University-Industry Linkages in Ethiopia: A Comprehensive Review and Analysis of Current Trends, Challenges, and Future Prospects

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Abstract: This study employs a comprehensive literature review and qualitative content analysis to identify and synthesize the current trends, challenges, and prospects of university-industry linkages (UIL) in Ethiopia. Currently, UIL has become a critical concern for nations and an integral economic component of many countries worldwide. UIL fosters innovation, drives economic growth, and bridges the gap between academic knowledge and industrial applications. It enables the commercialization of knowledge (research) and enhances industry productivity. Despite efforts to promote UIL in Ethiopia, the progress has been sluggish, accompanied by several challenges. While there is literature on UIL in Ethiopia, a significant problem persists in accessing and acquiring in-depth research or literature that adopts a comprehensive approach to the subject. This review aims to examine the status of UIL in Ethiopia. Through an analysis of 15 articles and 6 legal documents, the study identifies areas of collaboration, challenges faced, and legal frameworks that shaped UIL. The paper thoroughly analyzed research articles and legal documents to gain insights into the current landscape of UIL in Ethiopia. The result shows that the status of UIL in Ethiopia is in a nascent stage. Student internships, consultancies, and training initiatives are common forms of collaboration. Challenges identified encompass infrastructural limitations, knowledge gaps, weak institutional commitment, and awareness deficits. From the industry side, limited investment in research and development (R&D), lack of structured collaboration frameworks, and a perception of UIL as costly and impractical further hinder collaboration. From the government side, insufficient funding and weak enforcement of legal frameworks have contributed to the slow progress of UIL. The government's role in fostering a more robust UIL ecosystem remains weak. Legal documents, including UIL directives and policies, highlight efforts for alignment of technological development with national goals, emphasizing the multifaceted approach towards UIL. Despite facing challenges, there is optimism about the potential benefits of UIL, including practical industry exposure, financial support, and research opportunities. The findings stress the need for a collaborative and well-defined approach involving academia, industry, and the government to foster a vibrant UIL ecosystem. Based on these findings, recommendations for improving University Industry Collaboration (UIC) include strong legal enforcement mechanisms, increased investment in research and development (R&D), and the creation of more structured engagement instruments among universities, industries, and government. This comprehensive review reveals that the UIL landscape in Ethiopia is characterized by both promise and challenges, and exhibits sluggish progress. This review provides valuable insights for future research.

Keywords: University Industry Linkage, Collaboration, Challenges, Legal frameworks, Ethiopia, Higher education

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1. Introduction

University-industry linkages (UIL) have become increasingly important in today's knowledge-based economy. These symbiotic partnerships facilitate the seamless flow of ideas, resources, and expertise between higher education institutions (HEIs) and industries (OECD, 1999). They not only contribute to economic growth and job creation but also promote research, innovation, and entrepreneurship (Etzkowitz & Leydesdorff, 2000). Such collaborations enable the leveraging of academic expertise, access to state-of-the-art facilities, and industry insights, while offering universities opportunities for funding and practical relevance for their research (Dooley & Kirk, 2007).

The concept and practice of UIL have a long history, dating back to the early 20th century. However, UIL gained significant recognition and attention during the second half of the 20th century as economies increasingly inclined towards knowledge-based models (Hadad, 2017). Particularly, the seminal work of Vannevar Bush, with his report "Science, the Endless Frontier" in 1945, emphasized the importance of collaboration between academia, industry, and government in driving scientific progress and innovation (Bush, 1945). Since then, numerous initiatives, policies, and programs have been developed worldwide to foster and formalize UIL, acknowledging its potential for economic development and societal progress (Rahm et al., 2000).

Countries around the world are increasingly giving attention to UIL as a means to drive innovation, economic growth, and societal development. The global experience of countries unequivocally demonstrates the vital importance of UIL for their overall development (Seppo et al., 2014). In developing countries like Ethiopia, the UIC is often not as extensive as it is in developed nations (Martin, 2000). In Ethiopia, while efforts have been made to promote university-industry collaboration (UIC), various factors contributed to the inadequate UIL integration (Kahsay, 2017).

In this country, the engagement of UIL formally started in 1985 (1978 E.C). The first UIL was established under the cooperation program between Addis Ababa University (AAU) and the Ministry of Industry. This program involved ten corporations and all the faculties of AAU. To run the program for about a year, both AAU and the Ministry of Industry each contributed 50,000 Birr (i.e., equivalent to USD $24,154.59 based on). In terms of areas of collaboration, there were various activities in which they were engaged. These included regular training, summer work, joint research, internship programs, and sponsorship programs (Dan, personal communication, July 11, 2023).

Despite such early efforts, the contribution of Ethiopian HEIs to industry has remained limited. Universities mainly engage in UIL through student internships, short-term consultancy services, and training programs rather than long-term strategic collaborations (Teressa, 2022). Research outputs from HEIs have often remained within academia without tangible industrial application due to weak knowledge transfer mechanisms (Kahsay, 2017). Likewise, industries in Ethiopia have shown minimal commitment to UIL, largely due to financial constraints and limited awareness of the benefits of collaborating with HEIs (Degaga & Senapathy, 2021).

The Ethiopian government has taken some initiatives to enhance UIL, such as formulating policies and strategic frameworks to encourage collaboration (MoSHE, 2021d). The expansion of HEIs and the development of technology transfer (TT) offices in most of the HEIs indicate an attempt to strengthen UIL (Hailu, 2024). However, challenges such as fragmented policies, insufficient funding, and weak enforcement mechanisms have slowed progress; similarly, inadequate institutional support has further hindered its effectiveness.

The objective of this review is to critically examine the literature on UIL in Ethiopia. Specifically, it aims to analyze and synthesize published articles and official/legal documents on UIL. By consolidating and analyzing existing literature, the review paper seeks to contribute to the

understanding of UIL in Ethiopia and provide valuable insight for researchers and policymakers seeking to enhance UIL in the country.

Based on the objectives above, the paper addresses the following questions:

- What is the current status of UIL in Ethiopia, and how does the existing literature portray it?
- What are the key factors facilitating or hindering the integration of UIL in the Ethiopian context?
- What are the major challenges and barriers in establishing and maintaining UIL in Ethiopia?
- How does UIC contribute to job creation, entrepreneurship, knowledge diffusion, and the overall economic development of the country?
- What mechanisms should be applied to improve the current UIL status?

2. Scope and Significance of the Study

This comprehensive review focuses on examining the current status of UIL in Ethiopia by analyzing existing literature, including research articles and legal documents. It explores the key areas of UIC, the challenges they face, and government policies and directives that shape these linkages. The study also highlights the factors that either facilitate or hinder effective UIL, providing a comprehensive assessment of the Ethiopian context.

Understanding the status of UIL in Ethiopia is crucial because it directly impacts the country's ability to drive its economic development. While UIL has been widely studied in developed economies, there are limited comprehensive review studies in Ethiopia that integrate both academic and policy perspectives. This review aims to fill this gap by synthesizing available literature to provide a clearer picture of the

existing UIL landscape. The findings will be valuable for universities, industry leaders, and policymakers working to strengthen UIC.

3. Literature Review

3.1. Theoretical Foundations of University-Industry Linkages

This study attempts to look at two relevant theories that relate to University-Industry Linkages: Triple Helix Theory and Human Capital Theory.

3.1.1. Triple Helix Theory

The concept of UIL is rooted in several key theories that highlight the role of knowledge production, TT, and economic development. One of the most influential frameworks is the Triple Helix Model, which emphasizes the dynamic interactions between universities, industry, and government (Etzkowitz & Leydesdorff, 2000).

The Triple Helix Theory was developed by Etzkowitz (1993) and Etzkowitz & Leydesdorff (1995). The theory explains the evolving relationship between universities, industries, and governments in the shift from an industrial to a knowledge-based economy (Leydesdorff, 2012). Traditionally, industry and government were the dominant forces in economic development, but universities are now taking on an increasingly active role in innovation, TT, and economic growth (Etzkowitz & Leydesdorff, 1995).

In this framework, universities and industries have begun engaging in activities beyond their traditional domains. Governments, in turn, encourage academic institutions to go beyond education and research to contribute directly to economic development (Chatzinikolaou & Vlados, 2019). The university is seen as a key driver in this system and working alongside industry and government to generate, apply and transfer knowledge (Ranga & Etzkowitz, 2013).

The theory emphasizes progressive linkages between these three entities, which are crucial for fostering innovation. While universities have historically been the primary arena of knowledge production, today's competitive landscape requires businesses to continuously develop and integrate new knowledge to remain innovative (McMullen, 2018; Meyer & Davis, 2003).

The co-evolution of universities, industries, and governments forms a dynamic system in which each sector influences the others (Chatzinikolaou & Vlados, 2019). This interaction leads to the creation of hybrid structures such as technology transfer offices, business incubators, and research centers (Etzkowitz, 2008). In this model, universities are actively contributing to economic development through entrepreneurship, commercialization of research, and direct industry engagement, while governments support UIC through policies and funding (Etzkowitz, 2008).

3.1.2. Human Capital Theory

In this theory, education is a key driver of economic development. Education is not merely a tool for personal growth but also a foundation for national progress. High-quality education improves skills and productivity, leading to economic success (Almendarez, 2011).

In today's world, knowledge has become more valuable than ever before. As a result, many governments are closely linking their HEIs to national economic goals (Almendarez, 2011). As per this theory, education serves as both a consumer good and a capital good. As a consumer good, it provides personal satisfaction. As a capital good, it enhances human skills, which are essential for economic growth (Sweetland, 1996).

The theory emphasizes this role, arguing that education is an investment that increases a person's ability to contribute to the

economy. Proponents of this theory believe that a well-educated population leads to higher productivity (Almendarez, 2011). According to this theory, education improves workers' skills and efficiency by increasing their cognitive stock. As a result, investing in education is seen as just as important—if not more important—than investing in physical infrastructure (Psacharopoulos & Woodhall, 1997).

In the modern economy, this theory suggests that human capital is more valuable than physical assets. Businesses and governments now focus on knowledge, research, and innovation as key economic drivers. This theory has become an influential theory of modern education since the early 1960s. It is widely viewed as a key determinant of economic performance (Holden & Biddle, 2017).

Generally, the aforementioned theories are essential in the understanding of UIL. The Triple Helix Theory explains how universities, industries, and governments work together to drive innovation and economic growth (Etzkowitz & Leydesdorff, 2000). It shows that universities now play an active role in industry engagement and knowledge transfer (Ranga & Etzkowitz, 2013). This has led to the creation of TT offices, business incubators, and research centers (Etzkowitz, 2008). Similarly, Human Capital Theory highlights the role of education in building skills, boosting productivity, and supporting economic growth (Almendarez, 2011). It argues that investing in human capital is just as vital as investing in infrastructure (Psacharopoulos & Woodhall, 1997).

3.2. University-Industry Linkages in a Global Context

University-Industry Linkages play a key role in driving innovation and economic growth. Around the world, universities and industries work together to transfer knowledge and technology. In many developed countries, this collaboration is well-structured and valuable to their economies. Universities do not only focus on education and research.

They also contribute to solving real-world problems through partnerships with industries.

In the context of a globalized economic landscape, the significance of synergistic relationships between universities and industries has gained significant attention. Nearly every industrial nation is actively striving to establish UIL as a fundamental element of their innovation systems (Yusuf & Nabeshima, 2007). As Göransson and Brundenius (2010) reveal that the growing importance of UIL is necessary not only for knowledge diffusion but also for its practical application in economic activities. The collaboration between universities and industries is often seen as a means to bridge the gap between academic research and practical applications, fostering the transfer of knowledge, technology, and skills.

Despite this collaboration having multitudes of benefits, due to various reasons, developing countries are unable to enjoy such benefits. In this regard, Crull and Schnitzer (2010), identified the following elements as major challenges such as incompatibility of interest among industry and academia, mismatch between available skills and those required by industry and lack of capability on the part of enterprises to recruit, manage, and develop human resources as some of the developing countries' deep-rooted problems in relation to UIL (Crull & Schnitzer, 2010).

3.3. University-Industry Linkages in Ethiopia

In developing countries like Ethiopia, UIL is still evolving. Of course, there is growing awareness of its importance, but challenges remain. The country is currently undergoing significant political and economic transformations. These reforms can be enhanced through a collective endeavor involving both HEIs and industries. This collaboration between sectors holds great significance, particularly within the framework of the ongoing expansion of HEIs in the country.

In the context of Ethiopia, it is acknowledged that there is a lag in sectoral collaboration as well as competence in TT (FDRE, 2012). Despite efforts made by some universities to strengthen linkage with industries, the current status of collaboration remains weak and in extreme cases, non-existent (Abraham, 2016; Hiwote, 2014).

In Ethiopia, so far, some studies have been conducted in this area. To mention some of these studies, for example, Daniel (2006) evaluated the country's effort to develop UIL, with a focus on establishing a resource center between university and industry (Daniel, 2006). Kannan (2012) conducted a study that was limited to Dilla, one of the country's southern municipalities, and found that there is a gap in linking HEIs and businesses (Kannan, 2012).

Abebe (2020) conducted a similar study, but limited the study to UIC in the Debre Markos area (Abebe, 2020). Teklay & Ayenew (2017) conducted research using evidence from two universities (Teklay & Ayenew, 2017). In addition, Misganu Legesse (2018), unlike previous studies, attempted to study the area comprehensively; however, the research perspective is more focused on the challenges and opportunities associated with UIL in the country.

Though there are some previous studies conducted concerning UIL in Ethiopia, there is a lack of reliable data that provides a comprehensive and informed picture of what steps have already been taken so far to establish a concrete collaboration among universities and industries in Ethiopia. Similarly, because the development and expansion of industry is a relatively new phenomenon in the country, the constraints to establishing a tangible collaboration have not yet been thoroughly assessed.

Several studies in Ethiopia have explored different aspects of UIL. However, there is a lack of comprehensive analysis that presents the overall status of UIL in the country. Many existing studies focus on

specific cases or sectors, making it difficult to understand the broader picture. Additionally, there is a shortage of empirical data that clearly illustrates the extent and effectiveness of UIL in Ethiopia. Without such data, it is challenging to identify key trends, gaps, and opportunities for improvement. A more thorough and data-driven analysis is needed to provide a clearer understanding of UIL. Thus, this paper contributes to filling the gap by analyzing the current status of UIL in Ethiopia.

3.4. UIL Policy and Incentives in Ethiopia

From the mid-1990s to the 2000s, there was a remarkable expansion of HE in the country. During this period, due to ideological change and HE policy reforms, the private HEIs, in particular, played a significant role in this expansion (Alemu, 2010). However, it brought a challenge to maintaining HE quality. Also, the absence of clear guidelines or policy to manage and foster UIC placed the HE system of the country in a lower position (Degaga & Senapathy, 2021).

Currently, the government is increasingly becoming aware of the overall benefits of UIC for TT, innovation, and economic development. Therefore, it encourages universities and industries to engage actively in this process. Among others, under the recent “Home-grown Economic Reform” agenda, the government has given considerable attention to UIL. As per this reform, the Education Sector Development Programmes underpin the key role of UIC in bringing about the expected economic prosperity (IMF Country Focus, 2019).

In terms of policy, the 2009 HE Proclamation No.650/2009 (FDRE, HPR, 2009) of the country promotes and encourages UIC. In Article 24.4 of this proclamation, it is stated that, “every institution shall have the responsibility to forge relations with industries for mutual benefits” and the focus of institutional research should emphasize the transfer of technology and joint research projects with industries.” Furthermore, the current HE Proclamation (FDRE, HPR, 2019). No. 1152/2019

dictates its objective as to “promote and enhance research focusing on knowledge and technology transfer consistent with the country’s priority needs” (Article 4(2)).

4. Methods

4.1. General Methodology

This study employs a qualitative approach, primarily utilizing a comprehensive review of academic literature with an in-depth analysis of government policy documents and institutional reports. The review and analysis were done based on similar methodologies used in studies conducted by Ankrah & AL-Tabbaa (2015), Gilman & Serbanica (2014), Oztemel & Gursev (2020), Perkmann et al., (2013), and Romero-Sánchez et al., (2024).

A comprehensive review is a type of academic writing that involves a thorough and systematic investigation of all available literature on a specific topic or research question. It aims to provide a comprehensive overview, synthesis, and analysis of existing knowledge in a specific area of knowledge/research (Onwuegbuzie & Frels, 2016). According to these authors, a comprehensive review is “…conducted either to stand alone or to inform primary research…in a systematic, holistic…process of exploring, interpreting, synthesizing, and communicating published and/or unpublished information” (Onwuegbuzie & Frels, 2016, p.18). In addition to reviewing existing literature, this study includes a detailed analysis of major policies and strategies in Ethiopia related to UIL. The analysis examines how these policies address UIL, its focus areas, key players (stakeholders), and overall discussion to provide a deeper understanding of the policy landscape in Ethiopia.

Data collected from the selected studies were utilized to synthesize findings and provide insights into the topic, including areas where further research is needed. This contribution encompasses an analysis of 15 published works and 6 legal documents pertaining to the status of UIL in Ethiopia. To this end, one major and four specific research questions were addressed. This approach was adopted to offer an independent summarization and interpretation of the findings, as advocated by scholars (Nunn & Chang, 2020). The review was conducted based on the guiding elements proposed by Stratton (2016) to perform a comprehensive literature review. While it incorporates several of the elements suggested by Stratton (2016), it may not encompass all of them. Additionally, the review incorporates features and components from other relevant literature on comprehensive reviews such as studies conducted by (Ankrah & AL-Tabbaa, 2015; Gilman & Serbanica, 2014; Perkmann et al., 2013; Romero-Sánchez et al., 2024).

Given the scarcity of specific databases on UIL in Ethiopia, the review utilized a combination of database platforms and non-database sources. This approach enabled the search and selection of numerous published articles, PhD dissertations, and MSc theses. Limitations are acknowledged to ensure transparency and credibility in the review process (Stratton, 2016; Onwuegbuzie & Frels, 2016). The reviewers systematically categorized publications into two distinct groups, i.e., academic publications and legal documents. This categorization was necessary due to the limited availability of published materials on UIL in Ethiopia in reputable journals. The review process is systematically structured into three primary stages: selection, identification, and synthesis, as outlined by literature (Gough et al., 2017).

4.2. Searching Strategy

The literature search was conducted through an electronic search of databases and institutional databases. Further searches were performed by cross-referencing the bibliographies of selected articles

to ensure a more exhaustive scope and to reduce the risk of bias. The initial search string (Table 1) and criteria (Table 2) included peer-reviewed articles in English, reporting on the status of UIL in Ethiopia, and indexed in numerous databases such as Semantic Scholar, Google Scholar, and ScienceDirect (covering titles, abstracts, and keywords), or journals were highly utilized. Also, doctoral dissertations and MSc theses, searched and accessed from databases of various universities were used. Moreover, government publications (legal documents) were searched and accessed from the publishers.

4.3. Eligibility Criteria

First, publications with titles that included “university” OR “higher education” OR “higher education institution” OR sequence words AND “industry linkage” OR “industrial linkage” OR “industry collaboration” OR “technology transfer; and second, publications with titles that included “industry” OR “industrial” OR “business” OR “sectorial” sequence words AND “university linkage” OR “higher education linkage” OR “university collaboration” OR “university technology transfer” were searched. In both cases, publications were searched with the same terms sequenced AND “Ethiopia” OR “Ethiopian context” OR “Ethiopian status” OR “Ethiopian experience”. The same searching procedure was applied for publications from the abstracts. In cases where the title and abstract were not adequate to decide, the entire content of the paper was assessed. Third, legal documents that included “university” OR “higher education” OR “higher education institution” sequence words AND “industry linkage policy” OR “industry linkage directive” OR “technology transfer policy” in their titles were searched.

Table 1: Initial search string

Topic	Search terms
University OR Higher education	"university" OR "higher education" OR "higher education institution" AND "Industry linkage" OR "industrial linkage" OR "industry collaboration" OR "technology transfer" AND "Ethiopia" OR "Ethiopian context" OR "Ethiopian status" OR "Ethiopian experience"
Industry	"Industry OR "industrial" OR "business" OR "sectorial" AND "University linkage" OR "higher education linkage" OR "university collaboration" OR "university technology transfer" AND "Ethiopia" OR "Ethiopian context" OR "Ethiopian status" OR "Ethiopian experience"
University OR Higher education OR Industry Linkage	"university" OR "higher education" OR "higher education institution" AND "Industry linkage policy" OR" industry linkage directive" OR "technology transfer policy"

4.3.1. Inclusion and exclusion criteria

The following inclusion and exclusion criteria were established to select studies appropriate for obtaining answers to the proposed review questions (Gough et al., 2012). The results obtained after applying the search strings were identified. The authors actively sought input and feedback on the inclusion and exclusion criteria from academic colleagues and advisors. Given the nature of a comprehensive review, the methodology allowed for flexibility in criteria application rather than adhering to strict guidelines (Onwuegbuzie & Frels, 2016).

Table 2: Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Published from January 2005 to October 2023	Published before 2005
English language	Non-English
University level or higher education, or education including tertiary higher education	Education level below university or higher education, or other specific education level
Peer-reviewed, PhD dissertation, MSc thesis, legal documents	Non-Peer Reviewed
Indexed in several journals or databases, non-indexed publications (PhD dissertation and legal documents)	Published in non-reputable journals, unpublished documents
University/HE linkage/collaboration/partnership in Ethiopia	University-university or industry-industry linkage, or any UIL-related studies not on Ethiopia

Table 2 outlines the inclusion and exclusion criteria used to select relevant studies for this review. Studies published between January 2005 and October 2023 were included, while those before 2005 were excluded. Only English-language sources were considered, excluding non-English publications. The focus was on university-level or higher education, leaving out studies on lower education levels. Peer-reviewed articles, PhD dissertations and MSc theses, and legal documents were prioritized, while non-peer-reviewed works were excluded. Additionally, studies indexed in reputable journals or databases were included, whereas non-indexed and unpublished works were left out. Finally, the review specifically considered UIL in Ethiopia, excluding studies on UIL from other countries.

4.3.2. Quality criteria

To ensure the robustness and credibility, a multifaceted set of quality criteria was applied. Preference was given to peer-reviewed publications as well as publications from HEIs. The reputability and impact factor of publication sources, including esteemed databases or journals, were prioritized (Romero-Sánchez et al., 2024).

4.4. Screening

The screening process followed a structured approach to ensure the selection of relevant and high-quality publications. Initially, all retrieved publications underwent a preliminary review based on their titles and abstracts (Romero-Sánchez et al., 2024). The inclusion criteria guided this step, allowing the identification of studies that aligned with the research objectives.

A more detailed evaluation followed, involving a full-text review of selected publications to confirm their adherence to the established criteria. Publications were further classified based on three key factors:

1. Relevance to Research Questions – Studies were screened to determine whether they directly addressed UIL within the Ethiopian context. Publications that did not focus on UIL or that examined unrelated forms of collaboration (or partnerships) were excluded.
2. Unit of Analysis – The screening categorized studies based on their primary focus, whether they examined UIL practices, challenges, prospects, engagement, and analyzed policies/legal frameworks.
3. Methodological Approach – The selected studies were further analyzed based on their research methodology. Both qualitative and mixed-method studies were considered, prioritizing peer-

reviewed studies and policy reviews. Non-peer-reviewed sources and studies with unclear methodologies were excluded.

Table 3: Searching and Identification Process

	Publication Sources	Primary Search Result	Source Journals & institutional publications	Initially Recorded	Identified & Selected publications
Search Engines & Database	Sematic Scholar	123	Various Journals	44	6
	Google Scholar	115	Various Journals	3	4
	ScienceDirect	236	Various Journals	8	0
	HEIs Repository	38	HEIs' Repositories/Publications	12	2
	Total	**512**	**11 different Journals and 4 publications from two HEIs**	**101**	**15**
	Legal Documents	19	Governmental Publications	13	6

Table 3 provides a summary of the search and identification process. It shows the sources explored, the number of initially retrieved publications, and the final set of studies included after screening. The search was conducted between June 2023 to December 2023, focusing on publications from 2005 to 2023. Three major sources - Semantic and Google Scholar searching engines, and ScienceDirect database - were explored. After removing duplicates and applying the classification criteria, only studies meeting all inclusion requirements were retained for analysis.

5. Results and Discussion

In this section, the paper delves into the results and discussion of the comprehensive review by synthesizing insights from 15 academic publications and 6 legal documents. The rigorous selection process,

guided by inclusion and exclusion criteria, ensured the inclusion of materials that contribute substantially to the understanding of UIL in Ethiopia. Focus was given to addressing the major question of this paper i.e., “what are the current trends of UIL in Ethiopia, and how does the existing literature portray UIL in the country?”

Table 4: Details of documents/publications used for the review

No.	Author/s & year of publication	Title of the Work	Published on/by	Type of Study	Country
1	Kannan (2012)	Existence of and Benefits from Linkages between University and Industry in Ethiopia	*International Journal of Advanced Research in Management*	Research Article	Ethiopia
2	Belay (2008)	Linkage of Higher Education with Agricultural Research, Extension, and Development in Ethiopia	*Higher Education Policy Journal Published by the International Association of Universities*	Journal Article	Ethiopia
3	Bareke (2018a)	Managing University-Industry Linkage in Government Universities of Ethiopia: Challenges and Opportunities	*Education Management, University of South Africa*	PhD Dissertation	South Africa
4	Tjeldvoll et al., (2005)	The Complex Relations Between University, Society, and State: The Ethiopian Predicament in Establishing a Service University	*Journal of Higher Education in Africa*	Journal Article	United States
5	Kahsay (2017)	The Links between Academic Research and Economic Development in Ethiopia: The Case of Addis Ababa University	*European Journal of STEM Education*	Journal Article	Ethiopia and The Netherlands
6	Teressa & Besha (2020b)	The Role of University-Industry linkage in Implementing Competency-based Curricula in Public Higher Learning Institutions in Ethiopia: A Review of Literature	*Logistics & Supply Chain Review*	Research Article	Ethiopia
7	Shukra et al., (2021)	An Adaptable Conceptual Model for Construction Technology Transfer: The BRI in Africa, the Case of Ethiopia	*Sustainability (MDPI)*	Journal Article	China and Ethiopia
8	Shewakena & Belay (2017a)	The Role of University-Industry Linkage to Produce Graduates with Employable Skills: Analysis of Banking and Finance Graduates' Attributes from Educators and Industries' Perspective	*International Journal of African and Asian Studies*	Research Article	Ethiopia

9	Yilma & Alemu (2018a)	Determinants of University-Industry Linkage: Evidence from Dire Dawa City	*European Journal of Business and Management*	Research Article	Ethiopia
10	Fufa et al. (2019)	Developing Cloud-Based University-Industry Linkage Model for Improving Quality of Education: Case of Debre Berhan University	*IOSR Journal of Computer Engineering*	Research Article	Ethiopia
11	Gemeda et al., (2023)	University Industry Research Linkage: The Case of Adama Science and Technology University, Ethiopia	*IOSR Journal of Humanities and Social Science*	Research Article	Ethiopia
12	Abdu Adem (2013)	University-Industry Partnership in Ethiopia	*College of Education and Behavioral Science, Addis Ababa University*	PhD Dissertation	Ethiopia
13	Sertse (2013)	The Link between University and Industry: The Case of AAiT	*Institute of Educational Research, Addis Ababa University*	Master Thesis	Ethiopia
14	Molla (2014a)	University Industry Linkage in Terms of Research: The Case of Addis Ababa University	*Institute of Educational Research, Addis Ababa University*	Master Thesis	Ethiopia
15	Tamrat (2022)	University-Industry Ties – The Need for Good Management	*Book Chapter in "Higher Education in Ethiopia: Themes and Issues from an African Perspective"*	Book Chapter, Series: Global Perspectives on Higher Education	The Netherlands

Table 5: Details of selected articles, PhD Dissertations, and MSc theses

No.	Author/s and year of publication	Design/Methodology/approach	Major Findings
1	Kannan (2012)	Survey and interviews. Data was collected from teachers, officials, and administrative staff in HE, as well as employees at various management levels in industries. Descriptive statistics, weighted average, and chi-square test were applied for data analysis.	Linkages exist in areas of employment support, academic and research support, and business relationships. Both HE and industry benefit from these linkages. Major benefits for HEIs include producing industry-fit candidates, conducting real-life business research, and enhancing manpower quality, while major benefits for industry include increased productivity, technological innovations, and reduced training costs.
2	Belay (2008)	Literature Review and Discussions with officials of Agricultural Institutions of HE and regional agricultural research institutions/centers.	There is a shortage of highly qualified and experienced national staff. Weak emphasis is given to practical training in curricula, which are, in fact, narrowly focused. The teaching programs have limited relevance to Ethiopian conditions. There are weak inter-institutional connections, limited connections with other parts of the agricultural education system, and insufficient communication with key stakeholders. Agricultural Institutions of HE contributes to the agricultural sector through training, research, and technology dissemination.
3	Bareke (2018a)	Concurrent mixed research design, combining quantitative and qualitative data	UIL management in Ethiopian government universities is weak, especially in planning, organizing, staffing, and decision-making. UIL activities are primarily driven by student internships, followed by consultancy services, limited joint research, and capacity-building training. Benefits of UIL include practical industry exposure, financial support, training, research, consultancy services, and resource sharing. Challenges in UIL include institutional bottlenecks, contextual variations, financial and awareness-related hurdles, leadership and policy-practice gaps, and trust issues between universities and industries. Opportunities for UIL promotion include existing policy platforms, increased awareness among university leaders, expansion of universities and industries, and government plans for industrial parks.
4	Tjeldvoll et al., (2005)	The study employs a qualitative research approach, combining a literature review, Internet sources, and visits to Ethiopian universities (Addis Ababa, Mekele, and Debub). The research is based on a pilot project initiated in 2002 to identify conditions for capacity building in Ethiopian higher education.	Mismatches exist between university production and society's low-tech agricultural focus. The state lacks investment for new economic activities; governance discrepancies between the state and the university need addressing; differences in opinions on academic freedom, autonomy, and accountability should be addressed. The work recommends attracting foreign capital tied to HE development for national development, and suggests establishing a dynamic decision-making body for science, technology, and competence production at the government level.
5	Kahsay (2017)	The study is a descriptive survey method and utilized key informant interviews. Data collected through reviews of legal and policy documents, proclamations, guidelines, national development plans, published reports,	The UIL, in terms of academic research and innovation, is at its infant stage in Ethiopia. Challenges include a low level of industrialization, a shortage of capable researchers, and a traditional attitude towards the university-industry linkage. Universities are just starting to collaborate with industries, and their experience is

		and meeting notes. Theoretical and conceptual issues regarding UIL were gathered from internationally published and unpublished documents. Interviews were conducted with key informants from AAU, MoE, the Ministry of Science & Technology, and the industry.	immature. The capacity of universities to produce commercially attractive research outputs and graduates is a major challenge. Contract and joint research projects, commercialized research outputs, and patents are almost non-existent. Further challenges include a lack of a robust national framework and institutional commitment to collaboration in research and innovation, and limited attention and inadequate funds allocated to research and innovation at the national level. There is also an absence of well-established research infrastructure and a shortage of facilities in both industries and universities, as well as a scarcity of capable staff with a PhD qualification for advanced research.
6	Teressa & Besha (2020b)	Qualitative systematic review. The review includes 20 studies: 14 journal articles, 3 government or nongovernment reports, 2 policy issues, and 1 working paper.	Academic research has had minimal contribution to Ethiopia's economic development, and there is no attention given to the issues of responsibilities regarding the non-implementation of competency-based curriculum in HEIs of Ethiopia. Thus, he government needs to develop a system of monitoring for better implementation of competency-based curriculum in HE of Ethiopia.
7	Shukra et al., (2021)	The research employs a system dynamics technique for modeling the construction technology transfer model (CTTM). This involves analyzing existing technology transfer models, incorporating Chinese experiences in TT, and using relevant information from BRI projects in Africa in the case of Ethiopia.	The BRI projects in Africa, including those in Ethiopia, have the potential for significant technology spillovers. However, a lack of a tailored TT model results in unplanned and suboptimal implementation. The proposed CTTM addresses this gap, emphasizing the role of UIL in research, development, and innovation throughout project lifecycles. Thus, the UIL structures can facilitate the process through R&D and innovation in the whole project life cycle.
8	(hewakena & Belay (2017a)	Utilizes embedded research design, combining quantitative (questionnaires) and qualitative (interviews) methods. Sample: 76 industry employees, 73 instructors. Statistical analysis and thematic narrative approach were used.	The sample includes 76 industry employees and 73 instructors. No significant difference was seen in perceptions between industry employees and instructors. Graduates are perceived as possessing the required knowledge, skills, and ethics. Strong collaboration between universities and employers is emphasized for curriculum development. The work recommends competency models for defining graduates' successful performance.
9	Yilma & Alemu (2018a)	Mixed research approach (quantitative and qualitative). Questionnaires and interviews were used for data collection. Descriptive statistics and the ordered logit model were applied for analysis.	Training and student internship programs were primary areas of collaboration between the university and industries. Determinants of UIL included access to funding, previous experience, and publication. Listed obstacles were poor structure, orientation, and industry trust.
10	Fufa et al., (2019)	The research employs a mixed-method approach. Primary data is collected from Debre Berhan University using surveys and interviews. The study utilizes cloud computing technology to establish a collaborative platform for students, teachers, researchers, and industry professionals.	The cloud-based UIL model holds significant potential for improving education quality and industry output. The model fosters effective collaboration between academia and industry, enabling knowledge and technology sharing. Different cloud deployment models (public, private, hybrid, community) were considered, with a preference for the hybrid cloud due to its balanced advantages.
11	Gemeda et al., (2023)	The study uses mixed methods, incorporating a sample survey of 125 individuals, interviews with scholars and industry experts, and document analysis of policies related to university-industry linkages.	The study reveals a low perception of institutionalized UIL in terms of research at ASTU, with only 38% of respondents indicating some level of linkage, primarily in areas like internships and consultancy. There is minimal research-industry collaboration. Policy frameworks exist, but they lack enforcement. Existing challenges include the absence of an institutional framework, a lack of IPR policy, low research motivation, and inadequate research facilities.

12	Abdu Adem (2013)	Utilizing a sequential exploratory mixed approach, the study employed various data collection methods including questionnaires, semi-structured interviews, focus group discussions, and document analysis. Students, instructors, deans/directors of universities, industry officials, and experts from federal ministries were participants.	The study shows that the practice of UI partnership in Ethiopia is still weak, and there is limited awareness of the benefits of UI partnership among universities and industries. There is an absence of clear and specific policies and appropriate organizational structures. Lack of resources (manpower, finance & facilities) is a critical challenge. There are also inadequate incentives for researchers to engage in industry matters, as well as the absence of monitoring and evaluation systems. Generally, the roles played by universities, industries, and the government are insignificant.
13	Sertse (2013)	The research employs a mixed approach. Descriptive research method employing surveys and interviews. Quantitative data were collected through questionnaires and qualitative data from interviews, involving 12 respondents from AAiT and 11 from industries. And data were analyzed using simple percentage calculations.	There is an infant level of linkage between AAiT and industries in terms of academic and research support. This linkage has the potential to produce graduates better-suited for the industry and to address industry-specific problems, and it can lead to increased productivity and service quality for both parties. Barriers to strong UIL include a knowledge gap between the actors and the absence of a policy framework as a means to improve linkage.
14	Molla (2014a)	Mixed methods, including sample survey, qualitative interviews, and document analysis. Document analysis was used to examine policy related to UIL.	The UIL, in terms of research, is at an infant stage. Issues such as communication gaps, low industry owner awareness, and inadequate commitment and competence from university leadership have been identified as major hindrances. Weak implementation of policies related to UIL. Limited leadership commitment to creating a link with industry. Academic staff are not competitive in conducting research for industries due to financial constraints and inadequate research infrastructure. Limited impact of the national IPR policy on creating a strong linkage. Below-average funding in research at the national and university levels.
15	Tamrat (2022)	Not applicable (Book Chapter) or not specified; however, this book chapter is part of a larger compilation of previously published work of the author.	The chapter emphasizes the significance of professional management in UIC. It suggests the creation of structures and specialized offices within universities to facilitate partnerships. Financial management rules, personnel policies, and intellectual property management are also identified as crucial aspects of successful university-industry collaborations.

5.1. Current Trends of UIL in Ethiopia

The reviewed materials indicate that UIL in Ethiopia is still at its early stage, showing both progress and encountering persistent challenges. Most collaborations focus on student internships, consultancy services, and training programs, with minimal engagement in joint research and technology transfer (Gemeda et al., 2023; Tjeldvoll et al., 2005). This pattern suggests that while universities and industries recognize the importance of collaboration, the depth and scope of engagement remain limited (Bareke, 2018; Tamrat, 2022).

The studies highlight various barriers that hinder UIL growth. A lack of laboratory facilities, weak infrastructure, and limited financial resources are among the main challenges (Abdu, 2013; Bareke, 2018; Kahsay, 2017). Universities struggle to establish well-equipped research environments, making it difficult to attract industry partnerships (Tjeldvoll et al., 2005; Shukra et al., 2021). Additionally, the absence of a structured UIL framework leads to inconsistent collaboration efforts (Abdu, 2013; Gemeda et al., 2023).

Despite these challenges, there is a growing opportunity to enhance UIL in Ethiopia. Some universities have started strengthening UIL offices, facilitating industry visits, and promoting research collaboration (Bareke, 2018; Shewakena & Belay, 2017). The reviewed studies emphasize that improving institutional commitment, policy enforcement, and industry engagement can significantly enhance the effectiveness of UIL (Fufa et al., 2019; Shukra et al., 2021).

Another key theme in the literature is the potential benefits of UIL. Collaborations provide practical industry exposure, financial support, training opportunities, and knowledge transfer (Kahsay, 2017; Tjeldvoll et al., 2005; Yilma & Alemu, 2018). These partnerships also support universities in aligning academic programs with industry needs, which

helps enhance graduate employability and workforce readiness (Bareke, 2018; Kahsay, 2017).

However, several institutional and policy challenges remain. The studies highlight leadership gaps, financial constraints, and limited awareness as critical barriers to UIL (Abdu, 2013; Teressa & Besha, 2020). The absence of a national UIL framework further complicates efforts to establish structured collaborations (Tamrat, 2022; Belay, 2008; Kahsay, 2017).

Lastly, the literature points to a weak connection between academic research and economic development. Ethiopian universities contribute very little to industry innovation due to low research commercialization and a lack of patenting initiatives (Kannan, 2012; Teressa & Besha, 2020; Molla, 2014). This highlights the need for stronger research-industry partnerships and policies that support TT and innovation-driven UIL (Tamrat, 2022; Kahsay, 2017).

In general, the reviewed studies indicate that UIL in Ethiopia has potential but remains underdeveloped. While some progress has been made, addressing policy gaps, institutional challenges, and resource limitations should be given attention if expected collaborations are to be advanced.

The following sections provide a deeper analysis of the factors that are in play in shaping UIL in Ethiopia and the challenges that hinder robust UIL in the country.

5.2. Factors and Challenges

The findings in relation to factors that shape UIL in Ethiopia and existing challenges have been organized into three key areas: cultural and corporate factors, operational factors, and institutional factors.

5.2.1Cultural and Corporate Factors

Cultural and corporate factors play a significant role in shaping the dynamics of UIL in Ethiopia. These factors include the attitudes, perceptions, and corporate cultures of both universities and industries, which can either facilitate or hinder collaboration.

One of the most prominent cultural challenges is the misalignment between the academic and industrial sectors. Universities often prioritize long-term research and academic freedom, while industries focus on short-term, market-driven goals (Bareke, 2018; Tjeldvoll et al., 2005). This divergence creates a barrier to effective collaboration.

Further, there is a significant lack of awareness among both university leaders and industry stakeholders regarding the benefits and mechanisms of UIL (Fufa et al., 2019; Shewakena & Belay, 2017). This lack of awareness often results in low engagement and trust between the two sectors (Abdu, 2013; Gemeda et al., 2023).

Moreover, the issue of trust is another critical factor in UIL in Ethiopia. The reviewed literature highlights that mistrust between universities and industries is a major barrier to collaboration (Bareke, 2018; Kahsay, 2017). Industries often perceive universities as being out of touch with real-world business needs, while universities view industries as overly focused on profit at the expense of academic integrity (O'Dwyer et al., 2023).

5.2.2 Operational Factors

Operational factors refer to the practical aspects of UIL, including the mechanisms, processes, and resources that enable or hinder collaboration. These factors are critical for the day-to-day functioning of UIL initiatives. In this regard, the following elements have been identified in this review.

✓ *Infrastructure and Resource Limitations*

One of the recurring themes in the literature is the lack of adequate infrastructure and resources to support UIL. Universities often lack the necessary laboratory facilities, research equipment, and funding to engage in meaningful collaboration with industries (Bareke, 2018; Shukra et al., 2021; Tjeldvoll et al., 2005). This limitation is very noticeable in most HEIs of the country, and financial constraints are a major challenge (Abdu, 2013; Kahsay, 2017).

✓ *Collaboration Mechanisms*

The most common forms of UIL in Ethiopia are student internships, consultancy services, and training programs (Gemeda et al., 2023; Tjeldvoll et al., 2005). While these mechanisms provide some level of interaction, they are often limited in scope and depth. Joint research projects, which are more impactful, are rare due to operational challenges such as funding shortages and a lack of institutional support (Bareke, 2018; Kahsay, 2017).

✓ *Knowledge Transfer and Communication*

Effective communication and knowledge transfer are essential for successful UIL. However, the literature highlights a significant knowledge gap between academia and industry. Industries often struggle to understand academic research outputs, and universities fail to address industry-specific needs (Kannan, 2012; Tjeldvoll et al., 2005).

5.2.3 Institutional Factors

Institutional factors encompass the policies, frameworks, and organizational structures that govern UIL. These factors are critical for creating an enabling environment for collaboration. In this regard, the literature observed several issues in UIL in the Ethiopian context. Among others, the following are critical.

- ✓ *Policy and Legal Frameworks*

The absence of a comprehensive legal framework for UIL is a major institutional barrier in Ethiopia (Abdu, 2013; Gemeda et al., 2023). While some policies and directives, such as the "Directive on Research, Technology Transfer, and UIL" (MoSHE, 2019), exist, their implementation is weak, and there is no robust national policy to guide UIL activities (Kahsay, 2017; Tamrat, 2022).

- ✓ *Institutional Commitment and Leadership*

Weak institutional commitment and leadership are identified as critical challenges in fostering effective UIL (Abdu, 2013; Belay, 2008; Fufa et al., 2019). Universities often lack the organizational structures and leadership support, such as dedicated UIL offices or technology transfer offices, needed to promote UIL (Bareke, 2018). Although these offices are largely formally established in the HEIs of the country, they are inactive both in terms of organizing UIL activities and managing them.

- ✓ *Funding and Incentives*

Limited funding for research and innovation is a major institutional challenge in Ethiopia. Both universities and industries face financial constraints that hinder their ability to engage in collaborative projects (Kahsay, 2017; Molla, 2014). Also, there is a lack of incentives for

academics to participate in UIL, as the rewards for such activities are often insufficient (Tamrat, 2022).

5.3. Contributions of UIL in Ethiopia

In Ethiopia, with a minimal degree, UIL has emerged as a force driving crucial contributions to job creation, entrepreneurship, knowledge diffusion, and overall economic development. The publications consistently emphasize that student internship programs, consultancies, and training initiatives are common types of interactions that facilitate job opportunities (Bareke, 2018; Kannan, 2012). Though insignificantly, UIL serves as a source of entrepreneurship. Student internship programs, consultancy services, and joint research endeavors have been identified as fostering entrepreneurship (Kahsay, 2017; Kannan, 2012; Shewakena & Belay, 2017). However, as pointed out above, challenges such as institutional bottlenecks, financial hurdles, and leadership gaps hinder the entrepreneurial potential of UIL (Tamrat, 2022; Yilma & Alemu, 2018; Sertse, 2013).

Moreover, the publications underscore UIL's role in knowledge diffusion in the country (Fufa et al., 2019; Kannan, 2012; Shukra et al., 2021). Academic research, innovation, and TT have been identified as crucial components contributing to the diffusion of knowledge (Bareke, 2018; Kannan, 2012). Despite a number of challenges, UIL is acknowledged as a conduit for the transfer of expertise and innovation between universities and industries, and it enhances knowledge diffusion (Bareke, 2018; Fufa et al., 2019; Kannan, 2012).

These publications forwarded a series of recommendations to enhance a robust UIL in the country. Improving facilities, encouraging industry visits and improving institutional and policy framework are among the recommendations (Shewakena & Belay, 2017; Teressa & Besha, 2020; Tjeldvoll et al., 2005). The publications also assert that partnerships between universities, industries and the government are crucial for

improved collaboration (Abdu, 2013; Fufa et al., 2019; Gemeda et al., 2023; Sertse, 2013).

6. Reviewed Legal Documents Result

In addition to academic publications, insight from legal documents is important to understand the current status of UIL as it shapes the landscape of this linkage. The results presented here offer a focused exploration of key findings extracted from legal documents and they needed to promote UIL unveil the general realm of UIL in Ethiopia.

6.1 Reviewed Legal Documents and Results Obtained

Table 6: Identified policies and other legal documents on UIL in Ethiopia

No.	Title of the Document & Year of Issuance	Issuing Authority or Institution	Objective/Purpose of the Document	Target/Goal
1	Directive on Research, TT, UIL, and Community Services for HEIs (MoSHE, 2019)	Ministry of Science and Higher Education (FDRE, MoSHE) (now MoE)	To establish a comprehensive framework for Research, TT, UIL, and Community Services within HEIs. It encourages UIL via research, consultancy, staff exchange, as well as internship/externship arrangements.	Standardized and coordinated research, TT, UIL, and community services across all HEIs. Bridged gap between academic research and industry needs.
2	Directive on Consultancy Service in HE and Training Institutions (MoSHE, 2020)	Ministry of Science and Higher Education	To encourage active participation of staff from higher education and training institutions in consultancy services. It provides guidance on how consultancy works may be undertaken and the procedures to follow.	Staff participation, guidance on consultancy procedures, compensation guidelines, and outline management and quality control expectations.
3	HE and Training, Research Institutions, and Industrial Linkage Policy and Strategy (MoSHE, 2021d)	Ministry of Science and Higher Education (MoSHE,)	To foster collaboration between HE and training institutions, research institutes, and industries to narrow the gap in knowledge exchange, TT, and information dissemination for economic growth and social development.	Four set of goals tailored for collaboration and development between HEI and industry: Strengthened practical training; Enhanced research and development; Enhanced consulting and industrial extension services; and Strengthened innovation development and TT
4	A Directive Issued for the Implementation of Internship Program (MoSHE, 2021a)	Ministry of Science and Higher Education	To promote linkages among HEIs and industries towards improving implementation of Internship and improve it. Define the roles and responsibilities of the key actors in the implementation of internship.	Improved access and quality of internship in the Ethiopian HE and industry ecosystem.

5	Externship Implementation Directive (MoSHE, 2021c)	Ministry of Science and Higher Education	To bridge the gap between theoretical knowledge and practical skills by facilitating structured industry attachments for academic staff.	A framework for academic staff to gain hands-on experience in business and industrial settings, and to complement their theoretical knowledge.
6	Directive for Joint Applied Research (MoSHE, 2021b)	Ministry of Science and Higher Education	To establish a framework for collaborative research between HE, technical and vocational education institutions, research institutions, and industries.	Conducive environment for dynamic joint applied research responsive to national and regional socio-economic needs; collaboration among stakeholders

6.2 UIL in Ethiopia: Insights from Legal Perspective

As mentioned above, while academic publications basically serve as valuable resources for understanding UIC, the scarcity of available studies published in reputable journals necessitates a broader exploration. This work, therefore, extends its horizon to include a critical examination of key legal documents explicitly crafted to govern and guide UIL in Ethiopia. Thus, incorporating these legal documents into this review not only fills the void left by the limited availability of peer-reviewed publications but also enhances our understanding of the national contexts in which UIL functions. Below comes the analysis based on the identified legal publications in relation to UIL in Ethiopia.

6.2.1 Focus Areas

The reviewed legal documents highlight several key focus areas in the context of UIL in Ethiopia. A pivotal theme across these documents is the alignment of technological development with national goals and economic growth (MoSHE, 2019, MoSHE, 2021d). Many documents, such as the Directive on Research, TT, UIL, and Community Services for HEIs (2019), and the HE and Training, Research Institutions, and Industrial Linkage Policy and Strategy (2021), emphasize fostering collaboration between HEIs and industries to narrow the gap in knowledge exchange, TT, and information dissemination (MoSHE, 2021d; MoSHE 2021a). These policies aim to enhance practical training, research and development, consulting and industrial extension services, and innovation development and TT (MoSHE, 2021d).

The HE and Training, Research Institutions, and Industrial Linkage Policy and Strategy (2021) represents a pivotal focus on collaboration between HE and training institutions, research institutes, and industries. This policy outlined four strategic goals: strengthening practical training, enhancing research and development, improving consulting and industrial extension services, and fostering innovation

development and TT (MoSHE, 2021d). Thus, it underscores the multifaceted approach towards UIL.

Also, sseveral directives, such as the Directives on Internship (2021), Externship (2021), and Joint Applied Research (2021), contribute to the broader focus on UIL. They establish frameworks for promoting linkages among HEIs and industries through improved internship implementation, structured industry attachments for academic staff, and collaborative research endeavors (MoSHE, 2021a; MoSHE, 2021c; MoSHE, 2021b). These collectively aim to enhance access, quality, and practical experience within the Ethiopian HE and industry ecosystem. Also, by defining roles and facilitating the development, promotion, and commercialization of technologies, these legal documents actively contribute and foster effective UIL.

6.2.2. Key Players (Stakeholders) of UIL

These legal publications pertaining to UIL in Ethiopia identify and engage various stakeholders that play pivotal roles in the realization of collaborative endeavors between HEIs and industries. The stakeholders collectively contribute to the implementation and success of UIL initiatives.

At the forefront of the UIL legal landscape, MoSHE (currently MoE) plays a leading role as almost all of these documents emanated from MoSHE. The Ministry has served as a central orchestrator, providing overarching guidance, regulatory frameworks, and strategic direction to promote UIL (see 1-6*).* But HEIs, both at a national and institutional level, are the primary stakeholders as per the UIL legal frameworks of the country. The reviewed documents display this fact and highlight the role of universities in fostering collaboration, enriching practice-based learning and TT activities. The policies empower universities to actively engage with industries, bridging the gap between academic and practical skills (MoSHE, 2020; MoSHE, 2021d; MoSHE, 2021a;

MoSHE, 2021c). Beside HEIs, these legal documents underscore the importance of active industry participation in the UIL setting. Directives like those on Joint Applied Research (2021) highlight the crucial role of industries in applied research (MoSHE, 2021b) while those on Internship (2021) and Externship (2021) emphasize the roles of academic staff and students as key players in UIL activities. These legal documents, designed to improve internship implementation, define the roles and responsibilities of the stakeholders and bridge the gap between theoretical knowledge and practical skills in UIL (MoSHE, 2021a; MoSHE, 2021).

6.2.3 Gaps in the Legal Documents

Despite their strengths, these legal documents have some gaps in their legal framework governing UIL. While they emphasize university responsibilities, they do not provide clear mandates for industry participation. There is no dedicated provision requiring industries to collaborate with universities, invest in UIL initiatives, or engage in joint research efforts. The absence of binding commitments and structured incentives has contributed to low industry engagement (Gemeda et al., 2023; Tamrat, 2022).

Additionally, there are no strong mechanisms to encourage industry involvement. In many countries, UIL policies include financial incentives, tax benefits or research funding mechanisms to attract industry participation. Existing documents and policies, however, lack concrete financial or regulatory incentives to drive industry engagement. Without such incentives, industries often perceive UIL as costly and impractical.

Another limitation is the weak enforcement of UIL policies. While the legal documents highlight UIL as a priority area, the implementation remains inconsistent due to the absence of monitoring mechanisms and institutional accountability (Tamrat, 2022). Coordination between

universities, industries, and government bodies is limited making it difficult for their partnership to sustain. Universities and industries largely operate in isolation and policy-driven collaboration remains sporadic rather than systematic (Gemeda et al., 2023).

Because of these gaps, existing legal documents have had little impact on improving UIL in Ethiopia. Without clear industry participation mandates, financial incentives and effective enforcement mechanisms, UIL remains immature. Addressing these gaps would thus become essential for establishing a robust UIL ecosystem in the country.

7. Discussion

7.1 General Discussion

By reviewing the literature and analyzing related legal documents, we have come to understand that the current trend of UIL is marked by both potential for growth and persistent challenges. The findings indicate that UIL in Ethiopia is still at its infant stage, with most collaborations centered around student internships, consultancy services, and training programs (Gemeda et al., 2023; Tjeldvoll et al., 2005). While such endeavors provide initial engagement, they lack depth and continuity, making UIL less impactful compared to advanced systems in developed countries (Guimón, 2013). They also reveal untapped opportunities for expanding and diversifying collaboration.

In many developing countries, UIL tends to progress slowly. Establishing and strengthening the linkage requires time and effort (Guimón, 2013). UIL in Ethiopia, like in other developing nations, faces unique challenges that must be carefully considered (Malik & Wickramasinghe, 2015). Despite the challenges, however, there is reason for optimism. Countries like Brazil (Fischer et al., 2009) and Nigeria (Adeoti, 2008) faced similar obstacles in the early stages but eventually built strong UIL systems. Studying the experiences of

nations with advanced UIL frameworks could provide valuable lessons on expanding collaboration and overcoming challenges.

Unlike countries with developed economies where UIL involves joint research, TT, and structured innovation hubs, Ethiopia's collaborations remain limited in scope (Kahsay, 2017; Shewakena & Belay, 2017). The findings align with trends observed in other developing nations where UIL is often constrained by weak institutional frameworks, limited funding, and low industry participation (Malik & Wickramasinghe, 2015). The constraints, however, are not insurmountable as shown by Brazil and Nigeria.

Brazil overcame early challenges through institutional reforms, policy incentives and investment in infrastructure. The country introduced policies such as the Innovation Act of 2004 which established legal frameworks for UIC and encouraged TT (Fischer et al., 2009). Universities played a key role in patenting activities and contributed significantly to the national innovation system. Likewise, a key factor in Nigeria's success has been the institutionalization of UIL in the national innovation policies. The government has actively linked HE policies with industrial strategies. This enabled that universities contribute directly to economic growth (Adeoti, 2008). Ethiopia could learn from these countries by adopting structured mechanisms to overcome some of the critical UIL challenges and diversify their engagement beyond internships and consultancy.

A more effective UIL framework should integrate joint research projects, collaborative innovation hubs, and industry-sponsored academic events (O'Dwyer et al., 2023). These initiatives not only facilitate knowledge transfer but also promote long-term partnerships between universities and industries. Establishing international collaborations can further broaden UIL engagement, exposing stakeholders to advanced research, innovative technologies and best practices in UIL implementation.

The literature highlights several benefits of UIL, including industry exposure, research funding, workforce training, and resource sharing (Kahsay, 2017; Tjeldvoll et al., 2005; Yilma & Alemu, 2018). Beyond these benefits, UIL plays a critical role in fostering innovation, driving economic development, and strengthening the link between academia and industry (Fischer et al., 2009; Suzigan et al., 2009).

7.2 Challenges Hindering UIL in Ethiopia

The findings reveal multiple barriers to UIL development in Ethiopia. These include a lack of relevant facilities, inadequate infrastructure, weak institutional commitment, and limited UIL enablers (Bareke, 2018; Teressa & Besha, 2020). These challenges mirror those faced by other developing countries, where UIL remains constrained by financial and structural limitations (Albuquerque et al., 2015; Vaaland & Ishengoma, 2016).

A major barrier is the deficiency in physical and technological resources which restricts academic research integration with industrial needs (Abdu, 2013; Gemeda et al., 2023; Kahsay, 2017). Universities lack specialized facilities, research laboratories, and equipment, making it difficult to support joint research and applied innovation (Kahsay, 2017).

Furthermore, knowledge gaps, weak institutional leadership and low awareness hinder UIL effectiveness. A lack of awareness and trust is a major barrier to effective UIL in Ethiopia. Many industries do not fully understand the benefits of collaborating with universities. At the same time, universities often struggle to engage with industries due to limited outreach. This gap creates hesitation on both sides and prevents meaningful partnerships (Fufa et al., 2019; Shewakena & Belay, 2017). Trust issues also play a significant role. Industries often view universities as too focused on theory, while universities see industries as profit-driven with little interest in UIC (Bareke, 2018; Kahsay, 2017).

Successful UIL models in other countries show that building trust requires structured and long-term commitment from both sectors (Guimón, 2013). Creating structured platforms for dialogue, joint projects and policy-driven incentives can help bridge this divide. Without trust and awareness UIL will remain weak in the country.

Similarly, the findings highlight that UIL struggles due to the absence of well-defined legal frameworks (Abdu, 2013; Gemeda et al., 2023). While legal documents such as the Directive on Research, Technology Transfer, UIL, and Community Services for HEIs (2019) offer a foundation for collaboration, their enforcement remains weak (MoSHE, 2019). The review reinforces the importance of comprehensive policies that bridge the gap between academic research and industry needs, as emphasized by previous studies (Mgonja, 2017).

In terms of factors facilitating or hindering UIL, the reviewed publications underscore the critical role of institutional frameworks and collaboration dynamics in shaping the nature and effectiveness of UIL (Fufa et al., 2019; Shukra et al., 2021). The alignment between these findings from other literature sources further solidifies the understanding that while there is some level of interaction, the depth and continuity of collaboration depend significantly on the establishment of an institutional framework (Martin, 2000; Nagaoka et al., 2009). The establishment of a robust institutional framework is foundational to the success of collaborative endeavors between universities and industries. This involves creating a supportive environment that facilitates sustained engagement and productive interactions. Also, it contributes in shaping the dynamics of collaboration among academia and industry.

7.3 Contributions of UIL to Economic Development

In terms of contributions, the review emphasizes the role of UIL in job creation, entrepreneurship, knowledge diffusion, and indirectly the

overall economic development. Common forms of collaboration, such as student internship programs, consultancies, and training initiatives (Belay, 2008; Kannan, 2012; Shewakena & Belay, 2017), are acknowledged for their effectiveness in facilitating job opportunities and entrepreneurial endeavors (Bareke, 2018; Gemeda et al., 2023; Kahsay, 2017; Kannan, 2012). This perspective aligns with the views expressed by Etzkowitz & Leydesdorff, (2000), who similarly recognize the positive impact of UIL in these areas. Furthermore, the literature recognizes the role of UIL in knowledge diffusion in Ethiopia. Academic research, innovation, and TT are identified as crucial components contributing to the diffusion of knowledge (Bareke, 2018; Gemeda et al., 2023; Kannan, 2012).

Generally, the discussion presents a unified narrative on UIL in Ethiopia, aligning the reviewed literature with findings from legal documents. While UIL remains at an early stage, strategic interventions such as expanding collaboration mechanisms, strengthening institutional frameworks and introducing incentives for industry participation could enhance its effectiveness. Ethiopia's UIL framework requires effective structure, policy enforcement, and industry engagement to ensure sustainable university-industry collaboration.

8. Limitations

This study has both conceptual and methodological limitations. Conceptually, the review focuses on UIL within the Ethiopian context which may limit the generalizability of the findings to other countries. The analysis relies on existing legal documents and policy frameworks which are subject to interpretation and potential bias. Additionally, some critical aspects of UIL such as informal collaborations and industry-driven initiatives, may not be fully captured due to the focus on published materials. Methodologically, the inclusion criterion prioritizes peer-reviewed articles published in English excluding possibly relevant studies published in other languages. The decision to focus on reputable journals similarly excludes valuable insights from non-

indexed sources. Furthermore, the analysis incorporates legal and policy documents which are subject to amendments making reproducibility a challenge. Despite these limitations, the study provides a comprehensive review and analysis of UIL in Ethiopia. It offers valuable insights for future research and policy development.

9. Findings

This review provides new insights into the current trends of UIL in Ethiopia and their broader implications for the HE ecosystem, industry, and policy-making. It highlights critical gaps in legal frameworks, weak industry participation and the lack of structured UIC which have not been comprehensively analyzed in previous studies.

The findings contribute to UIL by identifying key areas where academic engagement can strengthen UIL particularly in TT and innovation-driven partnerships. For industry, this review underscores the need for incentives and structured engagement mechanisms to encourage collaboration with universities. From a policy perspective, it emphasizes the urgent need for a comprehensive UIL framework, including clear performance indicators and enforcement mechanisms as well as financial support structures.

10. Conclusion

This comprehensive review reveals that UIL in Ethiopia is marked by both potential for growth and persistent challenges. In terms of UIL student internship, consultancies and training are some common forms of collaborations. Despite facing challenges, there is a gradual progress in UIC. UIL is not easily executed in the country as several challenges confront the area. Challenges including institutional, financial and awareness-related hurdles, leadership and policy-implementation gaps, and trust issues among universities and industries are critical challenges. The benefits associated with UIL

include practical industry exposure, financial support, training, research opportunities, consultancy services, and resource sharing.

Even if there are legal documents which advocate UIL as well as certain institutional efforts, the country has not accomplished what was anticipated (Tamrat, 2019). While there are policies and directives that promote UIC, a comprehensive nation-wide UIL policy is yet to be robustly implemented. The lack of the implementation of UIC framework can hinder the systematic development of effective UIC. Furthermore, the absence of a clear indicator system to assess the status and impact of UIL at the national level presents a significant challenge. Generally, addressing these challenges requires a holistic approach involving stakeholders from academia, industry, and the government.

This comprehensive review has research-related implications that can guide future scholarly inquiries and academic investigations. The identified gaps and areas of collaboration, offer a rich terrain for further empirical research. Scholars can delve into specific aspects of UIL landscape to deepen our understanding of the area. Also, researchers can focus on assessing the tangible impact of UIL initiatives on economic development, job creation, and knowledge diffusion. Understanding the real-world outcomes of collaborative efforts can inform policymakers and institutions about the effectiveness of their interventions. By focusing on these research avenues, scholars can contribute to the academic discourse, provide evidence-based recommendations, and actively participate in shaping the trajectory of UIL.

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