Challenges and Opportunities for Technology Transfer and Community Engagement at Research Universities: The Case of Hawassa University, Ethiopia

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Abstract

Research universities in emerging economies are increasingly recognised as crucial actors in promoting sustainable regional development through research, technology transfer, and community engagement. To better understand the situation of Ethiopia as an emerging economy, this study critically examines the contributions of Hawassa University to the evolving Regional Innovation Systems (RIS). Employing a qualitative design, data were collected through document analysis, 40 key informant interviews, and three focus group discussions. Thematic analysis revealed significant progress over the last fifteen years, with notable growth in staff research projects (1,414 projects) and intellectual property registration (12 patents since 2020). However, the university faces systemic challenges including suboptimal research impact (with 90% of projects underperforming against intended benchmarks), chronic underfunding (allocating only 2.2% of its budget to R&D), bureaucratic procurement inefficiencies (i.e. red tape), and insufficient community engagement frameworks. Opportunities for synergy exist, particularly through industrial clusters and indigenous knowledge integration. The study concludes that Hawassa University's transformative role in regional development can be amplified through strategic policy reform, enhanced resource allocation, and recalibrated community engagement models. These findings contribute to the broader understanding of the entrepreneurial university paradigm in low-resource settings.

Keywords: Community Engagement, Entrepreneurial University, Ethiopia, Regional Innovation Systems, Technology Transfer, Transformative Innovation Policies.

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1. Introduction

In emerging economies like Ethiopia, Education is essential for boosting national competitiveness and economic growth (Ildikó et al., 2024). Along with their traditional commitments to educational and research activities, universities are expected to play an indispensable role in fostering regional innovation and economic growth (Thomas et al., 2023). In particular, research universities are regarded as hubs for community engagement, technological innovation, and knowledge transfer—all of which are paramount to driving regional development (Gebreab & Tekle, 2024; Corsi et al., 2023).

For universities to support a more comprehensive regional socioeconomic growth strategy, they must transcend their conventional role in research commercialization (Rådberg & Löfsten, 2024). Universities are increasingly seen as key actors in regional development and policy implementation, particularly in knowledge-based economies. However, challenges such as insufficient funding, outdated curricula, and infrastructural deficits limit their capacity to function effectively as knowledge hubs.

The expectation that universities will foster economic growth, innovation and development is the most recent development (Thomas et al., 2023; Pugh et al., 2022). The Humboldtian model, which points out teaching and research integration, has progressively transformed universities from simply academic organizations to entities with a 'third mission'—actively contributing to regional economic and social development through knowledge transfer and community engagement (Etzkowitz & Leydesdorff, 2000; Etzkowitz & Klofsten, 2005). This shift is most visible in research universities, which are increasingly required to bridge the gap between academia, business, and local communities (Borah et al., 2023; Delgado-Verde & Díez-Vial 2024; Ursić et al. 2024), however, this shift raises concerns. A disproportionate emphasis on economic imperatives may compromise critical thinking and knowledge transmission in higher education (Marginson, 2016). This might sideline the social sciences and humanities that are fundamental to democratic citizenship and the development of society as a whole (Nussbaum, 2010).

The frameworks of entrepreneurial ecosystems and innovation systems offer valuable insights into how universities could contribute as drivers of technical innovation and regional development (Wanger et al., 2021). Despite offering valuable conceptual tools for analyzing the evolving role of universities in regional development, the frameworks of innovation systems and entrepreneurial ecosystems are not universally applicable across institutional or geographic settings (Pidorycheva et al., 2020; Reichert, 2019). Given the demands of commercialization and the possible mismatch between academic outputs and local community requirements, it is important to carefully examine the premise that universities naturally promote equitable and sustainable development (Sedlacek, 2013). At research universities, knowledge and technology transfer, and community engagements are essential elements of contributing to transforming scientific investigation into practical solutions for pressing social issues. According to Guerrero and Urbano (2012), entrepreneurial universities are institutions that have established in place systems that foster innovation, facilitate technology transfer, and contribute to regional development.

African universities continue to be quite young and have yet to produce a considerable contribution to research and development, innovation, and economic growth in their respective regions (Bezeng et al., 2025; Wenham et al., 2021). Despite making up 12% of the world's population, Sub-Saharan Africa has the fewest researchers per million people and contributes only 1% of global research production (Jowi, 2021; World Bank 2014). The slow progress of innovation's contribution to the region's development trajectory may have been credited with impediments to the development and execution of innovation policies (Forson, 2020; Van't Land 2016; Jowi & Obamba 2013).

These days, prominent African universities dealing with transformative innovation policies to address grand continental critical issues like housing, water, sanitation, and infrastructure continue to be at the forefront of redefining development (Katsamudanga & Nhamo, 2025). Africa must make investments in education, research and development, and innovation as it expects to realize sustainable economic development. Correspondingly, innovation is essential for long-term

growth, economic competitiveness, and improved societal welfare (Carnoy & Castells 2001, World Bank 2009).

African universities, like the University of Nairobi, Makerere University, and Eduardo Mondlane University, are embracing innovation as a strategic institutional mission, driving social and organizational change through policy frameworks and development projects, requiring local expertise and collaboration (Langa, 2024). Universities in East Africa recognize community engagement and technology transfer as means of contributing to sustainable development. Institutions such as the University of Nairobi and Makerere University have established policies that enhance academic capacity, finance, and research management (Rwakijumba & Okaka, 2017). However, barriers such as insufficient finance and poor inter-university networking prevent the best possible performance

Universities in Ethiopia have both the potential as well as constraints when regards to employing their research output to address the local communities' issues along with promoting socioeconomic development. The commercialization of university research has gained more attention, both as a means of contributing to competitiveness and as a way for institutions to generate revenue from their research projects (Berggren, 2017; Ambos et al., 2008). Universities are considered to be the most important institutions and advocates in the national innovation system (Zaidan et al., 2024; Audretsch, 2014). Consequently, through establishing incentives towards innovation, policymakers should aspire to enhance universities' capability to innovate and to successfully apply it (Wanger et al., 2021).

Ethiopian higher education has a relatively recent history, dating back to the 1950s, and it is still evolving. While the sector has grown rapidly—it now includes 49 public and 128 private institutions—it has not yet been matched with adequate investment, with education consuming only about 3% of GDP, falling below the Sub-Saharan African average (Tareke et al., 2024; Tessema & Abebe, 2011). Such underfunding has exacerbated long-standing problems with research capacity, instructional quality, and infrastructure. The rapid expansion of higher educational institutions poses a further burden on the system, raising concerns that currently underway insufficient staffing and the

absence of institutional and financial resources could compromise academic standards.

The Higher Education Proclamations of 2009 and 2019 constitute two recent government efforts that highlight the vital role of universities in national development, particularly in the areas of technology transfer and community participation. However, their implementation is still uneven. In Ethiopia's broader innovation landscape, the transformational potential of higher education is limited with limited organizational capacity and enforcement gaps that continue to hinder the realistic achievement of these targets (FDRE, 2009; FDRE, 2019; Ildikó et al., 2024).

In Ethiopian Universities, the old "community service" paradigm of community participation has given way to a more cooperative "community engagement" strategy. The evolution reflects the growing realization that universities have to actively collaborate with their local communities in addressing societal issues through partnerships and reciprocal knowledge sharing, in addition to serving them (Ildikó et al., 2024). As Community Engagement Directive for Higher Education Institutions (MoEDR1, 2019), Community Engagement (CE) refers to the cooperation between higher education institutions and their larger communities (local, regional/state, national, and global) for the mutually beneficial exchange of knowledge, resources, and practices to address urgent societal issues in a context of partnership and reciprocity.

Although the Community Engagement Directive for Higher Education Institutions (MoEDR1) intends to promote transformational collaboration between communities and universities, it frequently overlooks fundamental operational impediments. Financial limits, power imbalances, and resource limitations can all lessen the efficacy of engagement programs. Furthermore, one-sided relationships when local demands are subordinated to academic interests might result from power imbalances. To fully recognize the transformational potential of community engagement, a thorough assessment of its practical efficacy and socio-political dynamics is required.

Despite significant advancements, the higher educational sector in Ethiopia continues to encounter challenges. Although financial limitations and quality issues are the main challenges, the system also has flaws with regard to relevance, academic freedom, and equity (Molla, 2018). Most significantly, there is a misalignment between industries and universities since industry-university relations are still in their early stages (Gebreab & Tekle, 2024). The existing relations are limited to short-term training programs, consulting services, and student internship programs. Universities face two challenges concerning community engagement: the increasing demand from their local communities and the limited government funding for social development projects (Ildikó et al., 2024).

The role of Ethiopian higher education institutions (HEIs) has been the subject of numerous studies, though few have examined both the possibilities and challenges associated with technology transfer and community engagement. Notable studies have focused on the impact of community engagement on student performance (Belete, 2024) and the sustainability of public universities' societal roles (Reda, 2024), but the dual focus on both technology transfer and community engagement in the Ethiopian context remains underexplored. Consequently, this study intends to investigate Hawassa University's technology transfer and community engagement as an opportunity and challenge to demonstrate how Ethiopian research universities could foster transformational innovation and regional development.

2. Literature Review

This section discusses substantial theoretical frameworks and empirical debates regarding universities' growing roles in national and regional development, in particular emerging economies. The "triple mission" of universities—teaching, research, and social engagement—is first discussed globally. Subsequently, the applicability and adaptation of Transformative Innovation Policies (TIP) and the entrepreneurial university model in resource-constrained settings are examined. Following looking deeper into empirical findings on technology transfer and community engagement, noting both successful strategies and enduring difficulties, it concludes by outlining the conceptual framework that underpins this study.

2.1. Universities and the Triple Mission: Global Debates

Universities have historically been served mainly as teaching and research institutions. The "third mission" of universities, which is to contribute to regional and national development, has recently been introduced to their role in the past few decades. This evolution is most evident in how universities have turned into entrepreneurial entities where the emphasis is on the creation and dissemination of knowledge to promote the betterment of society and the economy, instead of simply teaching and research (Guerrero et al., 2016; Thomas et al., 2023). The shift is in line with a worldwide trend that envisions universities as indispensable catalysts for social change, economic growth, and innovation (Menter, 2024). This extending role is particularly significant in emerging economies like Ethiopia, where universities are still relatively newly established and deal with severe limitations on resources. Nevertheless shifting from an entirely academic role to a position of regional development does not come without challenges, especially when considering light of the structural deficiencies in resources and policies (Gebreab & Tekle, 2024).

The "third mission" of Ethiopian universities has begun to gain recognition, in particular through technology transfer and community engagement (Ildikó et al., 2024). However, it is essential to recognize that the principle of the entrepreneurial university, which is frequently employed in well-off settings, must be tailored to the local setting. For instance, in Ethiopia, universities including Hawassa University encounter particular challenges in environments with limited resources, which include inadequate supply of funds, infrastructure, and human capital (Tessema & Abebe, 2011). Therefore, it becomes essential to have a contextual awareness of how Ethiopian universities could integrate their teaching, research, and community engagement initiatives towards regional development.

2.2. Transformative Innovation Policies (TIP) and Emerging Economies

Schot and Steinmüller (2018) state that transformative innovation policies (TIP) refer to a policy approach designed to address significant socioeconomic problems as social and environmental sustainability, and injustice in addition to promoting economic growth. TIP emphasizes social aims and inclusive growth, moving away from the

conventional focus on market-driven technological advancements (Hekkert et al., 2020). TIP frameworks have been widely explored in high-income nations, though little attention has been paid regarding how applicable frameworks are in emerging economies, particularly in Africa.

In Ethiopia, TIP possesses the potential to be a successful instrument for promoting sustainable development. However, its implementation requires a significant modification of existing frameworks. The challenge is Ethiopian universities' inadequate capacity to engage successfully with TIP frameworks due to infrastructure and funding constraints (Pugh et al., 2022). While TIP highlights the significance of integrating innovation with societal needs, the lack of proper legislative backing and low industrial engagement in Ethiopia pose substantial challenges to its implementation. As a result, an advanced approach for TIP that is notably adapted to the conditions of Ethiopian universities is vital.

Additionally, African innovation research that focuses on indigenous knowledge and local context must be integrated into TIP discourse. The primary gap in existing TIP literature is the absence of African-centric models that appreciate the historical significance of Indigenous knowledge systems in driving transformational innovation (Babalola, 2024; Muwanga-Zake & Kibukamusoke, 2024). Considering how modern scientific and indigenous knowledge could potentially create TIP is essential for Ethiopian universities' sustainable and inclusive development.

2.3. Entrepreneurial Universities in Resource-Constrained Contexts

Rådberg and Löfsten (2024) define entrepreneurial universities as those that help commercialize knowledge and build regional innovation ecosystems. Traditional entrepreneurial university models, which are frequently based on models from high-income countries, present considerable hurdles in low-income and resource-constrained situations such as Ethiopia. In this regard, limited resources in Ethiopian universities, which include restricted finance, inadequate facilities, and insufficient skilled employees, offer substantial hurdles to the

successful implementation of entrepreneurial university models (Checkol. 2024; Mohammed, 2024).

The entrepreneurial university concept has been adapted for resource-constrained settings in various African countries (Breznitz, 2014). These modifications include the establishment of low-cost innovation centres, collaboration with non-governmental organizations (NGOs), and the incorporation of Indigenous knowledge systems to strengthen local capacity (Ozor et al., 2025; Moleka, 2024). In Ethiopia, universities like Hawassa University could benefit from such changes, especially in terms of building partnerships with local enterprises and regional actors. Furthermore, due to the fact Ethiopia is missing a substantial venture capital ecosystem (Haregwoin, 2022), universities might have to concentrate on encouraging low-risk, collaborative innovation models that can be sustained under existing limitations on resource availability.

This highlighting of resource-constrained entrepreneurial university models is critical for establishing a more inclusive and sustainable innovation ecosystem that is capable of addressing local development needs while strengthening the university's role as an economic and social actor (Kamuriwo, 2024; Gallage, 2023). The absence of a reliable funding scheme for start-ups, along with the fragile connections between academia and industry, underline the need for universities to take a more flexible, adaptive strategy to the entrepreneurial university model.

2.4. Technology Transfer and Community Engagement: Best Practices and Challenges

2.4.1. Technology Transfer

Technology transfer (TT) plays an integral role in integrating research from academia into practical applications that might address societal issues. According to Pohlmann et al. (2022), TT is the process that ensures academic research and innovation are shared with the general public and industries, hence aiding the commercialization and greater diffusion of scientific information. However, in emerging economies including Ethiopia, TT encounters substantial challenges such as inadequate infrastructure, the absence of industrial engagement, and a limited realisation of how to commercialize studies (Hailu, 2024).

Numerous ways may be employed to overcome all of these challenges. These include establishing multidisciplinary research institutes to bridge academic and industrial knowledge gaps, strengthening industry-academic relationships, and building incentive schemes to encourage researchers to engage in commercialization activities (Gao, 2024; Pohlmann et al., 2022). Ethiopian universities could personalize their approach to TT by focusing on sectors that coincide with national development priorities, such as agriculture, renewable energy, and health, where local discoveries can have the greatest immediate impact (Sube et al., 2024).

2.4.2. Community Engagement

Community engagement is a core element of universities' third mission, in which universities collaborate diligently with their local communities to address societal problems. In Ethiopia, community engagement began as a "community service" concept but has subsequently evolved into a more inclusive and reciprocal approach (Ildikó et al., 2024). This shift toward community participation is consistent with the overarching goal of ensuring colleges play an active role in regional development and social impact (Gebremariam et al., 2025).

Co-producing knowledge with regional stakeholders, ensuring that engagement activities are in line with the needs of the neighbourhood, and cultivating long-term partnerships that go beyond short-term projects are all highlighted by best practices in community involvement (Sánchez-Barrioluengo & Bennéworth, 2019). Hawassa University has the chance to enhance its involvement in the community by concentrating on projects that tackle urgent local concerns like environmental sustainability, healthcare, and rural development. The government's limited funding for social development initiatives and the changing demands of local communities for more participation in decision-making processes are two obstacles the university must overcome.

2.5. Conceptual Framework for the Study

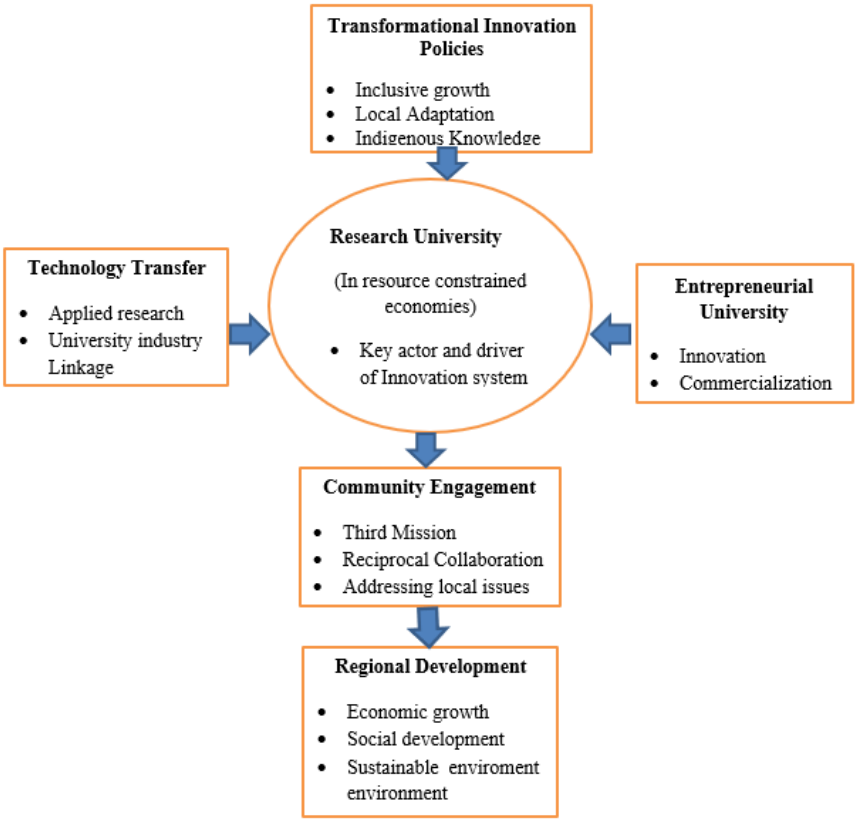
The conceptual framework of this study aims to explore the challenges and opportunities of technology transfer and community engagement efforts in research universities in emerging economies (resource-constrained economies such as Ethiopia), with a focus on Hawassa

University in Ethiopia. Universities, particularly research universities, have a responsibility to engage in the Third Mission along with their traditional responsibilities of teaching and research. Assuming the conceptual framework steps to bring together four distinct components: transformative innovation policies (TIP), the entrepreneurial university model, technology transfer, and community engagement. Through these dimensions, it is readily apparent that universities offer an indispensable part in contributing as an important innovation player to ensure equitable and inclusive development to address local and regional issues.

Starting Transformative Innovation Policies (TIP) presents a theoretical approach for aligning the innovation system alongside current societal issues including social justice, equity and environmental sustainability. The adaptation of Transformative Innovation Policies (TIP) to the Ethiopian context calls for contextualizing the global framework into the local context, stimulating indigenous knowledge, and focusing on handling institutional barriers including limited infrastructure and insufficient funding for research and development (RD). Similarly, the Entrepreneurial University Models are designed to enable universities, particularly research universities, to evolve into more innovative, commercialize knowledge, and constitute collaborations with various regional innovation system actors such as government agencies, private enterprises, and civil society organizations. Both of the frameworks stated above provide a road map for universities, particularly research universities in Ethiopia, to contribute a catalyst role to bring about economic growth and social development.

In operational terms, the framework highlights Technology Transfer and Community Engagement as vital tools for universities to successfully carry out their third mission. While technology transfer generates opportunities as aligning research outputs to regional demands in different sectors, whereas encounters constraints including poor university-industry linkages along with limited commercialization capabilities. Community engagement, which has developed from a linear service paradigm to a more reciprocal and collaborative approach, has the potential for significant collaborations with local communities, nevertheless, it also challenges such as resource constraints and policy misalignment. While addressing these double

dimensions, the framework attempts to demonstrate how universities in research-constrained economies, such as Ethiopia, may overcome institutional and contextual barriers to more efficiently fulfil their developmental roles.



Conceptual framework (Own Source)

3. Methods

The study employed a qualitative design to get an in-depth understanding of Hawassa University's engagement with regional development initiatives, including the opportunities and challenges associated with research, technology transfer, and community engagement initiatives. This qualitative design, as described by Oranga and Matere (2023), focuses on addressing the "how" and "why" questions. It explores participants' perspectives, experiences, and behaviours in-depth, making it a valuable tool for gaining a

comprehensive understanding of Hawassa University's engagement with regional development initiatives.

The study used a non-probability, purposeful sampling approach to select study participants who have shared extensive details on Hawassa University's position regarding technology transfer and community engagement initiatives; more specifically, the selection criteria targeted those participants who were expected to have personal involvement or expertise, positions, or direct collaboration with the university. Multiple data collection methods were employed in the study including focus groups, key informant interviews, and institutional document reviews. Key informant interviews have been conducted with experts that included eight Ministry of Education experts, eight high-level university officials, ten faculty members, eight government personnel, six researchers, and six local community members. In total, we conducted 46 key informant interviews.

An extensive understanding of the institutions' role in research, technology transfer and community engagement was given by the interviewees. Three focus group discussions with, faculty members (eight members), career centre coordinators (eight members), and recent graduates (ten members) were conducted. The focus group discussions aimed to collect multiple perspectives and first-hand information on transferring technologies and community engagement at Hawassa University. This participatory approach contributed to recognizing shared challenges and opportunities by facilitating participants to discuss while developing the thoughts of one another.

This study conducted a systematic assessment of numerous institutional documents to comprehend Hawassa University's engagement with research, technological transfer, and community participation. It reviewed R&D project documentation, partnership agreements, patent applications, intellectual property records, technology transfer reports, community engagement campaign reports, policy and guidance documents, and budget allocation reports. The objective of the review was to analyse the university's progress, variability, and research engagement trends over the last fifteen years, assess the impact of collaborative research initiatives, evaluate the university's progress

in innovation and technology transfer, and comprehend the scope, implementation, and outcomes of outreach activities.

Once data is collected, the study adheres to the six-phase theme analysis process put forth by Braun and Clark (2006). These phases include: understanding the data by turning spoken data into written form and translating it from Amharic to English for analysis; generating initial codes by turning collected data into codes that condense information into meanings that can be easily understood; creating codes by identifying potential themes or patterns within the data; creating codes by matching codes with data extracts to support each code; creating codes by identifying probable themes or patterns to cut down on the amount of The thematic analysis played a crucial role in organizing the responses and revealing key themes. The major themes that emerged were Research and Development (R&D) initiatives; promoting knowledge/ technology transfer; community outreach and engagement; existing and emerging opportunities; and existing and emerging challenges. Document assessment was used to identify patterns and trends in staff research projects, and intellectual property rights granted inventions.

To ensure quality, the study relies on four criteria: credibility to internal validity, transferability to external validity/generalizability, dependability to reliability, and conformability to objectivity. Credibility is achieved through prolonged engagement, peer debriefing, and data triangulation. Transferability is assessed by assessing the applicability of findings to other groups and situations. Dependability is ensured by consulting faculty members, PhD fellow students, and dissertation supervisors. Conformability is achieved by considering the researcher's perspective and double-checking transcripts. These methods help ensure the reliability and validity of qualitative research.

The study follows ethical guidelines, emphasizing social justice, beneficence, and respect for participants. It gained ethical clearance from Addis Ababa University's Institutional Review Board (IRB) before data collection, guaranteeing adherence to established guidelines. The study obtained informed consent by giving detailed explanations, answering queries, and translating materials into Amharic for accessibility. Participants were guaranteed privacy and the

responsible use of their contributions to avoid potential harm. The researcher circulated institutional support letters and got gatekeeper permission while complying with ethical standards.

4. Results

4.1. Research and Development (R&D) Initiatives

4.1.1. Growth Trends in Research Activities

The research findings indicate that the Ministry of Education has differentiated Hawassa University as a research university, with a particular emphasis on expanding knowledge in five major thematic areas: education, social sciences and humanities, STEM (science, technology, engineering, and mathematics), agriculture and natural resources, and health and human nutrition. The university's differentiation as a research university is a significant turning point in turning research initiatives into significant results. For instance, Key Informant 1, a research directorate of the university stated as follows:

> The university aspires to establish a centre of excellence and a demand-driven environment with adaptable systems to promote research. This includes engaging faculty, staff, and students in national and global collaborations to tackle important research issues, improving the quality and applicability of research outputs, and driving national growth.

While the vice deans of each college coordinate research activities, the university's vice president oversees all research activities to ensure that all initiatives are being handled effectively. A collaborative environment that supports both innovative research initiatives and academic education is created by this integrated approach, which makes it easier to coordinate research and teaching responsibilities.

The document reviews show that staff research projects have grown and diversified over the last 15 Academic Years (2008/2009 to 2022/2023), with a significant increase from 37 projects in the 2008/2009 Academic Year to 114 in the 2022/2023 Academic Year. Over fifteen years, 1,414 projects were carried out, demonstrating a robust research presence across all fields. Every year, there are discernible variations in the quantity of initiatives. For example, there was a notable decline to just

14 initiatives in the Academic Year 2017–2018, whereas the number of projects peaked in the Academic Year 2013–2014 at 182. The years after 2017/2018 have shown a progressive increase, with 114 initiatives in the 2022/2023 Academic Year.

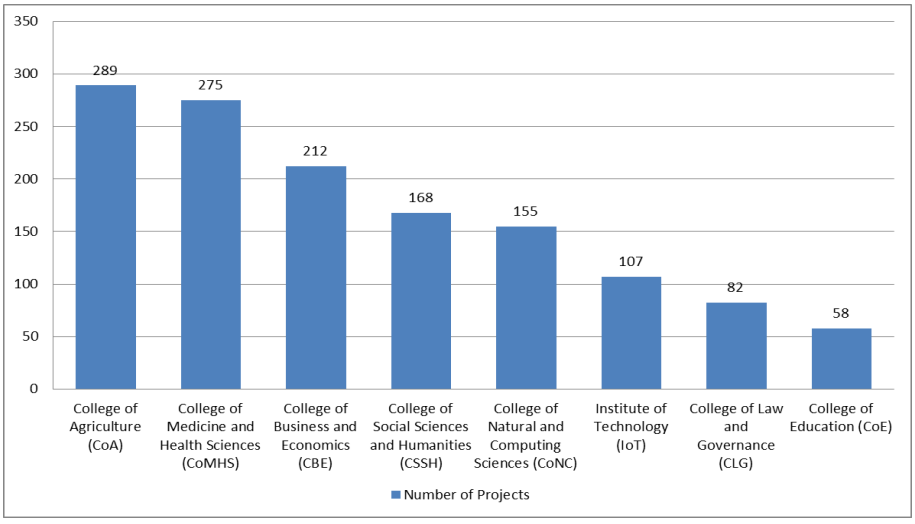


Table 1: Hawassa University's staff research projects (2008/2009 to 2022/2023)

Hawassa University's collaborative research projects have grown considerably in recent years, bringing in international recognition as a result of the academic staff's remarkable research and practical project administration. Presently, the institution oversees 65 joint projects with 112 domestic and 69 foreign partners from nations including Norway, Canada, Germany, the United States, the United Kingdom, Italy, the Netherlands, the Czech Republic, and Sweden. Key Informant 3, a joint research director, provided more insight into how joint research projects operate, as follows:

> These initiatives, which emphasize research, technology transfer, capacity building, and community engagement, help the university grow by increasing staffing, supplying necessary resources, and transferring relevant technologies. Through sponsorships, these partnerships help more than 250 PhD and Master's students pursue

> their education, enhancing the university's standing as a centre for collaborative research and development.

The research findings highlight the research projects listed in a range of sectors, including agriculture, health, education, and environmental conservation. The agricultural projects include climate-smart agriculture and improving crop resilience; the health-related projects include clinical trials and public health education initiatives; the environmental projects focus on wetland management and afforestation, and the educational projects highlight capacity building in renewable energy and higher education.

4.1.2. Impact Assessment of R&D Initiatives

Evidence indicates that the university conducted a comprehensive impact assessment to evaluate the effectiveness of its research projects during the period spanning 2009 to 2015. This assessment involved surveying to gauge the impact of the research projects based on several key criteria: publication in reputable journals, successful patent applications, and technology transfer to the community. The findings revealed that nearly 90% of the projects failed to meet these criteria, resulting in significantly poor outcomes. Most importantly, the research projects sponsored by the university continue to face difficulties. Accordingly, to address these issues, the university implemented a new guideline in 2023, which requires principal investigators to have prior publications before applying for new projects. Key Informant 1, the research directorate of the university provided the following insight, stating as follows:

> The strategy intends to enhance the overall calibre and effect of our research initiatives by providing incentives for researchers to prioritize publication. We intend to increase the overall effectiveness of our research efforts and motivate scholars to participate in projects more successfully by promoting a culture of publishing.

The study highlights that multiple barriers impede the advancement and efficacy of research initiatives at universities and throughout Ethiopia. One of the primary issues is that research projects, especially in science, fail to receive adequate funding. This problem is made worse by the

absence of well-equipped labs required for thorough scientific investigations. Consequently, there is a poor system of incentives for researchers, which demotivates them and reduces their productivity. It might take longer to acquire materials and equipment due to the government's complicated and lengthy procurement procedure than it does to conduct the study. This inefficiency frustrates researchers and deters senior researchers from participating. Key informant 12, a senior researcher, at the university highlights the following:

> Research engagement is discouraged by an intersection of insufficient facilities, ineffective incentives, and poor procurement procedures, which has an impact on the calibre and volume of research. To promote a thriving research culture and guarantee that research initiatives have the time and assistance they require to succeed, these issues must be addressed.

4.2. Technology Transfer Achievements and Gaps

4.2.1. Achievements in Patent Registration

Although there was no formal documentation system in existence before 2020, the institution has a systematic approach to maintaining and registering patents in relation to technology transfer. The institution applied for and received 12 patent rights from the Ethiopian Intellectual Property Office (EIPO) between 2020 and 2023. In 2024, the university submitted seven intellectual property applications, which not only underscores its growing commitment to innovation but also implies an increasing engagement of the university in knowledge and technology transfer towards the local community this engagement contributes a pivotal role to regional development through transferring research findings to address pressing social issues. Most significantly, patented innovations such as the Sand-Plastic Interlocking Blocks Construction system and the Biogas Semi-Gasfer Stove benefit the regional industrial clusters. These innovations can enhance sustainable energy solutions and innovative building techniques, respectively, and improve living standards through equipping environmentally friendly alternatives in the region. In a similar vein, research participants from industrial bureaus highlight patents such as the Gluten-free starch producing methods and composition from '*Enstet'* and the poultry feed processing. These patents can support regional economic growth and

improve local livelihood. Notably, key informant 5, a technology transfer director, explained as follows:

> These inventions have the potential to improve industrial efficiency with the Packaging Machine, improve environmental monitoring with the Automatic Real-Time Water Quality Measurement System, and improve educational delivery by utilizing technology like the Blended Learning Platform. In doing so, they strengthen Hawassa University's position in promoting regional development by offering innovative solutions that meet pressing demands in industry, education, and environmental sustainability.

4.2.2. Gaps and Systemic Bottlenecks

The research findings point out that the challenges associated with university-industry linkages are as complicated in Hawassa, as they are in many other places of Ethiopia. The missing link between academia and business, which prevents efficient cooperation and information exchange, is one of the fundamental problems. This is made worse by the minimal flow of information, which makes people unaware of the positive benefits and possibilities that these kinds of collaborations may provide. Furthermore, the amount of financial resources allotted for technology transfer initiatives is severely limited. Due to this budgetary constraint, universities are unable to make the investments in facilities and research infrastructure required for fruitful industry engagement. Key informant 15, a faculty member stated, as follows:

> Along with impeding innovation, these issues also restrict universities' ability to conduct applied research that addresses pressing issues and industries' access to skilled labour. Addressing these problems calls for collaboration from both parties as well as backing from the government to create a better organized and financially supported strategy for developing these collaborations.

4.3. Community engagement initiatives

4.3.1 Successful Initiatives

The university ensures that the research findings are properly disseminated to the community, and participates in the local community in a number of engagement initiatives that are rooted in applied research that addresses particular local issues. The Science, Technology, Engineering, and Mathematics (STEM) centres of the university, which were founded in September 2015, are important educational centres for improving the abilities and knowledge of primary and secondary school instructors and students. The centre aims to develop students' capacity for creativity, innovation, and problem-solving. Most importantly, the Science Shared Campus (SSC) program is an initiative designed to enhance STEM education for top-talented public high school students. Key informant 9 described the scope of the STEM centre, as follows:

> For students in grades 9 through 12, the Science Shared Campus (SSC) Program provides practical laboratory instruction that is in line with the curriculum. Likewise, STEM outreach programs involve talented students in grades 7 through 12 through a range of activities, such as science fairs and after-school programs. The STEM centre offers robotics classes that include computer skills and programming for middle and high school students, runs competitive science competitions, and provides field trips to businesses and organizations to highlight practical STEM applications. In general, the STEM centre seeks to develop community members' specific abilities and expand knowledge.

Furthermore, it was discovered that the university acknowledges indigenous knowledge since community points of view may contribute significantly to the generation of novel insights. The institution promotes more effective and inclusive solutions that connect with the community by integrating Indigenous traditions and ideas into research. In addition to enhancing the research process, the collaboration approach ensures that the findings are lasting and appropriate for the culture being studied. Above all, Key Informant 10 emphasized how the institution might be able to improve results by utilizing indigenous expertise.

> By embracing community-driven research and valuing indigenous knowledge, the university plays a pivotal role in empowering local communities and contributing to their socio-

economic development. This model of engagement can serve as a powerful tool for bridging the gap between academic research and practical community needs, ultimately leading to more equitable.

4.3.2. Challenges and Misperceptions

It has been found that the university's challenge in fostering community engagement stems from a limited understanding of its mission that considers it exclusively as a benefactor rather than establishing partnerships. Indigenous knowledge is essential for creating sustainable and culturally relevant solutions, yet this view frequently results in a lack of respect and acknowledgement for it. The university is working to create an improved understanding of its role as a collaborative partner rather than only a donor to overcome these obstacles. This may also be accomplished by incorporating indigenous knowledge into research and educational initiatives, which guarantees community members' participation in project development and execution. Findings likewise indicate that there may be reluctance and uncertainty when the institution approaches the community for assistance with initiatives, especially those which are related to STEM (science, technology, engineering, and mathematics). Despite their advantages, the university's STEM programs are sometimes seen as nothing more than high school mathematics tutors. These initiatives are sometimes seen as stand-alone endeavours rather than essential parts of a more comprehensive framework for collaboration. The scarcity of resources is still another important issue. Concerning the financial limitations, key informant 15, and faculty member stated as follows:

> It is challenging to maintain long-term relationships or carry out comprehensive programs due to financial restrictions that significantly limit the scope and effect of community engagement projects. Accordingly, looking into alternate financing sources or nurturing collaborations with other stakeholders may assist ease financial restrictions and make it possible to implement community engagement programs that are more robust and long-lasting.

4.4. Opportunities and Structural Constraints

4.4.1. Existing and Emerging Opportunities

Concerning opportunities, there are both existing and emerging opportunities that promote the role of universities in regional innovation systems, particularly in research, technology transfer and community engagement. The university benefits from established research thematic areas, technology villages, and an increasing number of journal publications, along with decentralized research budget administration and annual international research workshops. Incentives for research publications also encourage staff participation. Similarly, Hawassa town is experiencing a surge in opportunities for industrial linkages, largely fuelled by the development of industrial clusters like the Hawassa Industrial Park (HIP), the Yirgalem Integrated Agro Industrial Park (YIAIP), and the Hawassa Industrial Zone, which collectively function as a manufacturing hub in the region. These industrial clusters have proven the region as a model for industrial growth in Ethiopia and throughout Africa due to their effectiveness in attracting foreign investment and generating job opportunities. Correspondingly, Key informant 17, a representative of Hawassa Industrial Park Investors Association (HIPIA) highlighted the following:

> The collaboration between academia and industry presents a promising solution, as it enables the development of tailored training programs and collaborative research initiatives that can enhance the competitiveness of local businesses. We are actively working to strengthen connections between universities and industries. This is achieved through the establishment of internship and externship programs, which help align academic curricula with the needs of the industrial sector.

Evidence indicates that the university and regional industrial clusters have a mutually beneficial, symbiotic relationship. The university contributes by providing skilled human resources, innovative research findings, and transferring knowledge based on new insights. In turn, the industrial clusters absorb this human capital by offering university students internships and staff externship programs, making a cycle of collaboration that enhances both parties' capabilities.

The research findings on community engagement reveal that Hawassa University capitalized on the COVID-19 epidemic to develop innovative strategies that enable the institution to introduce asset-based community development practices in an effort to address problems within the community, particularly in terms of resource allocation and community engagement. Hawassa University reacted by releasing a multitude of research projects and community-based initiatives. For example, key informant 12 stated as follows:

> During the pandemic, the university initiated 18 research projects dealing with different dimensions of the COVID-19 pandemic, which not only improved worldwide comprehension of the pandemic but also contributed to the development of regional approaches to combat it.

Furthermore, there is evidence to suggest that the pandemic experience underscored the need to utilize local knowledge and indigenous assets. The institution successfully customized its responses by communicating with the local community to understand their specific needs. This strategy promoted neighbourhood resilience and solidarity while strengthening the university's ability to effectively utilize local resources. The value of community-based initiatives and the strategic use of local resources to solve local problems were highlighted by key informant 14, who stated that "the pandemic served as a provocateur for Hawassa University to explore new ways of addressing local challenges." As a result of this experience, the university is now seen as a model for how universities may respond to emergencies while promoting sustainable growth and the welfare of their communities. Besides, key informant 22, the researcher emphasized the value of universities' engagement in regional development, and stated as follows:

> Through community engagement and a particular emphasis on feasible alternatives, universities have to demonstrate that they are dedicated to addressing urgent problems in a way that is effective and sustainable. This approach ensures that universities will be able to continue playing a vital role in regional development and community empowerment while also addressing other social and economic issues.

4.4.2. Challenges in fostering research, technology transfer, and Community engagement

Hawassa University, like other Ethiopian universities, is expected to set aside a certain amount of its budget for research and development. Typically, these institutions must allocate a minimum of 5% of their budgets to these types of projects. In reality, though, the actual allocation frequently falls short of this goal due to the absence of commitment to invest in research projects. For instance, key informant 1 underscored, the research directorate stated as follows:

> Research and development at Hawassa University has been reported to have a maximum budget allocation of 2.2%, which is less than half of the Ministry of Education's indicated proportion of 5%. This disparity might affect the university's capacity to promote innovation and academic excellence as it shows how difficult it is to strike a balance between its financial obligations to research and development and other operational requirements.

Notwithstanding emerging prospects, there are still substantial financial gaps and administrative bottlenecks. Often, the research budget is less than the 5% threshold. Scientific projects are halted by procurement delays, and the institutional structure for connections between academia and industry is still in its infancy. Furthermore, the impartiality of reported accomplishments is limited by the absence of critical external voices, such as independent observers, community organizations, or local industry leaders. Administrative self-reporting forms the basis of much of the present narrative.

5. Discussion

The development of Transformative Innovation Policies (TIP), as noted by Schot and Steinmüller (2018) and other researchers, highlights a shift from conventional linear models of innovation to more sophisticated and participatory approaches that involve a greater number of stakeholders and cover multiple aspects including economic, social, technological, and environmental factors (Ghazinoory et al., 2024). For African universities intending to integrate innovation into their institutional missions, such frameworks are fundamental. However, transforming this into meaningful societal implications

remains a challenge. Hawassa University's recent engagements including its development of 65 joint research projects and the publication of over 1,400 publications in the last 15 years—indicate that research engagement is rising.

Its commitment to innovation complements TIP's fundamental objectives, notably in terms of comes to addressing pressing societal issues. In this regard, technology villages and other community engagement initiatives target essential sectors including legal assistance, healthcare, and agriculture. Such initiatives align with the concept presented by Calderini et al. (2023) that, when established in community-driven needs, innovation policy may serve as an engine for sustainable and inclusive development. In a similar vein, Hawassa appears to be gradually institutionalizing the requirement that transformational innovation be sensitive to contextual societal issues (Hekkert et al., 2020).

Notwithstanding these optimistic developments, there continues to be still an essential barrier to integrating innovation along with impact. While the institution has made progress in patent development and is expanding its technology transfer ecosystem through technology transfer offices (TTOs), it continually encounters significant challenges. Nearly 90% of its research initiatives have failed to produce real-world results. This deficiency is due in part to a poor research culture, low commercialization capabilities, and systemic governance inadequacies. Petersen et al. (2022) underline that universities must consciously complete the loop between research and society requirements, which Hawassa is aiming to do through projects like STEM centres and Indigenous knowledge integration.

Hawassa University's entrepreneurial attention, which is characterized by strengthened applied research, innovation networks, and collaborative efforts between stakeholders, distinguishes it from traditional academic paradigms. These developments have significance for universities that intend to become entrepreneurial (Guerrero et al., 2016; Rådberg & Löfsten, 2024). The institution's affiliations with regional industrial clusters including Hawassa Industrial Park (HIP), Yirgalem Agro Processing Industrial Park (YIAIP), and Hawassa Industrial Zone (HIZ) are a signal of an emerging relational innovation

ecosystem. Nevertheless, these improvements would remain episodic rather than systematic in the absence of sufficient institutional support.

Comparable to other East African universities like Makerere University and the University of Nairobi, Hawassa University has a commitment to employing research and innovation to accelerate regional development. Hawassa University has made progress through themed research initiatives and increasing patent activity, despite institutional and financial restrictions. As a research university, Hawassa has driven an increase in local innovation projects, partnerships abroad, and research initiatives. Nonetheless, the institution continues to struggle with structural limitations including inadequate funding for research, poor lab facilities, and limited inter-university collaboration.

Community engagement, a critical component of third-mission activity, is undeveloped. Despite Hawassa University's engagement with development-oriented initiatives and technology transfer platforms community engagement appears to be unpredictable. As O'Brien et al. (2022) point out, meaningful community engagement entails trust, continuous dedication, and collaborative culture, among other requirements characteristics many African universities are failing to institutionalize. At Hawassa, local people have a limited awareness of STEM's potential and the university's societal role, which impedes increased engagement.

As a result, universities might consider a multitude of strategies, including taking advantage of expats' collaborations for funding and mentorship, building innovative centres to bring in private-sector partnerships, and aligning research agendas with local development strategies to secure government and donor funding (World Bank, 2020; Altbach et al., 2018). The practical approaches may additionally promote collaborative systems of governance at universities that promote inclusive decision-making and accountability in research planning.

6. Conclusion and Policy Recommendations

6.1. Conclusion

As the transformative Innovation policy suggests, universities, particularly research institutions, have been mandated to engage in

research initiatives, technology transfer, and community engagement activities that deal with critical societal issues. African and other emerging nations' research institutions have resource constraints. This study addresses both the challenges and prospects of technology transfer and community engagement initiatives in research universities, using Hawassa University as a case study. The research findings indicate that Hawassa University growing more engaged in third missions, including applied research projects, patented innovations, and community outreach initiatives, in addition to research. Through the generation of 1400 staff-led published research outputs and 63 collaborative research projects jointly with global partners, the institution engaged in viable knowledge exploration activities. Additionally, its portfolio of patented technologies—which includes indigenous starch extraction methods, eco-hydrology-based restoration systems, and the biogas semi-gratifier stove— shows an essential contribution to local innovation and dealing with issues. Many of these inventions have been shared with the surrounding community, highlighting the university's recognition of its developmental roles.

Community engagement initiatives, including the development of STEM centres and the integration of indigenous knowledge into research, signify a positive shift toward participatory and locally grounded academic practices. Such initiatives align with broader efforts to transform the university into an institution that is not only research-intensive but also socially embedded and responsive to its regional context. Notwithstanding these developments, structural issues still restrict the efficacy and scaling of Hawassa University's technology transfer and community engagement efforts. Lack of performance-based incentives for academic personnel, restricted access to advanced laboratory facilities, insufficient and unpredictable research funding, and an ineffective and bureaucratic procurement system (i.e. red tape) are some of the main obstacles. Additionally, community engagement in strategic planning is still lacking, often driven by outreach principles rather than collaborative partnerships.

Structural issues related to Ethiopia's higher education governance structure aggravate these challenges by restricting the institutions' capabilities to effectively adapt to local developmental demands through adaptability and autonomy. While the university takes

advantage of its proximity to flourishing technological villages and regional industrial clusters, these resources are underutilized due to poor collaboration and inadequate innovation ecosystems.

6.2. Policy recommendation

The study offers a set of strategic policy recommendations targeted at addressing substantial barriers to technology transfer and community engagement at universities, along with identifying structural catalysts. These recommendations intend to strengthen the role that universities including Hawassa University contribute to regional innovation systems.

Regarding community-based frameworks to be successful and innovative, strategic financing arrangements ought to be consolidated, procurement and governance systems are required to be reformed, and a partnership-oriented strategy regarding community engagement might be adopted as well. Universities should embrace a co-creative paradigm founded on reciprocity and collective learning. Redesigning scholastic incentive schemes to acknowledge contributions to innovation, technology transfer, and community engagement is essential. The university's relevance to its regional setting may be improved by devoting the highest priority to fostering the development of innovation hubs that are consistent with local industry demands. This would promote entrepreneurship, applied research, hands-on training, and the dissemination of technology.

6.3. Limitations and Future Research Directions

Although informative, this case study has some limitations. Primarily, it depends on qualitative data, which offers richness but excludes the capacity to extrapolate findings or measure effect. Additionally, the study concentrates exclusively on a single university and therefore restricts its potential of drawing comparisons between other national or regional contexts. Third, it was challenging to engage with a greater range of stakeholders, in particular those from the business sector and marginalized groups, due to time constraints and logistical limitations. Furthermore, the study acknowledges several limitations, including unjustified swings regarding project figures, unidentified consequences of partnerships on tangible outcomes, missing relevant figures and an absence of analysis on study quality, including citation impact, journal

rankings, and real-world applications beyond patent counts, which are attributed by undocumented factors such as insufficient funding data, policy changes, and the broader context of academic and industry partnerships.

Future studies must incorporate comparative assessments of university engagement across different regional settings to identify context-specific effectiveness drivers and impediments. Longitudinal research is additionally valuable for analysing the long-term impact and sustainability of the transfer of technologies and community engagement initiatives. Further research should also focus on the ways that university cultures and governance structures affect universities' capabilities to fulfil their roles as catalysts for social transformation.

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