopia.”

At the opposite pole of argument, however, Mr. Mulugeta Amaha, the then Director of the Science and Technology Agency of Ethiopia, and his colleague in the Agency, Mr. Abebe Mekuriyaw, has strongly advocated the NIS. When underlying the importance of reviewing the national STP, the two officials stressed that the Policy should be reviewed using the NIS as a framework of analysis. According to them, the STP review must obviously focus on local conditions because any model that is simply imported is unlikely to yield the desired benefits. But, they aired their believe that the Policy could be upgraded focusing on coordinating, supporting and enhancing interactions of the various stakeholders of the national system of innovation including universities, industry and the government. This indicated that these officials were not advocating the special role of universities in the national innovation system of Ethiopia.

³⁵³ Interview with Ato Abebe Tesfa, Director for Legal Affairs Directorate, Ministry of Science and Technology, (Addis Ababa, 02/08/2009 E.C.). According to him, indeed TOT needs a legal framework in Ethiopia. Under the umbrella of TOT law, the issue of UIL can be addressed in a special platform. But, if the TOT law doesn’t address UIL as it deserves, there should be a special regulatory framework for UIL.

regulatory framework. Rather it endorses only the institutional framework as the primary focuses in the implementation of the policy.³⁵⁴ Hence, the Policy should be reformulated in a way that it boldly puts strategic directions as to the importance and need of legal infrastructure in the nation's STI arena.

In the case of the Ethiopian STI system, not only the main policy directions but also even some detail directions also beg for legal framework to be implemented.³⁵⁵ There is also a firm concern to have a strong legal infrastructure in TOT and UIL in Ethiopia³⁵⁶ and even some people advocate that the nation should also have even other specific laws that govern specific issues of UIL.³⁵⁷ However, the country doesn't have any comprehensive law on TOT. According to Ato Abebe, a Director for Legal Affairs Directorate in MoST, even if there is a Procedural Directive for the Linkage of Education and Training, Research Institutions and Industries, it is simply setting the procedural matters as to how the linkages are doing.³⁵⁸ Since it is a directive, it is just prepared by only the MoST and it has gotten its legislative ground from Proclamation 916/2008.³⁵⁹

Hence, since TOT is the one among the cornerstones for the country's development, it has to be regulated in proclamation or regulation hierarchy but not regulated yet. According to Ato Abebe, the fundamental reason for the absence of law in TOT in general and UIL in particular is directly related with the ignorance to understand the problems arisen in the absence of law.³⁶⁰ That is why MoST is conducting a study to understand how much the nation is costing because of the absence of law in the area.³⁶¹ Nevertheless, even if there is no any legislation background from the proclamation which defines the powers and duties of the executive branch or from other laws

³⁵⁴ Science, Technology and Innovation Policy, cited above at note 12, p. 20.

³⁵⁵ For instance, as it is seen from the experiences of US and Japan, there are specific TT laws that concern patent and licenses, TTOs, engagement of university researchers in firm businesses, corporate vehicles like spinoffs' ownership and other specific issues concerning UIL.

³⁵⁶ Interview with Ato Abebe Tesfa, cited above at note 354. Not only Ato Abebe, but also all other persons interviewed in this thesis are said the there has to be TOT law concerning the issue of UIL.

³⁵⁷ Establishment Document for Addis Ababa University Pilot Technology Business Incubation Center, cited above at note 1, pp. 29 and 34.

³⁵⁸ Procedural Directive for the Linkage of Education and Training, Research Institutions and Industries, 2013, Direc. No 3.

³⁵⁹ Definition of powers and duties of the Executive organs of Federal Democratic Republic of Ethiopia Proclamation, 2008, Article 23 (6), Proc. No 916, **Fed.Neg.Gaz.**, Year 22, No. 12.

³⁶⁰ In addition to Ato Abebe, according to Ato Adamu Esubalew, Director of University-Industry Linkage & Technology Transfer Directorate, Addis Ababa Science and Technology University, (e-interview via mail, 05/08/2009 E.C.), "the challenge (for not having a legal framework) is the attitude of understanding the benefits of UIL"

³⁶¹ Interview with Ato Abebe Tesfa, cited above at note 353. Here there is an important concern is detected by this thesis. According to Yohannes Hailu, cited above at note 338, the MoST has prepared Draft Regulation for TOT. In addition, the Policy and Future Planning Director in MoST, Ato Awol also noticed that the Ministry has drafted a Regulation to Search, Choice, Introduce, Use, adapt and Dispose a Technology. But, Ato Abebe, the Director for Legal Affairs in MoST has certainly derecognized the issues as to the existence of the Draft TOT.

to point out the responsible ministry or other organ to initiate for the regulation of TOT in general and UIL in particular, perhaps arguably, it is the MoST to do the job on its shoulder.³⁶²

4.1.4. Other Policy Considerations Concerning UIL

In this subtitle, the thesis is moving on to give explanations about policy considerations on UITT other than the above national STIP. The subsection is trying to come up with discussions concerning IPRs and Education policies as well as university policies in the area of TOT. Even if IPRs and Education Policies can be considered as national policy frameworks, it is better to treat them as “other” policy concerns because they are specific policy systems for specific TOT issues in the big picture of STI agenda of the nation.³⁶³

4.1.4.1. Intellectual Property Rights Policy

The issue of Intellectual Property (IP) is the one among in the Ethiopian STIP directions. As far as the UIL is concerned, the system has been identified as important tool to facilitate the transfer of university-generated knowledge to industry.³⁶⁴ But, in Ethiopia, the IP system is not in a position to play its vital role in accelerating TOT and expansion of local innovation activities.³⁶⁵ That is why the STIP primarily stipulated that the system needs to be designed in such a way to support the endeavor of technology learning and adaptation as well as to protect the rights of inventors and creators and support the intensification and application of indigenous knowledge.³⁶⁶ In order to implement such a policy direction, the country is expected to have specific IP policy as it has IP laws and an institution to oversee the issue. However, Ethiopia doesn't have a comprehensive IPRs policy yet. Nevertheless, nowadays, the country is on the path of having an IP policy since the draft is on the table for discussions.³⁶⁷

The Draft Policy has identified domestic innovation and TOT as one of the crucial issues in the IP arena of the country. One of the principal goals of the Document is also enacting laws in order to foster and facilitate inland TOT and independent innovative capacities. As far as university innovation and commercialization is concerned, the Draft Policy has clearly stipulated the goals for universities' innovation and researches as well as their commercialization through domestic TOT in to local industries. The Document has also articulated the strategies to be implemented so as to come up with its goals.³⁶⁸

³⁶² Definition of powers and duties of the Executive organs of Federal Democratic Republic of Ethiopia Proclamation, cited above at note 360, article 23. Since the Proclamation vests powers concerning the TOT to the MoST, it can be argued that the Ministry has to initiate laws concerning the issue.

³⁶³ Interview with Ato Awol Hussien, cited above at note 332. From his words, one important issue to be noticed is the fact that none of the Ethiopian regional states has its own regional policy framework for the STI system of the respective state. Even if going through this issue is beyond the scope of this thesis, the regional states don't have their own STIP just because of the national STIP which dictates for a strong national STI system.

³⁶⁴ Jeremy de Beer and others, cited above at note 11, p. 316.

³⁶⁵ Draft National Intellectual Property Policy and Strategy of the Federal Democratic Republic of Ethiopia, 2008 E.C.

³⁶⁶ Science, Technology and Innovation Policy, cited above at note 12, p. 15.

³⁶⁷ Draft National Intellectual Property Policy and Strategy, cited above at note 365.

³⁶⁸ The Draft Policy set several specific directions to the support system of business incubations centers in universities, promotion and support for market oriented university researches, establishment of technology and

Most importantly, one of the goals of the Draft Document is the use of IPR in selected key priority areas which makes the nation comparatively and competitively advantageous. Obviously, the leather subsector is among those sectors. Among the strategies set to achieve such goal, the one is “*giving selective and effective technological and scientific information to the researches conducted by and technological needs of the leather and textile industries.*” Therefore, the Draft Policy has courageously incorporates inland innovation capacity and their commercialization. This in turn, helps the nation to build its own independent innovative capacity which can highly be facilitated via domestic TOT channels like UIL. These all show that, unlike the STIP, the domestic TOT in general and UIL in particular has gotten a valuable concern in the Draft IP Policy.

4.1.4.2. Education and Training Policy and Programs

The Education and Training Policy is formulated in 1994. As far as TOT is concerned, the Policy has aired its concern under its objectives.³⁶⁹ Moreover, the Policy also articulated the expected component of human power development in the higher education, i.e. research.³⁷⁰ Interestingly, the policy clearly stipulates that problem-solving and research of societal impact is the basic aim of research system in higher educations of Ethiopia.³⁷¹ From all these policy directions one can understand that the issue of TOT in general and UIL in particular have gotten generic recognition. Accordingly, the Policy emphasizes the formation of an appropriate nexus between university research and industrial innovation.³⁷² In addition, the Policy considers universities and their researches and technologies crucial in the socio-economic development and it recognizes the role of universities as breeding grounds for professional leaders and researchers.

In order to implement the Policy, the government has experienced successive sectorial plans. These plans also incorporated the issues of research and TOT.³⁷³ Moreover, ESDP-IV stated that the major emphasis of higher education institutions will be, among others, sustainable development of research capacity for knowledge creation and TOT in priority sectors. This requires qualified manpower in the S&T fields. That is why it targeted a ratio of intakes S&T to

innovation support centers in universities, support the universities and innovators to make their inventions industrially applicable and use the royalties, establishing and supporting national award program for local inventions, support for and facilitate to universities to have their own institutional IP policies and TOT offices, establishing fund searching organ for local inventions, working to establish bank loan policy frameworks for local inventions and supporting the linkages between and among the actors of domestic TOT.

³⁶⁹ Education and Training Policy of the Federal democratic Republic of Ethiopia, 1994, p. 8.

³⁷⁰ Id., p. 15.

³⁷¹ Id., p. 27.

³⁷² Jeremy de Beer and others, cited above at note 11, p 321.

³⁷³ For instance the current Education Sector Development Plan-V (ESDP-V from 2008-2012 E.C.) stated that “to improve the relevance of research and technology development for societal and national development needs, institutions have identified their thematic research areas considering their staff profile, topics of excellence and local needs.”

Social Sciences and Humanities from 58:42 ratios in 2008/09 to 70:30 in 2014/15.³⁷⁴ And indeed, the target has fulfilled.³⁷⁵

4.1.4.3. Universities' Policies

4.1.4.3.1. AAU IPRs Policy

AAU has ratified its own university-wide IPRs Policy in June 2016.³⁷⁶ According to the Policy, the University is becoming active in research and TOT and its staffs and students are actively participating in the entrepreneurial efforts. This reality calls the promulgation of IPRs Policy. The Policy is organized with eleven sections.³⁷⁷ *“Promote, support, protect, and disseminate scientific investigations and research which are beneficial for the steady progress of invention, innovation and creativity thereby promoting S&T in the country”* is its prime objective. This objective clearly reflects the vital importance of indigenous knowledge created by universities and it encourages domestic TOT as it is crucial in the building up of innovative capacity of the nation.³⁷⁸

The Policy covers all the ingredients of IPRs recognized in the Ethiopia's IP legal regime. Accordingly, it covers and applies to patents, utility models, industrial designs, copyrights and neighboring rights trademarks, plant breeder's rights and trade secrets.³⁷⁹ Hence, the Policy primarily gives explanations for these IPRs in accordance with the respective proclamations of those IP properties. In addition, it stipulates the issue of ownership on IPRs. With regard to inventions which are invented by AAU students, teaching staff and other employees (including visitors), AAU is vested with ownership.³⁸⁰ Moreover, the Policy manages to address inventor's ownership. In addition to the ownership issue related with inventions, the Policy covers the ownership issues of other forms of IPRs. Interestingly, with respect to the ownership over

³⁷⁴ Education Sector Development Program IV of the Federal Democratic Republic of Ethiopia, 2010/2011 – 2014/2015, p. 65.

³⁷⁵ Education Sector Development Program V, cited above at note 373, p. 105.

³⁷⁶ Intellectual Property Right Policy of Addis Ababa University, 2016.

³⁷⁷ Section one - introduction, section two- objectives of the Policy section three- definition of terms and expressions, section four- policy application and coverage, section five – ownership of IPRs, section six- AAU organs responsible for the administration of the policy, section seven – disclosure, evaluation and waiver, section eight- commercialization and revenue distribution, section nine- Administration: creation of relevant licensing office, section ten- dispute resolution, chapter eleven – miscellaneous provisions.

³⁷⁸ In a nutshell, its objectives seeks the prompt and appropriate spreading of University's research outcomes and the exchange of information among scholars, facilitating the transfer of technologies, providing incentive structure, formulating standards for the rights and obligations of AAU, the creators of IP, partners and others.

³⁷⁹ The Policy also addresses “tangible research property”. But since it is clear that such kind of property is not categorized under the ambit of intangible limbs of property regime, it shouldn't be appear in such document which aims only IPRs. Rather, it would be better to address in the Research Policy of the University so as to convey the governing provisions of the 1960 civil code on property and contracts.

³⁸⁰ Intellectual Property Right Policy of Addis Ababa University, cited above at note 376, section 5.1.1. The inventions shall be owned by AAU when 1) the invention was developed with significant use of AAU resources or 2) the invention was developed in the course of pursuant to employment or service contract or when it is a work commissioned by the AAU (hired works) or 3) in cases other than the above, pursuant to agreements which confer ownership of the industrial property on AAU. The Policy also dully stipulates the requirements and the parameters for these three requirements.

sponsored researches (done by anyone) granted by non-governmental partner, the Policy bequeaths the ownership issue to be governed by the terms of the grant or the agreement and the university will assert ownership only in the absence of such agreements.³⁸¹ The other interesting issue stated in the Policy is method of commercialization. According to the Policy, the university IP can be commercialized through licensing, assignment and equity ownership.³⁸² Revenue sharing, dispute resolution and other important issues are also enshrined in the Policy.

TTOs are the basic innovative organizational feature of UIL. As it is discussed in the preceding chapter of this thesis, TTOs are important infrastructures to deal with the task of managing IPRs and transferring technologies developed in the universities' laboratories.³⁸³ Turning to the AAU IPRs Policy, it heralds the establishment of University Industry Linkage and Transfer of Technology Office (UILTTO) as one organ among which are responsible for the administration of the Policy.³⁸⁴ The Policy also stipulates the duties and responsibilities of the UILTTO. Here, a very critical and questionable point is the independency and responsibilities given to the Office.³⁸⁵ Moreover, the system of UIL & TOT isn't uniform since all businesses of UIL & TOT are not really managed by the Directorate/Office, rather all the Units and the Research Institutes are acting independently by their own.³⁸⁶ The final but the most important issue is that, since the 2010 AAU Research Policy has regulated the IPRs, the IPRs Policy should have repealing and transitory clauses. But, it doesn't have.

³⁸¹ Id., section 5.1.2. Accordingly, if the research is sponsored through the government funding, the government is entitled to non-exclusive, non-transferable, royalty-free, worldwide license on the invention. Here, the catching issue is the policy escapes the owner of government funded inventions as it doesn't clearly stipulate who is the owner. Rather, it conveys the issue of licensing over inventions. Hence, it should be clearly crafted in a way that the University shall claim on government granted researches on behalf of the government as the same fashion like we have witnessed in the US and Japan.

³⁸² Id., p. 24. Such kinds of commercialization mechanisms are familiar in US and Japan. Interestingly, having the issue of equity ownership of the University in a firm licensing its IP is the latest innovative mechanism of UIL as we have seen in US and Japan universities.

³⁸³ In US, it is the BDA which heralded their legal back ground and in Japan the 1998 TTOs Act did the same. In these countries, TTOs are independent but affiliated to particular universities so as to facilitate transparent and contractual transfer of university innovations to industry through academic entrepreneurship. They are also independently registered and licensed organs by responsible government ministry. The TTOs have their own internal specific regulations and implement mechanisms so as to perform their duties. Very importantly, they are expected to be managed and run by skilled and full-time managers and experts.

³⁸⁴ Intellectual Property Right Policy of Addis Ababa University, cited above at note 376. According to the Policy, in addition to the UIL and TTO, the office of the vice president for research and TT and University Units (including schools and faculties departments) are also organs responsible the administration of the Policy.

³⁸⁵ Indeed, the Policy vested the Office with crucial responsibilities in the implementation of the Policy. But, there are no directions as to organizational structure, working guidelines, staff matters, budgeting of the Office and other issues in the Policy. There is also a supreme organ, the Office of the Vice President for research and TT with the crucial powers of establishing and supervising the UILTTO itself, appointing the Director and hiring staffs, allocating budget, dealing with dispute resolution, reporting to the Senate of the University and preparing and enacting a university-wide code of ethics governing research and IPRs. Moreover, University Units are also vested with initial important responsibilities. Most importantly, even if the Directorate has full time staff experts, the director is not a full timer as he is permanently working in Amist Killo Campus as a lecturer. This reality is different from the experiences of US and Japan and at the end of the day will hinder the expected results from the Directorate/Office in fostering UIL.

³⁸⁶ Interview with Dr. Eng. Wondwossen Bogale, cited above at note 346. According to him, there is a plan to organize successive awareness creation trainings for the university community as well as to the industries.

4.1.4.3.2. AAU Technology Business Incubation Center Establishment Document

AAU has ratified a document for the establishment of Pilot Technology Business Incubation Center (TBIC) in 2013. Such kind of organizational structures are important in UIL as we have learnt from the experiences of US and Japanese spinoffs/startups. The AAU's center will also be helpful to avoid the fate of university researches staying on the shelves.³⁸⁷ According to the Document "the start-up failure rate of new knowledge-based enterprises is usually very high in the early years of establishment as the ventures are generally of high risk."³⁸⁸ Therefore, government utilizes TBIC as an instrument to promote innovation and counter the high start-up failure rate.³⁸⁹ Valuably, such kind of structures will change the failure realities of university inventions in criteria of industrial applicability.³⁹⁰

The Document serves the purpose of establishing the Center and describing its operation. In doing so, it sets out the vision, mission and objectives of the TBIC. The pre, during and post incubation activities of the Center are also clearly stipulated in the Document. According to the Document, the Center is expected to be an independent unit so that the incubator is not overshadowed by the non-entrepreneurial operations and culture of the university.³⁹¹ Organizational structures, policies, rules and procedures are also specified in the Document. Moreover, the priority areas that are expected to get incubated and nurtured in the Center are identified in the Document based on the economic and development priority needs of the country. Accordingly, projects concerning with agriculture, industry and infrastructure have gotten priority.

The Document sets the procedures related with admission, mentor assessment and conflict handling. Accordingly, tenants (technology-based small new enterprises), students, graduates, faculty, researchers selection and admission will be carried out through official application and evaluation processes. Prospective users that complete the application procedure are expected to provide their business plan to the manager of the Center.

In US and Japan, the flourishing of university spinoffs comes after the legal frameworks. There were even no or handfuls of startups before the legal oriented moves in those countries. But, after the enactments of specific laws, hundreds of spinoffs are created in every year. The AAU-TBIC

³⁸⁷ Ibid.

³⁸⁸ Addis Ababa University Technology Business Incubation Center Establishment Document, cited above at note 1, p.7.

³⁸⁹ Id., P. 15. Since the AAU-TBIC is intending to recruit technology-based small new enterprises (called tenants) or students graduates, faculty, researchers, it will provide them with working space, technological support and trainings for three years. At the end of their stay, successful tenants will be expected to develop their own prototype products tested and ready for production in the industry. These supports are helpful to tenants to avoid market barriers, to get a network and mentoring which facilitate partnership with suppliers and sources of capital. Finally, the Center can incubate countless spinoffs/startups.

³⁹⁰ Interview with Ato Getachew Tafa, Patent Examiner, Ethiopian Intellectual Property Office, (Addis Ababa, 12/08/2009 E.C.) According to him, most of the applications for patent in university inventions are usually failing the test of industrial applicability and in some cases novelty requirements.

³⁹¹ Addis Ababa University Technology Business Incubation Center Establishment Document, cited above at note 1, p. 15.

Document is also well aware that laws are important tools for the successful realization of university commercialization.³⁹²

4.1.4.3.3. AAU Research Policy

AAU has enacted the Research Policy in 2010.³⁹³ The Policy aims at inquiring and dissemination of knowledge through basic and thematic researches.³⁹⁴ The policy guaranteed academic freedom for researchers, among others, to choose the subject matter of their research and to seek support from any source for their research project.³⁹⁵ At the same time, it rests responsibilities up on them. Furthermore, it sets out the rules dealing with misconducts by a researcher. The Policy sets procedures how a given research can be proposed, conducted and reported. Most importantly, the researches conducted are expected to be based on the research priorities set at the national level and hence AAU is committed to take its share by setting institutional research priorities every five years.³⁹⁶ In the Policy, the university heralds its commitment to openness in research in which all interested individuals or bodies free access to the data collected, to information about the entire research process, and final results obtained in a study.³⁹⁷ The independent laboratories, institutes and centers are also established under the Policy.³⁹⁸ Rules on managing conflicts of interests are also incorporated under the policy.

However, some argued that the Policy is too theoretical and does not give practical facilitation when evaluated in line with the aspects of UIL.³⁹⁹ Moreover, the university research policy does not indicate how to create institutional modality which can enable the university to link with the industry via research system.⁴⁰⁰ Because of this, even if the Policy fully covers the expected issues concerning the enhancement of university's research system, there are several practical impediments in the implementation of the Policy.⁴⁰¹

4.1.4.3.4. AASTU Research Policy

AASTU has prepared its own Research Policy in 2012.⁴⁰² The institutional frameworks responsible for the acceptance, approval and follow up of researches are stated.⁴⁰³ According to

³⁹² Id., p. 34.

³⁹³ Addis Ababa University Research Policy, 2010, No. 601.

³⁹⁴ Id., section 2.1.

³⁹⁵ Id., section 2.1.1.

³⁹⁶ Id., section 3.1.

³⁹⁷ Id., section 2.4.

³⁹⁸ Id., section 2.5. Such institutions are established with the rationale to extend AAU's research to areas that go beyond the boundaries of mainstream academic units. Moreover, they are intended to create focus to multidisciplinary research that helps to attract new faculty and external funding.

³⁹⁹ Hiwote Molla, University-Industry Linkage in terms of Research: The case of Addis Ababa University, (Unpublished), 2014, p. 54.

⁴⁰⁰ Ibid.

⁴⁰¹ Ibid.

⁴⁰² According to the Policy statements, the need to have the Policy is "to help spearhead research at the University. It is important to motivate staff to sustain and improve research productivity and competitiveness at national and international levels. It also helps to support graduate students to engage and be supported in their research."

⁴⁰³ The issues of university research and centers of research excellence, research grants/funds and contracts, integrity and ethical conduct of research, research misconduct (policy on allegations, investigations and reporting), health,

the Policy, any research proposal should be channeled through the office of vice president for research and TT, office of the R&D, research committees and other respected organ of the university. However, here three critical points are waiting to address. The first one is related to the length of the channel through which a given research proposal get a grant to be conducted.⁴⁰⁴ The second point is the responsibility given to school research committee and school research director is verbally the same. The last but a very important point is the UILTT Directorate doesn't take any responsibility in the Policy. This can be considered as a big miss of the Policy because the Directorate is a very responsible organ with respect to research, TOT and making links to industry for the industrial applicability of the research outputs. Particularly, for all researches conducted out of the university's funding, it is the Directorate which has superior hand other than any organ of the university. Above all, no any other organ of the university should be given the governance of IPRs than the Directorate as learnt from cultivated experiences of US, Japan and even AAU.

When we have a look in to the tenth chapter, the Policy tries to cover only the patent and copyright issues. However, it should encompass all other aspects of IPRs. Moreover, in stipulating the criteria for patentability, the Policy only indicates novelty and non-obviousness criteria. Hence, the criterion of industrial applicability is missed out. With respect to revenue aspects, the Policy puts a subjective statement.⁴⁰⁵ But as the Policy is expected to be specific and objective enough and hence it must clearly put the schedule for distribution of net revenues with the share of each claimant. Above all, since the issue of IPRs in general and university IPRs is the widest concept, it has to be treated differently and extensively in a separate policy document. Hence, AASTU has to come up with specific policy document in the area of IPRs like its counterpart, AAU.

Furthermore, principles concerning research, research priorities, rights and responsibilities of researchers and their academic freedom are not stipulated in the Policy.

4.2. Legal Frameworks for Technology Transfer in Ethiopia

4.2.1. The FDRE Constitution

For the issue of TOT, even if the Constitution doesn't stipulate specifically, it puts a basic direction concerning innovation and patents which are the very components of TOT. According to the Constitution, everyone has the right to ownership of private property.⁴⁰⁶ Property includes

safety and wellbeing issues, university – private sector funding research, financial aspects of funded/sponsored projects administration, research outputs and IPRs are incorporated in the other chapters of the Policy.

⁴⁰⁴ There are above seven structures stated responsible to do the job and any research proposal is expected to get in and out the door of those responsible organs of the university. This makes the process somehow cumbersome.

⁴⁰⁵ It states that “revenues received in the form of cash royalties and/or equity holdings shall be distributed in such a way that encourages technology development within and technology transfer from AASTU.”

⁴⁰⁶ Constitution of the Federal Democratic Republic of Ethiopia, 1995, Article 40(1), Proc. No. 1, **Fed.Neg.Gaz.**, Year 1, No. 1. The Constitution follows the same fashion like its US counterpart. In the US, the fundamental basis for IPRs lies in the Constitution. In an effort to protect the rights of their creative citizens, the framers of the US Constitution stated that the creators of IP would own it and be able to exclude others from using it for a limited period of time.

both tangible and intangible product which has value and is produced by the labor, creativity and capital of individuals, organizations and communities.⁴⁰⁷ Hence, IPs are intangible fraction of property which have gotten considerable recognition in the Constitution.

Based on the Constitution, the Federal government shall patent inventions and protect copyrights.⁴⁰⁸ Therefore, one can say that the Constitution has laid down some sort of basis for the issue of TOT as IPRs play an important role in encouraging innovation, technological change and facilitating economic growth through the instrumentality of TOT. To implement such constitutional direction, the nation was expected to develop relevant proclamations and regulations. But unfortunately, the prime specific laws on TOT, the TOT Regulation and Patent Law, preceded the Constitution and yet there is no specific TOT proclamation or regulation which can get its roots from the Constitution.

4.2.2. Transfer of Technology Regulation

In Ethiopia, the first piece of legislation concerning the issue of TOT was the TOT Regulation.⁴⁰⁹ The “A to Z” of the Regulation is related only with international TT agreement i.e. TOT from foreign sources to Ethiopia.⁴¹⁰ Nevertheless, the regulation does not deal with TOT from an inland technology manufacturer and it did not an all-catcher law so as to govern TOT in the country. Therefore, TOT from Ethiopian universities to the industry through the instrumentality of UIL was not totally addressed in the Regulation.

Nonetheless, the regulation is expressly repealed in 2003 by the Investment (Amendment) Proclamation.⁴¹¹ Even if it is difficult to come up with a sound reason behind the abolishment of the Regulation from the country’s legal regime, some people say that it is because of there was no even a single TOT agreement registered during those 10 years reign of the Regulation.⁴¹² This means, there is no technological FDI in the country during that decade. Even if the situations especially after the Ethiopian Millennium is different from that of those ten years, it will give some alarming clue in order to rethink the priority policy direction in the TOT arena, which is foreign TT. Hence, one can conclude that the indigenous TT should be given a priority in the policy direction and the legal regime of the nation along with the foreign TOT.

One important notice here is, even if there was no any TOT agreement is registered in those ten years and there are some a handful of TOT agreements are registered by Ethiopian Investment

⁴⁰⁷ Id., Article 40 (2).

⁴⁰⁸ Id., Article 51 (19).

⁴⁰⁹ Transfer of Technology Regulation, 1993, Reg. No. 121, Trans.Gov.Neg.Gaz., Year 52, No. 53.

⁴¹⁰ When we are looking to its scope, the regulation is expected to govern TOT agreements between foreign technology supplier and an Ethiopian resident, domiciled or national. But TOT is exercised not only through foreign TOT rather inland TOT is the crucial aspect of TOT. Moreover, TOT agreements are the only segments in the concept of TOT and other aspects of TOT like ownership, duties and responsibilities of the parties, form of TOT, patent, license, incentives, mechanism of settling disputes and other issues should be addressed and regulated in the legal framework.

⁴¹¹ The Investment (Amendment) Proclamation, 2003, Article 5, Proc. No. 375, Fed.Neg.Gaz., Year 10, No. 8.

⁴¹² Yohannes Hailu, cited above at note 338, p. 88.

Commission after the Regulation has repealed,⁴¹³ there might be TOT agreements which are conducted out of the reach of legal framework. If so, the TOT conducted with such kind of agreements are not consistent with the country's economic and social development as well as they are not helpful to the development of technological advancement and innovative capability of the country because they are not done in accordance with laws.⁴¹⁴

4.2.3. Investment Proclamation No. 769/2012

TOT is among the prime rationales for the enactment of the law.⁴¹⁵ The Proclamation gives an interesting definition for TOT.⁴¹⁶ However, the definition doesn't indicate whether foreign TOT or a domestic TOT is stated. But from the entire reading of the Proclamation, one can easily understand that, since the law is intending to accelerate the foreign investment, the definition is concerning only foreign TOT. In addition, TOT is among the objectives of the Proclamation.⁴¹⁷ Moreover, the law sets the procedures of registration of TOT agreements.⁴¹⁸ Nevertheless, the entirety of this proclamation is concerned about, among others, the foreign TOT but not inland TOT. Above all, as it is clearly stated in the preamble of the same, one of the driving forces for the enactment of the proclamation is speeding up of TOT into the country. Hence, this shows only foreign TOT is regulated and TOT from the domestic sources of technology like universities to the industry isn't regulated in the Proclamation.

4.2.4. The Proclamation Concerning Inventions, Minor Inventions and Industrial Designs

Ethiopia has gotten its first Patent Law⁴¹⁹ during the transitional government era in 1995 followed by its implementing regulation in 1997.⁴²⁰ When we are easily walking through the statements in the preamble of the Proclamation, we can familiar with the rationales for the introduction of the patent system in the country. Encouraging local inventiveness and the transfer and adaptation of foreign technology and creating a harmonious scientific and technological progress so as to make useful for the public benefit are the main pillars for having such a Patent Law. This implies that TOT, specifically foreign TOT, is one of the driving forces behind the

⁴¹³ Id., p. 93. He found that the Ethiopian Investment Commission has managed to register about 23 TOT agreements 2003-2015

⁴¹⁴ Interview with Ato Abebe, cited above at note 353. According to him, in many occasions, many people are concerning about the inflow of outdated, pollutant and hazardous technologies from foreign countries just because of any specific and comprehensive law on TOT.

⁴¹⁵ Investment Proclamation, 2012, Preamble, Proc. No. 769, **Fed.Neg.Gaz.**, Year 18, No. 63. Accordingly, speeding up of TOT into the country is one of the very springboards for having such an investment law.

⁴¹⁶ Id., Article 2 (10). According to the proclamation, technology transfer means the transfer of systematic knowledge for the manufacturer of a product, for the application and improvement of a process or for the rendering of a service, including management and technical know-how as well as marketing technologies, but may not extend to transactions involving the mere sale or lease of goods.

⁴¹⁷ Id., Article 5 (8). According to this provision, the advancement of the transfer of technology required for the development of the country is one of the objectives stipulated in the Proclamation.

⁴¹⁸ Id., Article 21.

⁴¹⁹ The Proclamation Concerning Inventions Minor Inventions and Industrial Designs 1995, Proc. No. 123, **Fed.Neg.Gaz.**, Year 54, No. 25.

⁴²⁰ Council of Ministers Regulations No. 12/1997 Inventions, Minor Inventions and Industrial Designs Regulation, 1997, Reg. No. 12, **Fed.Neg.Gaz.**, Year 3, No. 27.

introduction of the patent law in the Ethiopian legal system.⁴²¹ But, it is equally important to be aware that encouraging of local inventions is a prime rationale even above the foreign TT in the country's patent regime.

It is so to say that the existence of strong patent system in a country will facilitate transfer of foreign technologies.⁴²² However, the other poles of argument claims that patent protections hinder the international TOT.⁴²³ As a result, advanced technologies will be unaffordable to local firms.⁴²⁴ In this situation the importance of the promotion of local inventions and indigenous TOT comes in to picture. Among others, encouraging TOT through the instrumentality of UIL is of a paramount importance not only to build national absorptive capacity but also innovative competitiveness of the nation.⁴²⁵

In this regard the Ethiopian Patent Law is more admirable than any other law of the nation concerning TOT since it is clearly declared that "it is necessary to create favorable conditions in order to encourage local inventive and related activities thereby building up national technological capability."⁴²⁶ Moreover, the Law is aware enough that in order to build the national technological capability, there has to be a favorable condition for the encouragement of local inventions.⁴²⁷ Hence, as it is hugely discussed that universities are the primary homes for local inventions, the Patent Law has given a due concern for TOT from universities. Interestingly, the Patent Law is highly aware that creating conducive environment, among others developing absorptive capacity of the nation, is an essential element for the transfer and adoption of foreign technology. This also shows that the Patent Law has recognized the importance of local TOT as equally important as foreign TOT more than any other TOT law of the country and even the Law is better than the STIP.⁴²⁸

According to the Proclamation, in order to get a patent i.e. a title granted to protect invention, three cumulative prerequisites must be fulfilled, newness (novelty), inventive step and industrial

⁴²¹ Yohannes Hailu, cited above at note 338, p. 98.

⁴²² Ibid. Accordingly, patent protection has a vital importance to facilitate TOT by stimulating the introduction of foreign technology and by making available technological information through patent documents.

⁴²³ Ibid. According to him, IPRs protection makes technologies more expensive and their price will be out of the financial reach of developing countries' firms.

⁴²⁴ Ibid.

⁴²⁵ Interview with Dr. Eng. Wondossen Bogale, cited above at note 346.

⁴²⁶ The Preamble of the Proclamation Concerning Inventions Minor Inventions and Industrial Designs cited above at note 419. From its declaration appeared in the opening statement of its preamble, one can easily argue that local TOT has given due attention in the law equally with foreign TOT.

⁴²⁷ By giving protection to local inventions, the law encourages further creativity and the development of indigenous technological capability.

⁴²⁸ To achieve its objectives, the Proclamation is expected to create conducive legal frameworks through its several parts. To this end, the Patent Law has stipulated specific regulations as to the patentable and non-patentable inventions, rights to a patent, application and examination of patents, issuance, contents and duration of patent and annual fees. Moreover, the law introduces four forms of protection namely patents, patents of introduction, utility model and industrial design.

applicability of the invention at hand.⁴²⁹ When we say that the invention must be new, it should never have been published or publicly used before.⁴³⁰ Moreover, industrial applicability is to mean that the invention must be something which can be industrially manufactured or used.⁴³¹ And it must have an inventive step or it must be non-obvious i.e. it should not be an invention which would have occurred to any specialist working in the relevant field.⁴³²

Utility model protection is the one among the four forms of protections introduced in the Ethiopian patent law regime. Such protection is given for minor inventions that possess novelty and industrial applicability.⁴³³ Therefore, the introduction of such special protection in the law is clearly pictures that the Ethiopian Patent Law is successively endeavoring to realize its main objective manifested in the opening statements of its preamble i.e. encouraging local inventiveness. As far as university inventions are concerned, the realities show that most of the inventions registered in EIPO by universities are of minor inventions which are titled with utility model certificate.

As it is discussed in the preceding chapters of this thesis, patent protection is an age-old mechanism used to encourage the commercialization of university technologies. It bridges the distance between the university and the market. Indeed, patenting represents only a single mechanism by which academic research results can be transferred to the market, it is still the system in which universities maintain legal ownership of inventions as well as advancing the commercializing technology and encouraging entrepreneurship. Moreover, the ownership over patenting is seen as a way to encourage the additional and often substantial investment necessary for new goods and services.

When we are looking the Ethiopian patent law, even if it doesn't have a specific regulation concerning the patenting system of university inventions, it puts general regulatory frameworks for the patenting system in the country.⁴³⁴ But, even if the law is there, there are lots of

⁴²⁹ The Proclamation Concerning Inventions Minor Inventions and Industrial Designs cited above at note 420, Article 3 (1).

⁴³⁰ Id., Article 3 (2). Accordingly, "an invention shall be considered new if it is not anticipated by prior art. Prior art shall consist of everything disclosed to the public, anywhere in the world, by publication in tangible form or by oral disclosure, by use or in any other way, prior to the filling or, where appropriate" the priority date, of the application claiming the invention. "

⁴³¹ Id., Article 3(5). The provision states that "an invention shall be considered as industrially applicable where it can be made or used in handicraft, agriculture, fishery, social services and any other sectors."

⁴³² Id., Article 3(4). According to this provision "an invention shall be deemed as involving an inventive step if having regard to the prior art relevant to the application and as defined in sub-article (2) herein above, it would not have been obvious to a person having ordinary skill in the art."

⁴³³ Id., Article 38 (1). See also Wondossen Belete, Intellectual Property System in Ethiopia, 2004, p. 12. According to him, the main reasons for inclusion of such protection in the law are;

"1) the fact that most of the inventions in Ethiopia involve small adaptations of existing technologies which do not qualify for patent protection;

2) Minor inventions can have a positive impact on the growth of productivity in the country and

3) To encourage local inventors."

⁴³⁴ The provisions governing the patentable and non-patentable inventions, rights to a patent, application and examination of patents, issuance, contents and duration of patent and annual fees and other issues are also similarly applicable to the university patenting.

limitations on creating a strong patent system for the realization of strong UIL in the country.⁴³⁵ Moreover, patenting of university inventions has its own unique features.⁴³⁶ That is why the ownership, filing, examination, incentive and other issues need explicit and special treatment as we have witnessed in countries' experiences. Most importantly, the issues concerning the licensing, royalty and rights of universities, inventors and the sponsoring firms are also inherently connected with university patenting and they need special treatment under the law. These issues are important concerns to be regulated clearly and specifically so that patenting, as a prime linking mechanism in UIL, can play an essential role in facilitating and fostering the link and thereby can facilitate the development of inventions in the country.

4.2.5. Higher Education Proclamation

This Proclamation is a law that governs the nation's higher education system which is offered to undergraduates and graduate students who attained degree programmes.⁴³⁷ Among the very rationales to have this Proclamation the most relevant to this thesis are enabling higher institutions to serve as dynamic centers of capacity building making them to focus on research to contribute to the development need of the nation.⁴³⁸ Moreover, one of the objectives of the higher education in Ethiopia is to promote and enhance research focusing on knowledge and technology transfers consistent with the country's priority needs.⁴³⁹ When putting the directions as to how the research in higher education is conducted, the Proclamation says that the research is expected to focus on problem solving through TT.⁴⁴⁰ Moreover, the Proclamation states that TOT is the aim of research fund.⁴⁴¹ In a nutshell, the above extractions show that TOT is among the major cornerstones of the Ethiopian higher education system. However, the Proclamation

⁴³⁵ Hiwote Molla, cited above at note 399, p. 51. Hiwote summarized the limitations especially related with university researches as follows "when does the researcher own IP, what is considered to be within the scope of employment of the researcher as far as IP is concerned? How is the benefit from commercialization of research results protected by patents distributed among the different parties? Who is owner of IP generated during contract research? What are rights of visiting researchers over their findings?"

⁴³⁶ The Higher Education Proclamation, cited above at note 31. The Proclamation recognizes individual IP rights and confidentiality agreements when university-generated knowledge is used for public benefit. This indicates the unique feature of university innovation. University inventions are the results of the minds of students and professors. They are the results of public funding schemes and supported by industries. Universities have long been recognized as sources of knowledge creation, innovation, and technological advances in the globe. Not only in Ethiopia, but also at every corner of the world, universities are being positioned as strategic assets in innovation and economic competitiveness and as problem-solvers for socio-economic issues affecting their countries.

⁴³⁷ Higher Education Proclamation, cited above at note 31, article 2 (8).

⁴³⁸ Id., preamble.

⁴³⁹ Id., article 4 (2).

⁴⁴⁰ Id., article 24 (1).

⁴⁴¹ Id., article 25 (2). The article states that every institution shall allocate sufficient fund particularly for research focusing on technology transfer and innovation. Most importantly, according to article 25 (5) of the same, institutions and academicians are also entitled to "enter into joint research and receive research funds from external and foreign sources if the research falls within the research standard, code of professional ethics, and norms of the institution. See also Hiwote Molla, cited above at note 399, p. 49. According to Hiwote, this entitlement it creates better chance of TOT among others, in using the R&D facilities of the partner institutions and learning more advanced practical problems and methodologies.

failed to incorporate the issue of innovation in higher education institutions and hence this can be considered as big miss of the law.

4.2.6. Procedural Directive for the Linkage of Education and Training, Research Institutions and Industries

It is said that there is no any legal framework to govern domestic TOT in proclamation or regulation hierarchy. However, there is a Procedural Directive for the linkage of education and training, research institutions and industries which is enacted by MoST.⁴⁴² As its name and the readings of the provisions indicate that, the Directive is merely serving as a procedural tool to put in place a system of coordination.⁴⁴³ To implement its objectives, it establishes organizational structures called national and zonal forums.

The Directive lacks some basic issues. Among others, it simply establishes the organizational structures but says nothing about where the organizations are really resides. The actor who has a privilege to chair the forum is not mentioned, the duties and responsibilities of chairs of both forums are not listed, no rules on the respective responsibility of universities, TVET and research institutes considering their special role rather it simply listed joint responsibility, no rules on decision making mechanisms and no any rule as to transparency and accountability mechanisms. Most importantly, since the responsibilities of the federal ministries, trade, industry and education bureaus aren't stipulated in the Directive, it pause practical challenges during implementation.⁴⁴⁴

It is said that the Directive is merely procedural guideline as to how coordinate synergy especially forum-type meeting. Hence, the critical substantive issues like how to transfer technology, what are the linking mechanisms, the ownership, incentive, conflict of interest, management of contracts and other concerns are missed out from the Directive. These issues are the major ingredients of TOT that should be dully addressed in a given TOT law as we have witnessed in US and Japan. Moreover, when we are going through several policies, laws, development strategies and plans of Ethiopia, we can easily conclude that TOT is an important ingredient in the growth and development agendas of the nation.

Above all, the issue of TOT has gotten a great concern in a comprehensive STIP document. Not only TOT but also domestic TOT via UIL is praised as a vital critical policy direction for the S&T development of the country even if it doesn't get a prime concern like that of foreign TOT in the Policy. Therefore, one can ask that “does it is sound to govern domestic TOT in a directive

⁴⁴² Procedural Directive for the Linkage of Education and Training, Research Institutions and Industries, cited above at note 358. MoST is the main actor to implement STIP. For the realization of its responsibilities, MoST has issued this Directive in 2013. The Directive got its base mainly from the STIP as the later stipulates the linkage among universities, research institutes, TVET institutions and industry is the one among the 11 critical policy issues.

⁴⁴³ In other words, it all talks about the procedural matters like how to gather in a forum, how to facilitate the platform, who are the members and what is the expected role played by the actors, who chair the forum and other issues.

⁴⁴⁴ Interview with Ato Yonas Tefera, cited above at note 326. According to him, the forums are getting difficulties when these actors are failing to perform some responsibilities allocated to them by the forum since there is no rules in order to ask them why fail to do their respective job.

issued by a specific ministry? Doesn't the issue of TOT in general and or domestic TOT in particular or specifically UIL deserve proclamation or regulation hierarchy?" The answer should be not only TOT in general but also domestic TOT in particular deserves to be regulated in a proclamation or regulation level.⁴⁴⁵ Most importantly, like that of the argument given concerning the policy issues in this thesis that UIL should be given a special and independent treatment by departing from TEVT and research institutions in the STIP, there has to be also a specific legal framework concerning the issue.⁴⁴⁶ Here an important remark to be noticed is that, for the nation to have a special regulatory framework for UIL, the universities' leaders have to play a key role in lobbying the government as the US's universities' leaders play for that country to enact the BDA.⁴⁴⁷

4.3. The Role of the Leather Subsector in Ethiopian Economy

Ethiopia has adopted IDS in 2002 which focuses on transforming the country's agriculture-dependent economy in to manufacturing-led industrialization by on labor intensive, capital saving and export based manufacturing industries like the leather subsector.⁴⁴⁸ The leather industry⁴⁴⁹ with its "twin" the textile subsector, has seen as the most preferred export industry that received enduring attention of the Ethiopian policy makers.⁴⁵⁰ The due attention is given to the subsector because it reflects the fundamental principles of the IDS as it can fasten the linkage between industry and agriculture, it consumes agricultural raw materials and it is labor intensive and most importantly it has a comparative and competitive advantage in the export market. Hence, the role played by the leather subsector in the nation's economy should be seen in light of these principles of the IDS as it will be discussed here under.

⁴⁴⁵ Interview with Ato Abebe Tesfa, cited above at note 353.

⁴⁴⁶ This argument is also shared by all the interviewees participated in this thesis. Accordingly they agree that since the relationship, behavior, channel, aim, subject matter, parties in the UIL is unique by itself from the cooperation of research institutions and training and vocational institutions with the industry, the UIL has to be treated differently in the legal regime of the nation. Little diverging argument is coming from Ato Abebe because he stated that under the umbrella of TOT law, the issue of UIL can be addressed in a special platform. But, if the TOT law doesn't address UIL as it deserves, there should be a special regulatory framework for UIL.

⁴⁴⁷ Interview with Professor Admasu Tsegaye, cited above at note 335. He has fully subscribed the assertion and he said that often times university leaders have the opportunity to lobby the policy and law makers.

⁴⁴⁸ Industry Development Strategy of Ethiopia, cited above at note 15, p.1.

⁴⁴⁹ Interview with Ato Abdissa Adugna, Secretary General, the Ethiopian Leather Industries Association, (Addis Ababa,04/08/2009 E.C.) According to him, in the Ethiopian situation there are mechanized and non-mechanized industries in the subsector according to the classification of the Association. Industries working with very small number of employees usually by a single actor and at the micro level of capital and infrastructure, they are called non-mechanized, whereas mechanized industries are working with a high level of employment, capital and infrastructure. Hence, in Ethiopia, there are hundreds of non-mechanized industries and their contribution in the subsector is not exceeding 10%. On the other hand, mechanized industries include tanneries, footwear and glove factories and other leather garment and articles manufacturers. Therefore, in Ethiopia there are around 65 mechanized industries of which 28 are tanneries, 20 are footwear factories, 2 are glove factories and the rest are manufacturers of leather articles and garments. From the mechanized industries, 12 are owned by foreigners through FDI. Above 98% of the mechanized industries are members of the Association.

⁴⁵⁰ Industry Development Strategy of Ethiopia of the Federal Democratic Republic of Ethiopia, cited above at note,15, p. 18

Even if the level of exploitation of the resource is very minimal, Ethiopia is the leading country with its livestock in Africa and 10th in the world.⁴⁵¹ Interestingly, Ethiopian goat and sheepskins are known for their superior quality in the global market.⁴⁵² Hence, the Ethiopian leather industry is lucky of using such raw and it can be said that the subsector can fasten the linkage between agriculture and industry. But Ethiopia's share in the world trade of leather and leather products is tiny.⁴⁵³ Moreover, there is a critical problem related with the market system of raw skin and hides.⁴⁵⁴ In order to avoid such problems, the government has issued a proclamation in 2013 which aims to improve the existing backward, inefficient and cost ineffective market structure.⁴⁵⁵

When we see the subsector in principle of “labor intensive”, by its nature, the leather industry hosts huge number of working force. That is why the industry has consumed nearly 16, 000 employment in 2014.⁴⁵⁶ Most importantly, one can imagine that how the subsector is importantly labor intensive when notifying the subsector expected to create new employment opportunities for about 336,000 citizens during the GTP-II period.⁴⁵⁷ However, the critical point to be noticed here is that the knowledge and skill status of this huge employment.

Coming to its export performance, the leather subsector is securing a notable foreign currency in each fiscal year. At the end of the GTP-I period (2014/15), the government was targeted to get a total of USD 465.5 million earning from the subsector.⁴⁵⁸ When we have a look to the GTP-II target, the subsector is expected to generate export earning of USD 707 million at the end year 2019/20.⁴⁵⁹ But still this target doesn't seem to be achieved like its predecessor targets as the industry secures only USD 116.2 million in the first year of the plan.⁴⁶⁰ That is why Ethiopia's share in the world trade is tiny. Hence, reaching a vision “to see the share of the Ethiopian

⁴⁵¹ Ministry of Industry official website, cited above at note 29.

⁴⁵² Ethiopian Leather Industry Development Institute official website, www.LIDI.gov.et. According to LIDI, the Ethiopian leather quality is characterized by its thickness, flexibility, strength, compact structure and clean inner surface. And also interview with Ato Abdissa Adugna, cited above at note 449. According to him, because of the unique natural quality gift of the Ethiopian sheep and goat skins, the Association has owned two brands internationally and nationally. “Ethiopian Highland Leather Brand” is registered in Ethiopia and Japan. “All African Leather Fair” is registered in Ethiopia.

⁴⁵³ Growth and Transformation Plan - II of the Federal Democratic Republic of Ethiopia, cited above at note 18, p. 29. For example, in 2014/15, the export revenue from the subsector is only USD 131.6 million. See also Zakaria Coppeaux and others, *Does Ethiopia have a comparative advantage in the leather industry?* 2016, p. 8. According to this work, leather is one of the most widely traded commodities in the world. Leather products play a prominent role in the world's economy, with an estimated global trade value of approximately USD100 billion per year. That is why Ethiopia's share is said tiny.

⁴⁵⁴ Mulu Gebreyesus, *Industrial policy and development in Ethiopia: evolution and present experimentation*,....., p. 32.

⁴⁵⁵ Raw Hides and Skins Marketing Proclamation, 2013, Proc. No. 814, *Fed. Neg.Gaz.*, Year 20, No. 29.

⁴⁵⁶ Ethiopian Science and Technology Information Center, cited above at note 16, p. 65.

⁴⁵⁷ Growth and Transformation Plan – II, cited above at note 18, p. 29

⁴⁵⁸ Growth and Transformation Plan – I of the Federal Democratic Republic of Ethiopia, 2009/10-2014/15, pp. 29 and 59. But in the event the export revenue from this subsector in 2014/15 stood at only USD 131.6 million, which is far lower than its target but much more than the figure for the base year

⁴⁵⁹ Growth and Transformation Plan – II, cited above at note 18, p. 139.

⁴⁶⁰ Ministry of Industry official website, cited above at note 29.

leather industry grow tenfold in 2023 in the global market⁴⁶¹ will be unthinkable. Surprisingly, only 16% of the firms in the subsector is exporting products while the huge rest are non-exporting firms.⁴⁶² The unsuccessful journey towards the expected export earning is clearly related with the unskilled man power and low technological capability which in turn resulted the loss of productivity and competitiveness in quality and value-added products.⁴⁶³ Hence, because of this, the subsector is begging for skilled manpower and modern technology. Since the main direction of the leather industry was to change the mix of exports toward processed and finished goods, the government has issued a proclamation in 2008 so as to discourage the export of unprocessed hides and skins with the aim of increasing the domestic value addition by imposing up to 150% export tax.⁴⁶⁴

All the above discussions show that, even if the subsector has a significant role in the economy as it is valued with the three principles of the IDS, but still the government has to work hugely with the drawbacks of the industry and the leather subsector in particular. Hence, this section of the thesis is showing the essential factor which is highly affecting the overall performance of the role played by the subsector i.e. having effective legal frameworks on TOT. This in turn makes the industry in general and the subsector in particular to be competent enough in the foreign market since the country is comparatively advantageous and has a potential to be competent, but yet inefficient.

4.4. The State Technology and UIL in Ethiopian Leather Industry

4.4.1. The State of Technology in the Leather Industry

Technology is the major challenge in the Ethiopian leather industry.⁴⁶⁵ This can be manifested through poor educational qualification of employees, low status of R&D units, out dated and

⁴⁶¹ Ethiopian Leather Industry Development Institute official website, cited above at note 452.

⁴⁶² Ethiopian Science and Technology Information Center, cited above at note 16, p. 77.

⁴⁶³ Interview with Ato Wondu Legesse, Director General, The Ethiopian Leather Industry Development Institute, (Addis Ababa, 13/08/2009 E.C.). According to Ato Wondu, in the global market with which the price of leather products are usually fluctuates, the industries with low level of technological capacity are facing more challenges. In Ethiopia, most of the factories are working with low technological capacity and hence they can't competent enough with others. And also Interview with Ato Abdissa Adugna, cited above at note 449. He gave extensive discussion about the challenges faced by the subsector. According to him, the overall leather industry problems are incubated from three "mother problems". The first one is the backward, inefficient and cost ineffective market structure of raw hide and skin which the government tried to regulate in its 2013 Proclamation. The second one is the quality of raw hides and skin which is the result of age old traditional system of animal husbandry. The government is not still working to avert the problem. The third, but the most important challenging reality is shortage of technology which is contributing the major impact of all the other "mother problems" in the subsector. See also Zakaria Coppeaux and others, cited above at note 453, p. 14.

⁴⁶⁴ Raw and Semi-Processed Hides and Skins Export Tax Proclamation, 2008, Article 4, Proc. No. 557, **Fed. Neg.Gaz.**, Year 14, No. 18. See also Ethiopian Science and Technology Information Center, cited above at note 16, p. 45. Nevertheless, the subsector has scored 6% of the country's GDP contribution in 2014 which is the highest of any other manufacturing industry. There is also a valuable increase of FDI in the subsector. Hence, it is so to say that the subsector is a significant manufacturing industry which can have a huge place in the economy and fastens the country's journey to transformation.

⁴⁶⁵ Interview with Ato Abdissa Adugna, cited above at note 449. And also Ato Yonas Tefera, cited above at note 326.

poorly planted automations, expensive imported machineries, spare parts and chemicals. Even if it is observed that the leather industry has proved its high consuming capacity of working manpower, the subsector lacks technology absorptive capacity because the majority of employees in the industry have poor educational qualification.⁴⁶⁶ 81% of the employees in the leather industry are 10th grade graduates or below. TVET graduate employees stand second accounting 14% of the total.⁴⁶⁷ There are only 10 BA/BSC holders in every firm and only two MA/MSc holders for every three firms.⁴⁶⁸ Hence, the industry is not employing knowledge equipped man power.⁴⁶⁹

The low expertise of employees shows the industry is using traditional techniques and has lack of acquisition, transformation and exploitation capacity with low level of production, undiversified products and competitiveness.⁴⁷⁰ Manpower with low knowledge can't effectively acquire, operate and control new knowledge, can't maintain, modify, imitate and develop technologies. One can prove that these assertions are real when realizes that 37% of the employees in the subsector have extreme and 52% have moderate lack of the necessary operational skill to carry out their job.⁴⁷¹ In other words, the productivity of plants and equipment is low when workers handling them are of low capability.⁴⁷² These facts indicate that the industry needs knowledgeable labor who are graduates of engineering & technology fields and who can knowledgably work on production line.⁴⁷³ The subsector also needs even social and applied natural sciences in addition to skilled labor in health service and medical science.⁴⁷⁴

Skilled status of R&D and workshops in the leather industry are key areas related with skilled labor and technological infrastructure. In these units, many useful researches can be conducted based on the real industrial problems faced during the operation process. Employees may get

⁴⁶⁶ Ethiopian Science and Technology Information Center, cited above at note 16, pp. 63 – 66. 81% of the employees in the leather industry are 10th grade graduates or below. TVET graduate employees stand second accounting 14% of the total. See also Jeremy de Beer and others, cited above at note 11, p. 323. And See also Zakaria Coppeaux and others, cited above at note 453, p. 18.

⁴⁶⁷ Ethiopian Science and Technology Information Center, cited above at note 16, p. 63 – 66.

⁴⁶⁸ Ibid.

⁴⁶⁹ Interview with Ato Abdissa Adugna, cited above at note 449, and Ato Wondu Legesse, cited above at note 463. According to them, even if a significant part of work in the leather industries is a labor work, but the subsector needs significant number of skilled manpower trained in engineering and technology fields.

⁴⁷⁰ This assertion is also shared by Ato Yonas Tefera, cited above at note 326.

⁴⁷¹ Ethiopian Science and Technology Information Center, cited above at note 16, p. 94.

⁴⁷² Henry Etzkowitz and Matthieu Roes, cited above at note 14, p. 90. And also interview with Ato Wondu Legese, cited above at note 463. Ato Wondu has fully subscribed the assertion that the top level management in the Ethiopian leather industry is harboring a sentiment of change resistance and hesitating to patently try to lead the working force, R&D and overall technology of the industry to the updated stage. The leather industry, by its nature, needs several trying and patency even to produce a single design or piece of needed product to the global market. This in turn prerequisites, among others, a high level of managerial commitment with which a given company decided to engage in strong R&D unit, recruitment of skilled man power and open for cooperation.

⁴⁷³ Ethiopian Science and Technology Information Center, cited above at note 16, p. 68. The assertion concretized when one realizes that 65% of the subsector needs more engineering and technology graduates from universities, based on the study.

⁴⁷⁴ Id., p. 70. According to the study, 10%, 20% and 5% of the leather industries need natural science, social science and medical science graduates respectively.

practical trainings and can develop their design skill in a day-to-day basis.⁴⁷⁵ However, in Ethiopia, research results show that in the leather subsector the level of R&D is very low.⁴⁷⁶ Only few (20%) firms from leather industries are reported that they engaged in R&D activities in their own compound.⁴⁷⁷ There are several reasons for this reality.⁴⁷⁸

With respect to material technologies, the subsector, specially owned by Ethiopians, is working with outdated technologies when compared with foreign industries landing through FDI.⁴⁷⁹ This is because the subsector is an age old industry in Ethiopia.⁴⁸⁰ For example, most of the tanneries are acquired their initial investment a long time ago and are still in their early years.⁴⁸¹ This is because of an increased price of factory plants and spares, and the majority of the tanneries suffer from lack of investment after they install their initial investment.⁴⁸² In leather industry, production process can be mainly divided into two parts, tanning and finishing, which both require specific machineries and infrastructure.⁴⁸³ However, Ethiopian tanneries are running both processes in integrated manner.⁴⁸⁴ This characterized them poor design of industrial plants, poor physical and institutional infrastructures. Their outdated states and poor plantation make the factories high consumers of electric power and water.⁴⁸⁵ In addition, this low level of automation makes them to use a high level of labor per machinery (on average 3 workers per machine).⁴⁸⁶ Most importantly, due to poor chemical industry sector in the country, tanneries imported chemicals with expensive price.⁴⁸⁷

⁴⁷⁵ Id., p. 6.

⁴⁷⁶ Jeremy de Beer and others, cited above at note 11, p. 329.

⁴⁷⁷ Ethiopian Science and Technology Information Center, cited above at note 16, p. 19.

⁴⁷⁸ Interview with Ato Abdissa Adugna, cited above at note 449. According to him, the main reason for this is related with the profit-oriented sentiment of industries and the unwillingness to incur costs for R&D. And also according to Ato Wondu Legese, the low commitment of management of industries is another reason. Most of the managers of the industries are not willing to spend budgets as well as they are not willing to try new things in patience until the expected result comes. The other possible reason could be the fact that the industries are not their owners' main business as indicated in Zakaria Coppeaux and others, cited above at note 453, p. 16.

⁴⁷⁹ Deborah Brautigam and others, cited above at note 38, p. 17. And also interview with Ato Wondu Legesse, cited above at note 463, and Ato Abdissa Adugna, cited above at note 449.

⁴⁸⁰ Ethiopian Leather Industry Development Institute official website, cited above 452. According to the information appeared in the website, Ethiopian leather industry has been working for more than 80 years.

⁴⁸¹ Zakaria Coppeaux and others, cited above at note 453, p. 16.

⁴⁸² Interview with Ato Wondu Legesse, cited above at note 464. And also interview with Ato Abdissa Adugna, cited above at note 449. See also Zakaria Coppeaux and others, cited above at note 454, p. 16.

⁴⁸³ Id., p. 17.

⁴⁸⁴ Ibid. Hence, this work advises firstly, the tannery value chain could be split up between different plants instead of trying to integrate the whole tanning process. Some tanneries could specialize in wet-blue (means skins that have been chrome tanned but, not fat-liquored and not dried) while others specialize in finished leather. The first would then sell on the local market the tanned raw hides and skins to the second which would process them into finished leather.

⁴⁸⁵ Interview with Ato Wondu Legesse, cited above at note 463. And also interview with Ato Abdissa Adugna, cited above at note 449.

⁴⁸⁶ Zakaria Coppeaux and others, cited above at note 453, p. 18.

⁴⁸⁷ Ibid. According to this study, there are two reasons for this situation - the first is that tanneries are highly sensitive to the chemicals' price variations on the international market. Secondly, the logistics of acquiring chemical inputs is more complex and requires more working capital. Indeed, the cost of importing chemicals has drastically

As far as the level of production capacity is concerned, from the firms in the leather subsector only 32% of them have realized their full production capacity.⁴⁸⁸ Furthermore, over 80% of the firms in the subsector is non-exporting.⁴⁸⁹ The first reason for these realities is lack of adequate skilled manpower because in a labor intensive industry, the labor productivity plays a central role.⁴⁹⁰ Other reasons include unscheduled plan for training, increased in the cost of imported inputs including foreign technologies.⁴⁹¹ Poor design of industrial plants, poor maintenance capacity, inadequacy of qualified managers, shortage of inputs, poor physical and institutional infrastructures are also among the reasons.⁴⁹² Moreover, high cost of production because of, among others, expensive imported chemicals and machineries, is another major characteristic of the existing industries.⁴⁹³

4.4.2. State of UIL in Ethiopia in the Leather Subsector

4.4.2.1. General Overview

Before examining the realities of UIL in the Ethiopian leather subsector, it is useful sketching an image of UIL in the industry sector as a whole. In Ethiopia, numerous research results and technologies often stay on shelves of the universities instead of being tested and disseminated in to industries for the purpose of commercialization. This claim is admitted even by the academia.⁴⁹⁴ There is also a huge gap between the research activities and the national development need and agendas.⁴⁹⁵ Even if UIL is considered as Ethiopia's global competitiveness indicator in STI,⁴⁹⁶ the current situation of the country confirms that universities are not taking the leading role and are lagging behind the industries.⁴⁹⁷ Even if there has been a continuous informal contact between universities and industries and individual academic staff members of universities and the private sector, this effort has not been made for the research outputs to make a significant impact on the society.⁴⁹⁸ This indicates that the interaction is fully

increasing. See also interview with Ato Wondu Legesse, cited above at note 463. And also interview with Ato Abdisa Adugna, cited above at note 449.

⁴⁸⁸ Ethiopian Science and Technology Information Center, cited above at note 16, p. 73.

⁴⁸⁹ Id., 77.

⁴⁹⁰ Zakaria Coppeaux and others, cited above at note 453, p. 18.

⁴⁹¹ ibid.

⁴⁹² Henry Etzkowitz and Matthieu Roest, cited above at note 14, p. 90.

⁴⁹³ Zakaria Coppeaux, cited above at note 453, p. 18.

⁴⁹⁴ Interview with Dr. Eng. Wondwossen Bogale, cited above at note 346.

⁴⁹⁵ Interview with Professor Admasu Tsegaye, cited above at note 335. According to him, because of the loose interaction between universities and the industry sector, most of the researches conducted by university scientists and their students are not reflected the practical realities of the sector and seldom serve as the solutions for the challenges faced by the industries. At the end of the day, the fate of these research results is the jewelries of the shelves. See also Jeremy de Beer and others, cited above at note 11, p. 322.

⁴⁹⁶ Ethiopian Science and Technology Information Center, Science and Technology Indicators Report, 2014, p. 19.

⁴⁹⁷ Science, Technology and Innovation Policy, cited above at note 12, p. 13.

⁴⁹⁸ Henry Etzkowitz and Matthieu Roest, cited above at note 14, p. 94.

dominated by informal way of cooperation.⁴⁹⁹ Above all, financial support to university research is low.⁵⁰⁰ Generally, the status of UIL is similar with the Tanzanian realities.⁵⁰¹

Development, promotion and commercialization of useful indigenous knowledge and technologies are among the objectives of the STIP⁵⁰² and TOT and UIL are among the identified critical policy issues in the document.⁵⁰³ But, according to the Policy, the existing UIL in the country is a loose relationship. Nevertheless, there is no implementing legal infrastructure which can be derived from the Policy that encourages, regulates, facilitates and governs the TOT as a whole and UIL in particular like we have witnessed in pioneering US and Japan. That is why many TT agreements and transactions are out of the auspicious of legal framework.

4.4.2.2. Existing Situations of UIL in Ethiopia in the Leather Subsector from the side of Industries

Ethiopian leather producers are establishing links with other twin companies (competitors), consultants, universities, research institutions and foreign technology firms.⁵⁰⁴ Moreover, LIDI⁵⁰⁵ is highly favoring to coordinate with foreign counterpart institutions with which foreign experts are coming for studies, technical assistances, trainings and consultations.⁵⁰⁶ Moreover, industries are importing machineries and chemicals from foreign technology suppliers.⁵⁰⁷ That is why, only 38% of the firms establish linkage with overseas firms.⁵⁰⁸ Even if the STIP primarily advocates foreign TOT through international cooperation, most alarmingly the state of foreign cooperation is becoming loosened and such a linkage makes the subsector dependent in foreign technologies.⁵⁰⁹ Moreover, the technologies transferred through overseas cooperation are of only

⁴⁹⁹ Jeremy de Beer and others, cited above at note 11, p. 329.

⁵⁰⁰ Education Sector Development Plan-V, cited above at note 374, p. 25. According to the data appeared in the Plan, in 2011/12, the research allocation of all universities accounted for only 1% of their total budget.

⁵⁰¹ Both countries are starting to walk on the path of free market economy since the beginning of 1990s. The industries and universities are infant in Tanzania. There is a loose UIL and there is no legal framework on UIL.

⁵⁰² Science, Technology and Innovation Policy, cited above at note 12, p. 4.

⁵⁰³ Id., p. 5.

⁵⁰⁴ Ethiopian Science and Technology Information Center, cited above at note 16, p. 88.

⁵⁰⁵ Leather Industry Development Institute Establishment Regulation, 2010, Article 5, Reg. No. 181, **Fed. Neg. Gaz.**, Year 16, No. 28. Accordingly, LIDI is a sector-specific institution, established with the objectives to facilitate the development and transfer to leather and leather products industries' technologies and to enable the industries become competitive and bring rapid development. In addition to LIDI, Leather and Leather Products Technology Institute is offering training in a 10+3 diploma and a year certificate program levels so as to enhance the man power capability.

⁵⁰⁶ Mulu Gebereyesus, cited above at note 454, p. 30.

⁵⁰⁷ Interview with Ato Wondu Legesse, cited above at note 464. According to him, leather industries do not establish permanent business partnership rather they are importing machineries and chemicals by considering the price, freight and delivery issues.

⁵⁰⁸ Ethiopian Science and Technology Information Center, cited above at note 16, p. 88.

⁵⁰⁹ Interview with Ato Abdissa Adugna, cited above at note 449. According to him, even if it is impossible to set aside the TOT and technical assistance from abroad, the dependency of the subsector in foreign industrial equipment by itself is a challenge just because the price, effectiveness and the in-taking capacity of industries.

abstract management techniques rather than the needed technical knowledge that could be applied to real practices in to the firms' production system.⁵¹⁰

Of all external linkages, leather firms have exhibited low partnership with universities. Only 25% of the leather industry has established linkages with universities.⁵¹¹ Moreover, according to Ato Yonas Tefera, a Team Leader of UIL in LIDI, currently there are only two formal and functional linkages with AAU-AAiT and AASTU are established. This shows that universities are not key partners for industries and the linkage between them is insignificant and needs more efforts to be strengthened.⁵¹² In addition to the low status of UIL, most firms still attach to informal contacts with universities that relate to the recruitment of graduates, internships, and consulting purposes based on mutual consensus through exchanging office letters.⁵¹³ This indicates that formal linkages (manifested with patenting, licensing and firm establishments based on contractual and legal frameworks) are not exercising. There is also a spread sentiment among leather industries which doubts whether universities do have technological solutions for practical problems as the latter are focusing on theoretical classroom lecturing systems.⁵¹⁴ This situation is the same as the Tanzanian and Japanese businesses viewed universities as less responsive to their needs. Hence, to shape such kind of behavior, to facilitate and improve the linkage, primarily, there should be a legal framework like we have witnessed in countries' experiences that law is a prime factor or motivation to UIL.

It is notable that the globalization of research spurred by multinational corporations and the use of information technology may encourage firms to look beyond their national boundaries.⁵¹⁵ So, it may not be as such a big deal that Ethiopian leather firms are begging for foreign technologies. However, if inland university innovation is truly decisive for their competitiveness or at least if there is a potential in universities, it would be unwise to look abroad for technology. In other words, if universities can significantly supplement the inflow of innovation through their own basic and applied research across a number of disciplines and if such innovations can be used by the subsector, the country can count on higher rates of growth in its manufacturing sector as a whole just by using its inland technological capabilities.⁵¹⁶ Most importantly, as universities are

⁵¹⁰ Deborah Brautigam and others, cited above at note 37, p. 2.

⁵¹¹ Ethiopian Science and Technology Information Center, cited above at note 16, p. 89.

⁵¹² Jeremy de Beer and others, cited above at note 11, p. 327.

⁵¹³ Interview with Ato Yonas Tefera, cited above at note 326, and Ato Abdisa Adugna, cited above at note 449.

⁵¹⁴ Interview with Ato Wondu Legese, cited above at note 463, Ato Yonas Tefera, cited above at note 326, and Ato Abdissa Adugna, cited above at note 449.

⁵¹⁵ Shahid Yusuf and Kaoru Nabeshima, cited above at note 91, p. 8.

⁵¹⁶ Interview with Professor Admassu Tsegaye, cited above at note 335. According to him, for example, the AAU researchers have innovated a technology which serves the tanneries to avoid the bad smell pollutant during their production process. This invention is already patented and licensed to the firms and nowadays they are using it. Moreover, AAU has offered leather engineering course. And also interview with Ato Wondu Legese, cited above at note 463. He recognizes the important role of universities for the subsector's development. According to him, the industry is importing all machineries and chemicals. But, universities can conduct surveys about the engineering of imported machineries and their spare parts and finally they can reinvent so that the industry substitute the imported machines. With respect to chemicals, as far as the universities have the knowhow of the chemistries of the ingredients of chemicals used by the industry, at least they can produce the required chemicals in lab application

starting to have incubation centers and science parks, they can undoubtedly incubate the needed machineries, spare parts, knowhow and chemicals at least in laboratory level.

It is discussed that the leather subsector needs knowledgeable labor who are graduates of engineering & technology and who can work on production line knowledgeably. The subsector also needs even social and applied natural sciences and man powers in health services and medical sciences. To fulfill such needs, the key possibility is consolidating the linkage with universities. Moreover, the leather firms depended on on-the-job training (47% of them engaged) and orientation training (41% of them engaged).⁵¹⁷ So, industries need to link with universities in order to give effective science and knowledge based trainings to enhance the capacity of their employees.⁵¹⁸ In addition, since the level of in-house R&D is very low, industries are better off advised to have a huge link with universities so as to build their internal R&D capability. At the same time, universities are expected to engage their students in industry internship, make them to get employed by companies and involve in the upgrading of industries' R&D skilled status. However, most of the time industries are not willing to accept students via internship channels just because of some reasons.⁵¹⁹

Excitingly, it has been observed that establishing external linkage in the subsector can increase the production capacity of firms by 24% and the possibility of a firm to produce at full capacity.⁵²⁰ As far as the level of production capacity, it is said that few portion of the leather firms (only 32%) have realized their full production capacity and the rest huge number of the firms produce below their expected or attainable capacity. Moreover, it is noted that only 16% of

stage. Then they can also assess the availability of chemical elements in the country and they can study the economic feasibility to produce the chemicals in Ethiopia. Moreover, the leather industry is characterized as a consumer of huge power and water. Therefore, universities can have the theoretical and scientific capacity to conduct researches decrease the huge utilization of power and water by industries. And see also Jeremy Wakeford and others, Innovation for green industrialization: An empirical assessment of innovation in Ethiopia's cement, leather and textile sectors, 2017, p. 21.

⁵¹⁷ Ethiopian Science and Technology Information Center, cited above at note 16, p. 108.

⁵¹⁸ Interview with Ato Yonas Tefera, cited above at note 326.

⁵¹⁹ Ibid. According to him, at the time when the LIDI is discussing with partners aiming to boost the UIL, industries are claiming that most of the students are not adhering to the rules and procedures of firms and frequently there happens some risks. Moreover, the industries also claim that the supervisors of universities who are intended to look after the students are not taking time with their students in the firms' compounds. Hence, according to him, there must be a legal binding rule so as to abide both parties to do well and following the law, both actors can stipulate their specific guidelines for the internship program. Such claim of industries is also admitted by universities. In addition, interview with Ato Abiy Tirfie, University-Industry Linkage Officer at Research, Technology Transfer and Industry Linkage Office, Addis Ababa Institute of Technology, (Addis Ababa, 26/07/2009 E.C.) According to him, the problem with university supervisors is related with the scarce in transportation and other services and fees given to the supervisors. That is why, even if the supervisors have gotten the advising fees, they cannot take enough time with their students in industries. Moreover, interview with Ato Anteneh Getinet, Acting Chair of Leather Stream at School of Chemical and Bioengineering, Addis Ababa Institute of Technology, (Addis Ababa, 26/07/2009 E.C.) He stated that the problem is also related with the deficiencies in staff numbers of the stream, only four academic staffs are working in the stream. And also interview with Dr. Eng. Wondwossen Bogale, cited above at note 346. He added that Addis Ababa University is well aware that practical problems related with the internship programs. Due to this the university is preparing its own internship rules and guidelines to avoid the problems. Interestingly, AASTU has implementing its own Student Internship Manual since 2014.

⁵²⁰ Ethiopian Science and Technology Information Center, cited above at note 16, p. 89.

the firms is exporting its products while the rest are non-exporting firms.⁵²¹ Hence, the need for strengthening the linkage, among others, with universities should be a key concern for industries to enhance their productivity and competitiveness.

4.4.2.3. Existing Situations of UIL in Ethiopia in the Leather Sub Sector from the side of Universities

4.4.2.3.1. State of UIL from the side of Universities

Over the past 15 years there has been a significant expansion of higher education in Ethiopia as the number of universities increased from just two in 2000 to over 30 this day and will be 50 in the coming five years. Universities in Ethiopia are legally obliged to become institutions to conduct researches in order to add a valuable contribution for the development of the nation.⁵²² To this end, promotion and enhancement of research and TOT is among the objectives of higher education⁵²³ and any research in universities is expected to focus on TOT.⁵²⁴ However, university research has not shown parallel growth.⁵²⁵ Furthermore, it is found that there is disconnect between the research focus of universities and the needs of the economy.⁵²⁶ This situation spurs the criticism on universities that incubate graduates and researches that are irrelevant to the needs of employers and the social, economic, and technical challenges facing by the Ethiopian economy. In consolidation of this assertion, Professor Admasu has stated as follows;

“There is a huge disconnection between universities and industry. Both of these actors are working by fencing their own territories. Moreover, in different ministries there are also special research institutes which are better close to the society and industry than universities. That is why researches and technologies developed by universities are not really in a position to solve the practical problems of the industry and finally staying on the shelf is their fate.”⁵²⁷

Giving the above highlights about the general discussions on UIL in Ethiopia, now the thesis is moving on discussing the practical realities of UIL in the leather subsector from the side of universities. In doing so, it picks up the experiences of AAU and AASTU purposefully just because the leather industry has established formal and active linkages only with these two

⁵²¹ It is discussed that the reason for the deficiency on production and exporting capacity include lack of adequate skilled manpower, unscheduled plan for training, inefficient and outdated technology, low technological adaptation and assimilation capability, low technological transformation and exploitation capacity and weak competitiveness, increased in the cost of imported inputs including foreign technologies and the like.

⁵²² Higher Education Proclamation, cited above at note 31.

⁵²³ Id., Article 4 (2).

⁵²⁴ Id., Article 24 (1).

⁵²⁵ Jeremy de Beer and others, cited above at note 11, p. 322. According this work, only a handful of universities, mainly Addis Ababa University, Haramaya University and Mekelle University, are engaged in notable research activities. Others have weak research capacities, both in terms of infrastructure and qualified manpower.

⁵²⁶ Ethiopian Science and Technology Information Center, Science and Technology Indicators Report, cited above at note 497, p. 19. According to this report, Ethiopia’s rank in terms of the quality of scientific research institutions stood 93rd out of 142 countries. Hence, it can be argued that the undeveloped research status of universities can contribute to the country’s low rank in R&D.

⁵²⁷ Interview with Professor Admasu Tsegaye, cited above at note 335.

universities.⁵²⁸ AAU is not only the oldest university in the country but also it is a pioneer in the area of UIL.⁵²⁹ It is the first university starts a formal and institutionalized linkage with the industry in general and leather subsector in particular.⁵³⁰ It established the first-ever university Technology Business Incubation Center in Ethiopia and it is preparing to establish more Incubation Centers. It is the university with its own IPRs and Research Policies.

Before some seven and eight years, in AAU, none of the units of the university had set research priorities based on national development objectives.⁵³¹ TOT and UIL were neglected.⁵³² Most of the cooperation activities were done in faculties without the knowledge of the higher organs of the university.⁵³³ Surprisingly, even if the Higher Education Proclamation supposes that any cooperation agreement must be signed with the knowledge of higher officials of universities, in AAU however, individuals were signing the deals without the knowledge of the university.⁵³⁴ But now the situation is changing.⁵³⁵ In the efforts to strengthen the UIL, currently the university has a Vice-President in charge of research and TT and there is also industry- university linkage and technology transfer directorate (UILTTO) lead by a director.⁵³⁶ The university has also regulated policies and guidelines to foster its linkage with industries. Moreover, it sponsored its own Bibliometric Performance Report by Thomson Reuters in 2015 to identify its research ranking and gaps by comparing itself with Cairo, Makerere, Nairobi, Dar Es Salam and Cape Town Universities.

As far as the linkage with leather industry is concerned, AAU has signed MoU with LIDI to make a formal linkage. Accordingly, the university has prepared curriculum and opened a Leather Stream program which offers under and postgraduate courses in leather technology based on the needs of the industry.⁵³⁷ The courses are offered jointly with the university's

⁵²⁸ Interview with Ato Yonas Tefera, cited above at note 326.

⁵²⁹ Addis Ababa University is legally reestablished by the Council of Ministers Regulation No. 214/2011.

⁵³⁰ Henry Etzkowitz and Matthieu Roest, cited above at note 14, p. 92.

⁵³¹ Jeremy de Beer and others, cited above at note 11, p. 322. See also Addis Ababa University Performance Report of 2004 E.C. – 2008 E.C., p. 55.

⁵³² Addis Ababa University Performance Report of 2004 E.C. – 2008 E.C., p. 55.

⁵³³ *Id.*, p. 28.

⁵³⁴ *Ibid.*

⁵³⁵ Interview with Professor Admassu Tsegaye, cited above at note 335. According to him, “AAU has aimed to be a distinguished research university not only in the country but also in Africa and the globe as well in near future. To come up with this ‘big dream’, it endeavors with notable changes. It has reorganized its units so as to enable them and their members to be independent enough to conduct more researches and to make links with the outside environment. The university has enacted its own IPRs and Research Policies to facilitate encourage research and UIL. In the future none of the units and member of the academia cannot survive unless conduct researches which are capable of resolving practical problems. Moreover, patenting and publishing in journals is a must in order to put the university at a center of excellence level in its several academic fields”

⁵³⁶ Interview with Dr. Eng. Wondwossen Bogale, cited above at note 346. According to him, the main responsibilities of the directorate are, university-industry cooperative research, industry-sponsored research projects, patent and licensing, consultancy services agreement between university and industry, publication, professional conferences, faculty personal contacts and establishing Science and Technology Parks and Technology Business Incubation centers, industrial internship and establishment of university affiliated enterprises.

⁵³⁷ Interview with Ato Anteneh Getinet, cited above at note 519. According to him, there are two batches of students are graduated with BSC in Leather Technology. There are also nearly 70 students engaging the charge. But, even if

academic staff and experts of the LIDI. Undergraduate students are conducting theoretical courses in the university and practical courses in the workshops and laboratories of LIDI.⁵³⁸ They are also engaging their internship programs in industries that are linked with the university.⁵³⁹

AASTU is one of the new public universities mainly established to play a leading role in technological transformation of Ethiopia, among others, by creating a strong linkage with industries.⁵⁴⁰ It aims at conducting demand-driven research in S&T to address the challenging issues the country faces in its development plans.⁵⁴¹ The outputs of the researches are to bring academic excellence and an entrepreneurial spirit to transfer into the commercial domain, and thus, strengthening the links between the university and the local community as well as benefiting the wider society.⁵⁴² Its motto, “University for Industry” also shows its desire to strongly link with industry. Hence, it established a formal tie with the leather subsector as it established Footwear Engineering program in undergraduate level.⁵⁴³ Hence, the university establishes UILTT Directorate which aspires to strengthen efficient and effective knowledge and TT between the university and industries.⁵⁴⁴ But the director and staff members are not full-timers rather they are conducting the job in addition to their main job i.e. teaching.

AASTU has also established a linking framework “Zonal Forums” for several subsectors.⁵⁴⁵ Among these University-Industry Linkage Zonal Forums (UILZFs), the one is the Leather

the stream needs 25 students in each semester joining the stream, there are only 17 students (in average) have been registering. The main reason for this is, fear and suspicious of the newness of the stream as well as the unemployment related fears. But, since the industry is in need of knowledgeable man power, all the graduates are consumed by the industry.

⁵³⁸ Ibid. According to him, there is no any facility in the university to conduct practical courses. But the university should have the facilities.

⁵³⁹ The linkage shows that the existing mechanisms for their cooperation are offering courses jointly, internship, using industries’ labs. But, the faces of the linkage should be expanded through other linking mechanisms.

⁵⁴⁰ Addis Ababa Science and Technology University website, www.aastu.et.edu. The university has a mission to be problem solver of the industry, a leader in the nation’s research activities with continental impact and well known globally. To achieve this mission, the university has given special attention to strengthening the UIL. The university establishes UILTT Directorate which aspires to strengthen efficient and effective knowledge and TT between the university and industries.

⁵⁴¹ Ibid.

⁵⁴² Interview with Ato Adamu Esubalew, cited above at note 360. He added the UIL helps to the university to build capacity of the students and staff, source of revenue, improve education quality, build confidence to carry out technical activities, share research laboratory facilities, support industries and contribute for national growth.

⁵⁴³ Ibid.

⁵⁴⁴ Ibid. According to him, the university carryout every activity based on the industry demand. The university does not allow budget and other facility for instructors unless the activities are approved by the industries. Thus, the university is working in line with industry demand.

⁵⁴⁵ Ibid. He stated that "even though the university is new, there are more than 50 partner industries and organizations that signed Memorandum of Understanding and work together in the above mentioned activities. For example, 5 grant consultancy projected are completed, 5 grant consultancy projected are ongoing, 1 joint research is completed and 3 are ongoing many technical trainings are completed and there are also many ongoing trainings we have agreed to deliver for industries"

and Leather Products Manufacturing Industries UILZF. But The Forums are not efficient at this time as the required level the linkages are highly emphasized on short-term, informal and individualized projects.⁵⁴⁶ The Directorate has stipulated its short term⁵⁴⁷ and long term plans⁵⁴⁸ for its UIL activities. In order to attain its objectives, the Directorate has been providing joint research, technical training, internship, externship, project consultancy and community services.⁵⁴⁹ But important channels like industry-sponsored research, technology business incubation, and science and technology parks have not been used. These linking activities are directly related with the long term plans of the Directorate. Hence, failing to introduce such useful linking activities has its own negative effect in the effectiveness of the long term relationship which is in turn a prime result of an effective and entrepreneurial UIL.

4.4.2.3.2. Practice of Patenting in the Academia

The current situation in Ethiopia concerning university patenting is completely resembles the realities of US and Japan before their legal innovations.⁵⁵⁰ IP system as a whole in Ethiopia is not playing a substantial role in accelerating TT and expansion of local innovation activities.⁵⁵¹ Many countless research results and technologies with the potential to be industrially applicable are not commercialized.⁵⁵² In addition, members of the academia are not willing to apply for patent protection on their innovative research results rather favors publishing in different journals and science magazines which make their works simply the public domain and consequently the loss of their commercial value. It is witnessed that researchers and academicians are rewarded in accordance with the frequency and quality of publishing.⁵⁵³ Hence, there is insignificant

⁵⁴⁶ Ibid.

⁵⁴⁷ Its short term plans are;

- 1) To provide consultancy, training and community services based on the current demand of industry partners and the surrounding communities.
- 2) To promote UIL activities of AASTU and find strategic partners.
- 3) To strengthen the students' industrial internship program implementation and instructors' industrial capacity building.
- 4) To bring industry experts to share their experiences and to advise the students in their final year project works.

⁵⁴⁸ Its long term plans are;

- 1) To strengthen the UIL and work for mutual benefit of both sides
- 2) To be center of excellence in UIL activities and S&T transfer, adaptation and innovation.
- 3) To establish technology parks, entrepreneurship training centers, science & technology innovation center for students, micro & small enterprises and other industries.
- 4) To be center of innovation and incubation in S&T.

⁵⁴⁹ Interview with Ato Adamu Esubalew, cited above at note 360.

⁵⁵⁰ The Draft National Intellectual Property Policy and Strategy and Science, Technology and Innovation Policy have recognized the problematic realities in the area of IP.

⁵⁵¹ Science, Technology and Innovation Policy, cited above at note 12, p.15. See also Science and Technology Information Center, Science and Technology Indicators Report, cited above at note 496, p. 162. According to this study, for instance, in 2010/11, only 29 patent applications are presented to EIPO which all have failed granted patent title. From 2010 – 2014, there are a total of 105 patent applications presented but only 26 are granted. Obviously, this is because the applications can't meet the requirements of the law.

⁵⁵² Addis Zemen, (Addis Ababa), "Researches-The Ornaments of Shelves or Problem Solvers?", February 30, 2009 E.C.

⁵⁵³ Wondwossen Belete, The Patent System and Innovation Performance in Ethiopia,, p.23.

university patenting in Ethiopia.⁵⁵⁴ These resembles the situations in US and Japan before TOT laws as there was little conversion of inventions in to commercial useful products due to the minimal patent and license practice in those countries.

These all are simply because of the lack of sustainable institutional linkage between universities and industries which is facilitated and governed by legal frameworks.⁵⁵⁵ Moreover, the low utilization of IP by universities is the outcome of the low level of awareness about IP among the academic community.⁵⁵⁶ The researchers' primary concern is also apparently funding.⁵⁵⁷ Absence of national IP policy has also contributing a lot for the problems.⁵⁵⁸ Despite a lacuna of legal and policy framework and other problems, universities are trying to have their own internal IP policies. Institutional IP and Research Policies may be especially important in the absence of national policy frameworks.⁵⁵⁹ As conflicts and issues concerning IP can be occurred in UIL, the universities' IP policies may be helpful in mitigating future conflicts as it is learned from US and Japan. But still there is an absence of awareness in Ethiopia even in these institutional policies among the academia.⁵⁶⁰ As a governing organ in the nation's IP regime, EIPO⁵⁶¹ is said engaging various activities to promote use the patent system in universities.⁵⁶² Above all, the Office has established Technology and Innovation Support Centers (TISC) in universities through the TISC project sponsored by WIPO.⁵⁶³

⁵⁵⁴ According to a data gotten from the Ethiopian Intellectual Property Office, Patent Protection and Transfer of Technology Work Processing, there is only a single patent and few utility models are registered by universities in Ethiopia. See also Jeremy de Beer and others, cited above at note 11, p. 327. According to this study, most of the local applications received by the EIPO are from SMEs. These SMEs are mainly requesting utility model certificates for their incremental inventions (which may not fulfill the criteria of patentability).

⁵⁵⁵ Interview with Ato Fikadu Haile, Team Leader of Patent Information Accumulation Dissemination and Technology Transfer, Ethiopian Intellectual Property office, (Addis Ababa, 09/08/2009 E.C.)

⁵⁵⁶ Jeremy de Beer and others, cited above at note 11, p. 326. And also Interview with Dr. Eng. Wondwossen Bogale, cited above 346.

⁵⁵⁷ Jeremy de Beer and others, cited above at note 11, p. 327. According to this study, in addition to the mentioned challenges, "... inadequate funds hinder their ability to carry out meaningful research that will be considered worthy of industrial application. Also cited as problems are; inadequate research facilities, shortage of qualified research staff, lack of information resources, lack of institutional incentive mechanisms and lack of clear research strategy...." are also frequently cited challenges.

⁵⁵⁸ Girma Bejiga, cited above at note 42, p. 43.

⁵⁵⁹ For example Addis Ababa University and Addis Ababa University Science and Technology University have formulated their own intellectual property and research policies in order to encourage their researchers to research more and to patent and publish their works.

⁵⁶⁰ Interview with Dr.Eng. Wondwossen Bogale, cited above at note 346, and Ato Adamu Esubalew, cited above at note 360. According to them, this is because the newness of the sectorial policy practices in Addis Ababa University and Addis Ababa University Science and Technology University and they are trying to conduct awareness creation forums. Moreover, the universities are putting IP clauses in every employment and IP related activities.

⁵⁶¹ Ethiopian Intellectual Property Office Establishment Proclamation, 2003, Article 5, Proc. No. 320, **Fed.Neg.Gaz.**, Year 9, No. 40.

⁵⁶² Interview with Ato Fikadu Haile, cited above at note 555 . He stated that the Office developed guidelines for the formulation of institutional intellectual policies in universities and conducted various awareness creation programs.

⁵⁶³ *Ibid.*, According to him, the Centers are there so as to make national and worldwide patent information available for the academia freely and without fees. This is done through the codes given from the WIPO to the EIPO.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

Ethiopia is comparatively and competitively advantageous in the leather industry just because of its untapped quality natural gift of raw hides and skins. Moreover, the nation has huge labor. However, the country is still inefficient in the subsector. Even if there are several problems associated with the inefficiency, all are hatched from the wombs of three “mother problems”. The first one is the backward, inefficient and cost ineffective market structure of raw hides and skins. This problem called for governmental regulatory intervention in 2013. The second one is the quality of raw hides and skin which is the result of age old traditional system of animal husbandry. Even if this is not within the scope of this thesis, it is noticed that the problem is much neglected and the government is starts to curb it with the establishment of a Ministry for livestock and fishery. The third and the most important challenging reality is low level of technology in the subsector. This problem isn’t still regulated but calls for governmental regulatory intervention.

Evaluated from the several aspects of technology, the thesis found that the Ethiopian leather industry is considered as technology deficient subsector. This is characterized through poor educational qualification of employees, low status of R&D units, outdated and poorly planted automations, expensive imported machineries, spare parts and chemicals. Even the subsector has absorbed huge number of manpower, but majority of the employees lacks competent skill and knowledge mainly because they have poor educational qualification. 10th grade graduates or below and TVET graduate employees accounted 81% and 14% of the total work force respectively. Because of this, huge number of employees has lack of the necessary operational skill to carry out their job. Moreover, they lack operating skill in R&D units and workshops in which the subsector’s innovative potential can develop. Even if a significant part of work in the leather industries is a labor work, it is also noticed that the subsector needs significant number of skilled manpower trained in engineering and technology fields who can even work in production line knowledgably. But, currently there are insignificant numbers of employees who hold BSC/BA, MSC/MA and PhD in the industry. Particularly, the subsector is looking for science, engineering and technology qualified labor force, and yet, labors who qualified with other fields are demanded.

With respect to material technologies, Ethiopian leather industry is yet working with inefficient and outdated technology. Because the subsector is an age old industry in Ethiopia, most of the tanneries, for example, are acquired their initial investment a long time ago and are still in their early years. This is because of an increased price of factory plants and spares, and the majority of the tanneries suffer from lack of investment after they install their initial investment. In leather industry, production process can be mainly divided into two parts, tanning and finishing, which

both require specific machineries and infrastructure. However, Ethiopian tanneries are running both in integrated manner. This characterized them with poor design of industrial plants, poor physical and institutional infrastructures. Their outdated states and poor plantation make the factories high consumers of electric power and water. In addition, this low level of automation makes them to use a high level of labor per machinery (on average 3 workers per machine). Most importantly, due to poor chemical industry sector in the country, tanneries imported chemicals with expensive price.

Even if R&D in the leather industry is a key area for productivity, the level of R&D is very low and minor in its nature. Only few firms (20%) are engaged in R&D activities in their own compound but the huge rest of them have no R&D units. This shows that the subsector invests least to build its in-house technological capability infrastructure. R&D unites and workshop facilities are highly related with skilled labor and technological infrastructure. Hence, both directly reflected that technological absorptive and assimilative capability can better be built in the internal capacity building infrastructures of the industries.

Generally, low level of technological status in the leather industry endangers the industry's productivity and competitiveness. From the firms in the subsector only 32% have realized their full production capacity and nearly 85% of the firms are non-exporting. It characterizes the nation with huge comparative advantage but inefficient. Nonetheless, this thesis is perceived that, in order to solve the problems, the government has set sector-specific institutional structures called LIDI and ELLPTI so as to endeavor the enhancement of technological capability of industries. The government also shows its commitment for the improvement of poor technological capability of the manufacturing sector in general and the leather industry in particular as it planned to formulate policies and legal frameworks. However, there is no any governmental regulatory intervention yet.

As far as the UIL in the case of the Ethiopian leather industry is concerned, the status of cooperation is very low. The subsector is establishing links with consultants, universities, research institutions and foreign technology firms. Of all the linkages, leather firms have exhibited low external linkages with universities (only 25% of the leather industry has established linkages with universities). Moreover, currently there are only two active and functional formal linkages which are established with AAU-AAiT and AASTU. Both universities started teaching in Leather Technology and Footwear Engineering respectively. Nonetheless, the linkage shows that industries are not making universities as their key partners and the linkage between them is insignificant and needs more efforts to be strengthened. In addition to the low status of such kind of link, most firms still attach to informal contacts with universities that relate to the recruitment of graduates, internships and consulting purposes based on mutual consensus through exchanging office letters. This indicates that formal linkages (manifested with patenting, licensing and firm establishments that basis contractual and legal frameworks) are not prevailing.

There is also a sentiment among leather industries which doubts whether universities do have knowledge and technological solutions to avert the practical problems as the latter are focusing on theoretical classroom lecturing systems. However, as it is proved that from the experiences of AAU and AASTU, university innovation is truly decisive for their competitiveness or at least if there is a potential in universities, it would be unwise to hold such attitudes. Moreover, the low technological status in the subsector begs for the strong cooperation between industry and university. The industry needs labor who are graduates of engineering & technology and who can work on production line knowledgeably. Universities have the potential to improve the R&D units. Furthermore, they can develop machineries, spare parts and chemicals at least in laboratory level. Moreover, establishing external linkage in the subsector can increase the production capacity of firms by 24% and the possibility of a firm to produce at full capacity. Hence, industries are advised to have a huge link with universities by avoiding the negative sentiments. The government may also, for instance, incentivize the industries through several schemes like tax relief and funding.

Even if the STIP primarily advocates foreign TOT through, among others, international cooperation, most alarmingly the state of foreign cooperation in leather industry is becoming loosened and such a linkage makes the subsector dependent in foreign technologies. The fact that only 38% of the firms establish linkage with overseas firms concretized the assertion. Moreover, the technologies transferred through this cooperation are of only abstract management techniques rather than technical knowledge that could be applied to future real practices in to the firms' production system. Hence, industries should have turned their face to the inland knowledge and technology powerhouses like universities.

In 2012, the country saw its second STIP. This Policy can be considered as a better document than its predecessor in several faces. Above all, it crafted in a way that demarcates clear boundaries between policy directions and of strategies. Moreover, it gives due attention for innovation which didn't have a place in the previous Policy. Eleven critical policy issues are identified. TOT is considered as an orbit for each and every STI matters. However, foreign TOT is considered as the backbone for the overall policy issues. All other critical policy matters directly or indirectly carrying the final aim of fostering foreign TOT. The research, human capacity development and the direction concerning manufacturing and service providing enterprises, among others, are at the end of the day expected to serve the aim of searching for, learning, adapting and utilizing effective foreign technologies.

Indeed, for Ethiopia it can be necessary to import effective and efficient foreign technologies. However, in order to copy appropriate and effective foreign technologies, the country must first build even the capacity to search, select, adapt and utilize. In order to build the national technological capability, there has to be a favorable condition for the encouragement of local inventions, among others, by laws, like the Patent Proclamation did. Hence, the STIP should be re-crafted in a way that the inland TOT gained an equal recognition with foreign TOT. Moreover, the Policy should be amended in a way that the national system of research, human

power development and manufacturing industry and university collaborations are primarily focuses on independent innovative capability in the nation.

With respect to the case of UIL, it's true that the issue is the one among the eleven concerns under the umbrella of “universities, research institutes, TVET institutions and industry linkage” in STIP. In addition, one of the strategies to achieve the policy direction in the area is creating conducive environment for university academia and students to engage in TT activities in industry. Nevertheless, the STIP doesn't put UIL as an independent policy direction. In black and white the Policy puts a direction for the collaboration of universities, research institutes, TVET institutions and industry is to support and facilitate foreign TOT. Hence, here also, the Policy neglects the fact that the relationship among these actors is not only an important means to transfer local knowledge but also a vital mechanism to supplement the acquisition and adaptation of international knowledge and technologies.

The other main concern identified in this thesis is the issue of Model of UIL. It is familiar to see the phrase “national innovation system” (NIS) in several parts of the Policy. But, it is difficult to understand how the academia-industry linkage is built-up and the role given to universities in the linkage. Indeed, the STIP dictates that the cooperation in the innovation system is expected to be a joint one among the actors and strengthening the integration among various stakeholders. Moreover, universities are not the only core actors rather the industries are taking the focus point. Hence, this shows that the STIP has adopted NIS Model, perhaps arguably.

However, this will clearly undermine the universities' role as centerpieces in the innovation agenda of the nation and the economy as a whole which is boldly stipulated in the Higher Education Proclamation. Most importantly, many new universities have been founded and the old ones have been re-oriented to the path of research and entrepreneurial universities like AAU and AASTU. Hence, universities are undoubtedly taking a special podium in the nation's innovation and development arena. Moreover, universities are taking the role of industries as they are establishing UIL directorates responsible for TOT, business-like firms in their compound, for example the technology incubation centers and university enterprises which clearly manifests the Triple Helix Model is in place. Therefore, the Ethiopian STIP should base its principles in line with this Model in order to have a clear theoretical background. The Model is helpful to solicit and recognize the special features of UIL and treated as an independent policy concern. The Model views innovation primarily as a product of interaction among three main actors - academia, industry and government and focuses on the university as a source of entrepreneurship and technology. Hence, it is sound to conclude that the STIP should manifest the Model. Moreover, the historical roots of the STIP discussions show that there were strong moves and grounds to clearly reflect the Triple Helix Model even there was small number of universities in the country with little research and entrepreneurial culture.

A policy is nothing without the corresponding laws. However, the Ethiopian STIP endorses the need for institutional frameworks but neglects the importance of regulatory frameworks. Hence,

the Policy should be reformulated in a way that it boldly puts strategic directions as to the importance and need of legal infrastructure in the nation's STI arena.

IP is treated as a critical policy direction in the STIP. The IP system is an important tool to facilitate the transfer of university-generated knowledge to industry. But, in Ethiopia, the system is not in a position to play its vital role in accelerating TOT and expansion of local innovative activities. Hence, one of the mechanisms to make the system workable is having a specific policy instrument. However, Ethiopia doesn't have a comprehensive IPRs policy yet. Nevertheless, there is a Draft Policy waiting for successive discussions. Unlike the STIP, domestic TOT in general and university innovation and commercialization through UIL in particular have gotten a valuable concern in the Draft IP Policy. The use of IPR in selected key priority areas like the leather subsector is an innovative aspect of the Draft Policy.

In addition to the national policies companies and universities are expected to have their own sectorial policies. In Ethiopia, most of universities are new with low reputation and far located from the central part of the country in which there is a high dense of industries. In the case of leather subsector, nearly 70% of leather firms are located in Addis Ababa. Hence, AAU and AASU are surrounded by leather industries. In such reality, universities policies are of a paramount importance. Even if UIL has given lesser emphasis in STIP and no legal backup and poor state of UIL in practice, AAU and AASTU are taking steps to initiate and strengthen the linkages with industry, among others, formulating their own institutional policies. There is also a general consensus on the need to the formulation and implementation of university policies in Ethiopia.

The thesis has noticed that AAU has formulated IPRs and Research Policies along with the TBIC Document. The IPRs Policy reflects the vital importance of indigenous knowledge created by universities and it encourages domestic TOT as it is crucial in the building up of innovative capacity of the nation. It incorporated, among others, issues of ownership on IPRs, methods of commercialization, revenue sharing, dispute resolution. However, independency and responsibilities given to the TTUIL Office are not well addressed in the Policy. Moreover, even if the 2010 AAU Research Policy has regulated the IPRs, the IPRs Policy doesn't have repealing and transitory clauses.

AAU TBIC Document serves the purpose of establishing the Center and describing its operation. The Document recognized TBIC as an instrument to promote innovation and counter the high start-up failure rate. Interestingly, it says laws are important tools for the successful realization of university commercialization. AAU Research Policy, on its part, aims at inquiring and dissemination of university's knowledge through basic and thematic researches. However, there happened practical disablements because it does not indicate how to create institutional modality which can enable the university to link with the industry via research system.

AASTU Research Policy, even if it established institutional frameworks responsible for the acceptance, approval and follow up of researches, there are some critical points. There is a lengthy channel for a research proposal to get granted and to be conducted which will make the

process cumbersome. Moreover, the responsibility given to school research committee and school research director is verbally the same. Furthermore, the UILTT Directorate doesn't take any responsibility in the Policy. The Policy covers only patent and copyright issues but other aspects of IPRs. The criterion of industrial applicability is missed out. The Policy puts a subjective statement concerning revenue sharing. Nevertheless, AASTU has to come up with specific policy document in the area of IPRs. Principles concerning research, research priorities, rights and responsibilities of researchers and their academic freedom are not stipulated in the Policy.

The experiences of US and Japan have shown that researchers' time allocations and their participation in business ventures, managing conflicts, use of university facilities for researches and other specific issues which are not or dully addressed in the nation's TOT policy and laws are covered in the universities' policies. This makes universities' policies are very important tools in a nation's TOT and UIL. However, the fact that they don't have strong enforcement power, they beg for a legal backup and otherwise, they stay mere theoretical documents. Moreover, since they are crafted by only universities and they are really reflecting the interest of university's side, they don't really go in line with the very purpose of collaboration with which the interests of the actors are mutually reflected and secured. Hence, there has to be a comprehensive legal framework for TOT in general and UIL in particular in Ethiopia and the universities' policies should be reformulated in accordance with those laws. However, Ethiopian leather industries don't have their own polices. They have to formulate company polices.

Legal framework is the vehicle or connecting link between the purpose expressed in a policy and the effect that is sought in practice. It is also said that the legal device goes beyond a policy and stipulates obligations, rights, rewards, and penalties connected with its being obeyed. However, this thesis is observed that there is no comprehensive and specific law governing TOT in general and UIL in particular. Undeniably, there was a TOT Regulation which is totally concerned about foreign TOT lasting from 1993-2003 until it was expressly repealed by the then investment proclamation.

Nevertheless, it can be said that there are some handful of legal provisions scattered in several laws of Ethiopia directly or indirectly related with TOT and UIL. The FDRE Constitution has laid down some sort of basis for TOT as it treated IP as a faction of property. The Investment Proclamation No. 769/2012 is another law which incorporated the issue of TOT. TOT is among the prime rationales for the enactment of this law. However, the entirety of the proclamation is concerned about, among others, the foreign TOT but not inland TOT. The Higher Education Regulation is also another law which embodied TOT as one of the major pillars of the Ethiopian higher education system. However, the Proclamation failed to incorporate the issue of innovation in higher education institutions and hence this can be considered as big miss of the law. UIL also doesn't regulated in this law.

The Ethiopian Patent Law, on its part, is aimed at encouraging both local inventiveness the transfer and adaptation of foreign technology. Hence, it can be concluded that this law encourages the domestic TOT with the aim of building up national technological capability. The

proclamation put general regulatory frameworks for patenting system but it doesn't specifically regulate university patenting. Patenting of university inventions has its own unique features. That is why the incentive, ownership, filing, examination and other issues need explicit and special treatment in the Patent Law. The issues concerning licensing, royalty and rights of universities, inventors and the sponsoring firms are also inherently connected with patenting and they beg special treatment under the law. By doing so, the law can make the patenting system an important mechanism used to encourage the commercialization of university knowledge.

Even if it is said that there is no any legal framework to govern TOT in general and domestic TOT especially UIL in particular in proclamation or regulation hierarchy, the MoST has decreed a procedural Directive for the linkage of education and training, research institutions and industries in 2003. Indeed, it can be considered as an encouraging step to regulate local TOT in general. But, there are several concerns waiting to be addressed. Even if it is merely a procedural directive as to how coordinate synergy especially forum-type meeting and hence, the critical substantive issues that are major ingredients of TOT waiting to be dully addressed in a given TOT law.

Generally, the since the Directive is issued by a ministry and it's the bottommost law in its hierarchy, it cannot be in a position to govern TOT which is the one among the cornerstones for the country's development. Therefore, both inland and foreign TOT should be regulated in proclamation or regulation hierarchy soon after the STIP is re-crafted. Most importantly, since it is observed that UIL is becoming and has a potential to become a vital tool in the country's journey of industrialization and development, it deserves to be regulated independently. Or otherwise, under the umbrella of the general TOT law, the issue of UIL can be addressed in a special podium. Hence, the government should be the guarantor of societal rules of the game played between firms and universities in the field of UIL through its regulations as the Triple Helix Model suggests. Therefore, the government should regulate several aspects of UIL - the relationship, accountabilities and responsibilities, behavior, linking channels, aim, subject matter, parties, IPRs, fund, incentive, conflict management, university entrepreneurial activities through science parks, incubation centers and business enterprises, TTOs, institutional and operational schemes are the major ingredients of TOT that should be dully addressed in a given TOT and UIL law.

5.2. Recommendations

Having the above findings, the thesis has suggested that the following recommendations.

- The current STIP should be re-crafted in a way that;
 - ◆ It gives a primary concern to domestic TOT like foreign TOT.
 - ◆ It gives a special and independent recognition for UIL and puts specific directions for its implementation.

- ◆ It clearly bases its principles in line with the Triple Helix Model when treating UIL in order to have a clear theoretical background.
 - ◆ It boldly puts the need for legal infrastructure along with the institutional frameworks in the nation's STI arena for the effective implementation of its directions.
- The Draft National IPRs Policy should be endorsed soon.
 - The government should formulate comprehensive TOT law in proclamation or regulation in which both inland and foreign TOT are equally entertained.
 - The government should formulate specific law for UIL. Or otherwise, under the umbrella of the general TOT law, the issue of UIL should be addressed in a separate section.
 - The UIL regulatory framework should be dully addressed, among other things, the issues concerning the relationship, accountabilities and responsibilities, behavior, linking channels, aim, subject matter, parties, IPRs, fund, incentive, conflict management, university entrepreneurial activities through science parks, incubation centers and business enterprises, TTOs, institutional and operational schemes and other major ingredients of TOT.
 - After having a comprehensive legal framework on TOT in general and UIL in particular, universities should reformulate their policies in accordance with those laws. Industries should also craft their own sectorial policies.
 - The Patent Proclamation should be amended in a way that it observes unique features of university inventions and patenting; incentive, ownership, filing, examination, licensing, royalty and rights of universities, inventors and the sponsoring firms needs special treatment.
 - Universities, in collaboration with EIPO, shall create awareness creation programs for the academic community about IPRs and the benefit of their utilization.
 - The LIDI should successively employ awareness creation programs for leather industries particularly for the managers and owners so that the latter able to avoid the negative sentiments towards collaboration with universities and to strengthened their R&D facilities.

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