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Original Research

Identifying Key Gaps in Knowledge and Innovation Technology Transfer Using Pareto Analysis: Evidence from Horro Guduru Wollega Zone, Western Ethiopia

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Abstract

Technology transfer is the process of moving knowledge from universities and research institutions into practical application, but this process remains critically weak in Ethiopia despite substantial investment in higher education and a national Science, Technology and Innovation Policy. This study assessed the status of technology transfer for knowledge and innovation in the Horro Guduru Wollega Zone, Western Oromia, Ethiopia, using a convergent parallel mixed-methods design. Data were collected from 185 respondents (92.5% response rate) across five institutions in the zone – using questionnaires, semi-structured interviews, direct observation, and document review. Overall technology-transfer effectiveness was rated critically low (mean = 1.48/5), no functional technology transfer office existed, no patents or licenses had been executed in five years, and 88% of respondents reported no university–industry collaboration. Pareto analysis of 700 recorded complaints identified two "vital few" gaps accounting for 71.4% of all complaints: Weakness in Competition (35.7%) and Creativity Gap (35.7%). Root-cause analysis using fishbone diagrams and why-why analysis traced these to captive markets that remove competitive pressure to innovate and to the absence of physical innovation infrastructure. Building on these findings, the study proposes a Center for Competitiveness and Innovation (CCI), a multi-stakeholder hub with five integrated units, to be implemented through a phased strategy. The study contributes methodologically, empirically, and practically, and offers recommendations for policymakers, universities, TVET colleges, industry and development partners.

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INTRODUCTION

Science, technology and innovation (STI) are widely recognized as fundamental drivers of economic growth, productivity and sustainable development (Walsh *et al*., 2020). The transformation of research knowledge into tangible products, processes and services – broadly termed "technology transfer" – is the critical bridge between research and economic value creation (Bozeman, 2000). Technology transfer is defined as the deliberate, systematic process of acquiring, sharing or licensing equipment, skills, knowledge, intellectual property and business processes for the purpose of manufacturing, applying processes, or rendering services (Miesing *et al*., 2007), and can occur through licensing, research collaboration, consultancy, spin-offs, internships, faculty mobility and informal networks (Arnold *et al*., 2012). Without effective technology transfer, investment in research, higher education and technical training yields sub-optimal returns, as knowledge remains confined to journals and laboratories rather than diffusing into productive use.

The challenges are particularly acute in Africa, where technology transfer remains sporadic, unsystematic and largely unmeasured (Mujuru, 2017). Few African universities have functional Technology Transfer Offices (TTOs); patenting and licensing rates are negligible; and industry–university collaboration is minimal (Komen, 2019). This "knowledge paradox" – high research activity but low economic impact – is a fundamental obstacle to Africa's development aspirations. Ethiopia ratified a national Science, Technology and Innovation Policy in 2012 that mandates Technology Transfer and Innovation (TTI) offices in all public universities (MoST, 2012), and most universities have established such offices on paper. However, the practical effectiveness of these mechanisms remains questionable: a 2019 evaluation found that most university TTI offices lack dedicated staff, budgets and performance metrics, and that industry–university collaboration remains "minimal and ad hoc".

The Horro Guduru Wollega Zone is a predominantly agricultural area in Western Oromia and hosts a notable concentration of knowledge-

producing and industrial institutions within a 30-kilometre radius. These include a public university campus, a technical and vocational education and training (TVET) college, a large-scale agro-industrial factory, and numerous small and medium-sized enterprises. Although there were several institutions and organizations in the zone. The core problem is therefore not an absence of research or technical capacity, but there is no adequate information available on this area linking knowledge generators with knowledge users – and the specific factors driving this weak performance, their relative magnitude and root causes had not previously been systematically quantified (Hailu & Desalegn, 2023).

The present study addresses those gaps by evaluating the status of technology transfer in the Horro Guduru Wollega Zone, quantifying the major barriers using Pareto analysis (the 80/20 principle that a small number of causes typically account for the majority of effects (Juran, 2019), identifying underlying root causes through cause-and-effect (fishbone) diagramming (Ishikawa, 2020), and developing an evidence-based strategic framework for improvement. Therefore, the specific objectives were to: assess the current level of technology-transfer awareness, infrastructure and activity across the key institutions; identify, categories and quantify the key gaps influencing technology-transfer performance; apply Pareto analysis to distinguish the "vital few" high-impact gaps from the "trivial many"; conduct root-cause analysis of the priority gaps using fishbone diagrams and why-why analysis; and develop an actionable strategic framework.

MATERIALS AND METHODS

Research Design and Study Area

The study adopted a pragmatist research philosophy (Creswell, 2017) and a convergent parallel mixed-methods design, in which quantitative and qualitative data were collected simultaneously, analyzed separately, and integrated at interpretation (Creswell & Clark, 2017). The study was conducted in the Horro Guduru Wollega Zone, one of 20 zones of the Oromia Region, located approximately 330 km west of Addis Ababa and comprising 11 districts and one city administration (Shambu, the zonal capital). The zone has an estimated population of 869,970, 92% rural, with an agriculture-dominated economy (CSA, 2022). The zone hosts Wollega University Shambu Campus, Shambu TVET College, the Fincha Sugar Factory, and numerous zone- and district-registered Small and Medium Enterprises (SMEs (WU, 2023; Federal TVET Agency, 2023; FSF, 2022). Data were collected between November 2024 and May 2025.

Target Population and Sample Size

The target population comprised all individuals directly involved in technology transfer across the five institutions, totaling an estimated 616 individuals: 292 academic staff at the University, 67 instructors at the TVET college, 145 managers and technical staff from the sugar factory, 47 zone-level (SME) owners/managers, and 65 district-level SME owners/managers. The minimum sample size was determined using Yamane's (1967) formula for finite populations, $n = N / [1 + N(e)^2]$, with N = 616 and a margin of error e = 0.07, giving n = 153. To accommodate an anticipated non-response rate of approximately 30%, the target sample was increased to 200 (Sekaran & Bougie, 2019). A stratified purposive sampling technique was used: the population was stratified by institution, sample size was allocated roughly proportionally to each stratum, and respondents within each stratum were purposively selected based on role and likely knowledge of technology transfer (e.g., faculty with ≥ 2 years' experience, TVET instructors with ≥ 3 years, factory managers/team leaders with ≥ 5 years, and SME owners/managers with ≥ 3 years of operation). The resulting distribution is shown in Table 1.

Table 1. Sample Size Distribution by Institution in the study area.

Institution	Target Sample (n)	Selection Criteria
Wollega University Shambu Campus	60	30 lecturers, 20 researchers, 10 department heads/deans
Shambu TVET College	40	30 instructors, 10 department heads/experts
Fincha Sugar Factory	50	20 production managers, 15 maintenance/engineering, 10 R&D, 5 other
Zone-level SMEs	25	25 SME owners/managers
Woreda-level SMEs	25	25 SME owners/managers
Total	200	–

Source: Field survey design, 2023.

Data Collection Instruments

Four instruments enabled methodological triangulation (Bryman, 2016). A structured questionnaire, adapted from a validated instrument used for technology-transfer effectiveness assessment in Vietnamese universities (Ha & Nguyen, 2020) and modified for the Ethiopian context, contained 35 items across four sections: (A) demographic information; (B) technology-transfer awareness and infrastructure (10 items, 5-point Likert); (C) technology-transfer activity and effectiveness (12 items, 5-point Likert and open-ended); and (D) gap assessment (7 items rated Not a problem to Severe problem across five predefined gap categories: Weakness in R&D, Technical Skill Transfer Gap, Weakness in Competition, Linkage Gap, and Creativity Gap). For the Pareto analysis, a "complaint" was recorded each time a respondent rated a gap category as a "Major problem" (4) or "Severe problem" (5), with each respondent able to contribute between 0 and 5 complaints. The questionnaire was administered in English and, where preferred, Afan Oromo, with back-translation used to verify accuracy (Brislin, 1970). A semi-structured interview guide covering ten themes (role and experience, perceived Technology Transfer (TT) status, examples of successful/unsuccessful TT, barriers, and recommendations) was used with 15 purposively selected key informants (three per institution). An observation checklist was used to document infrastructure and evidence of technology-transfer activity at each institution, and relevant institutional documents (strategic plans, TTI annual reports, curricula) were reviewed where available.

Validity and Reliability

Face and content validity were established through expert review by three industrial engineering experts (not part of the research team) and a table of specifications mapping items to objectives; construct validity was supported by adapting a previously validated instrument (Ha & Nguyen, 2020). Quantitative reliability was assessed through a pilot test with 20 respondents not included in the final sample; Cronbach's alpha exceeded the 0.70 threshold for all sections (Table 2). Qualitative rigour was supported through prolonged engagement, triangulation, member checking and peer debriefing (Lincoln & Guba, 1985); intercoder agreement for thematic coding was 89% (Cohen's $\kappa = 0.84$).

Table 2. Reliability Statistics (Cronbach's Alpha)

Section	No. of Items	Pilot n	Cronbach's α	Interpretation
Section B – Awareness & Infrastructure	10	20	0.85	Good
Section C – Activity & Effectiveness	12	20	0.89	Good
Section D – Gap Assessment	7	20	0.87	Good
Overall (all Likert items)	29	20	0.87	Good

Source: Field survey, pilot test, 2023 (SPSS v.26).

Data Analysis

Quantitative data were analyzed using SPSS version 26 software and Microsoft Excel 2019. Descriptive statistics (frequencies, percentages, means, and standard deviations) summarized demographic and Likert-scale data. Pareto analysis, the primary analytical technique, followed standard steps (Pyzdek & Keller, 2018; Juran, 2019): defining the problem (ineffective technology transfer); identifying gap categories; tallying complaint frequencies per category; calculating percentage and cumulative percentage contributions; constructing the Pareto diagram; and identifying the "vital few" categories accounting for the majority of complaints. Qualitative data (interview transcripts, observation notes, document excerpts) were analyzed using NVivo 12 following Braun and Clarke's (2022) six-phase thematic analysis (familiarization, initial coding, searching for themes, reviewing themes, defining themes, and write-up). Quantitative and qualitative findings were integrated using a joint-display approach comparing Pareto percentages with qualitative themes (Creswell & Clark, 2017).

RESULTS

Response Rate and Respondent Profile

Of 200 questionnaires distributed, 185 were returned complete, yielding a response rate of 92.5% (Table 3), attributable to in-person distribution and institutional support. Of the 185 respondents, 62.2% were male and 37.8% female, with the sugar factory showing the highest male proportion (86.4%) and the TVET college the most balanced distribution (55.3% male). Mean age was 34.7 years (SD = 8.2) and mean work experience 8.4 years (SD = 6.7). Educationally, 18.4% held a master's degree or higher, 45.9% a bachelor's degree, 21.6% a diploma, and 14.1% a certificate or secondary education (Table 4).

Table 3. Response Rate by Institution

Institution	Distributed (n)	Returned (n)	Response Rate (%)
Wollega University Shambu Campus	60	58	96.7
Shambu TVET College	40	38	95.0
Fincha Sugar Factory	50	44	88.0
Zone-level SMEs	25	23	92.0
District -level SMEs	25	22	88.0
Total	200	185	92.5

***Source**: Field survey, 2023.*

Table 4. Demographic Summary of Respondents

Variable	Category	Frequency(n)	Percentage(%)
Gender	Male	115	62.2
	Female	70	37.8
Age	20–30 years	52	28.1
	31–40 years	78	42.2
	41–50 years	41	22.2
	51+ years	14	7.6
Education	Master's or higher	34	18.4
	Bachelor's	85	45.9
	Diploma	40	21.6
	Certificate/Secondary	26	14.1
Institution	University	58	31.4
	TVET	38	20.5
	Sugar Factory	44	23.8
	Zone SMEs	23	12.4
	District SMEs	22	11.9

***Source**: Field survey, 2023 (n = 185).*

Current Status of Technology Transfer

Awareness of technology transfer mechanisms was very low across all institutions. Mean agreement with "my institution has a clear, documented technology transfer policy" was 1.8/5 (SD = 0.9); with "I am aware of how to submit an invention disclosure", 1.5/5 (SD = 0.8); and with "I can name at least one technology successfully transferred from my institution to industry in the past five years", 1.3/5 (SD = 0.6) (Table 5). University faculty reported marginally higher awareness (mean 2.1) than TVET staff (1.7) and SME respondents (1.3), though all remained in the "disagree" range.

Table 5. Awareness of Technology-Transfer Mechanisms by Institution (Mean Likert Scores)

Awareness Item	University (n=58)	TVET (n=38)	Sugar Factory (n=44)	SMEs (n=45)	Overall (n=185)
Clear TT policy exists	2.2	1.8	1.9	1.4	1.8
Know how to submit invention disclosure	1.9	1.5	1.4	1.2	1.5
Can name a successful TT case	1.6	1.3	1.5	1.1	1.3

Scale: 1 = Strongly Disagree … 5 = Strongly Agree. Source: Field survey, 2023.

Wollega University Shambu Campus has a Technology Transfer and Innovation (TTI) office on paper, but observation and interview data showed it to be less functional: no dedicated staff (one faculty member with a nominal 20%-time allocation), zero operational budget in 2022/23, and no documented invention-disclosure, IP, or licensing procedures. Shambu TVET College has no TTO. The Fincha Sugar Factory maintains an internal R&D unit and training center but has no mechanism for transferring technology to, or receiving it from, the university, TVET college or SMEs. No SME reported any technology-transfer mechanism or awareness (Table 5). Consistent with this, zero patents, zero licenses and zero spin-off companies had been recorded at either the university or TVET college in the preceding five to ten years, and formal university–industry collaboration (contracts, MOUs, funded projects) was reported by only two respondents; 88% of respondents reported no collaboration of any kind. Overall technology-transfer effectiveness was rated "very low" by 67.5% of respondents and "low" by a further 20.0%, giving an overall mean of 1.48 (SD = 0.78) on a 5-point scale, with no respondent rating effectiveness "very high" (Table 5).

Pareto Analysis of Technology-Transfer Gaps

A total of 700 complaints (ratings of "Major problem" or "Severe problem") were recorded across the five predefined gap categories. As shown in Table 6 and Figure 1, weakness in the Competition and Creativity Gap each accounted for 250 complaints (35.71% each), together contributing 71.4% of all complaints – the Pareto "vital few." Weakness in R&D contributed a further 14.3% (cumulative 85.7%), while Technical Skill Transfer Gap and Linkage Gap each contributed 7.1% (cumulative 100%) and were classified as the "trivial many." Within

Weakness in Competition, the leading sub-causes were a captive-market/monopoly mentality (39.2% of the category's complaints, driven largely by the sugar factory's guaranteed government-set market) and SMEs selling undifferentiated products (26.8%). Within Creativity Gap, the leading sub-causes were the absence of incentives for innovation (35.2%) and the absence of innovation exhibition centers or maker spaces (26.0%).

Table 6. Pareto Analysis of Technology-Transfer Gaps

Gap Category	Complaint Frequency (n)	Percentage (%)	Cumulative Percentage (%)
Weakness in Competition	250	35.71	35.71
Creativity Gap	250	35.71	71.42
Weakness in R&D	100	14.29	85.71
Technical Skill Transfer Gap	50	7.14	92.86
Linkage Gap	50	7.14	100.00
Total	700	100.00	–

Source: *Field survey, Section D (Gap Assessment), 2025.*

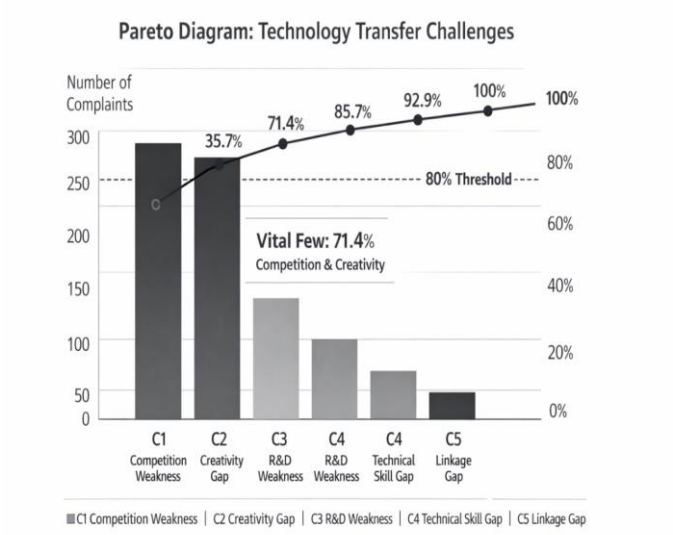

Figure 1. Pareto Diagram of Technology-Transfer Challenges

Source: *Field survey Pareto analysis, 2025.*

Root-Cause Analysis

Fishbone (cause-and-effect) diagrams were constructed for each vital-few gaps across six categories: Environment, Methods, Materials, Personnel, Measurement, and for Competition Weakness, Market/Support/Resources/Policy sub-branches (Figures 2 and 3). For Creativity Gap, root causes clustered around a risk-averse institutional culture with no incentives for innovation and fear of failure (Environment); a curriculum emphasizing rote learning over creative problem-solving, and the absence of innovation competitions or demonstration events (Methods); the absence of prototyping equipment and seed funding (Materials); and the absence of faculty/instructor training in creativity or innovation methods (Personnel). For Competition Weakness, root causes clustered around a captive market and absence of a benchmarking culture (Environment/Market); the sale of undifferentiated products with no market intelligence or business-advisory support (Methods/Support); and bureaucratic hurdles that discourage new entrants (Policy). A subsequent why-why analysis traced several of these proximate causes to a common upstream root: weak enforcement of quality standards and procurement policy, and the absence of implementation guidelines for the national STI policy at the zonal level.

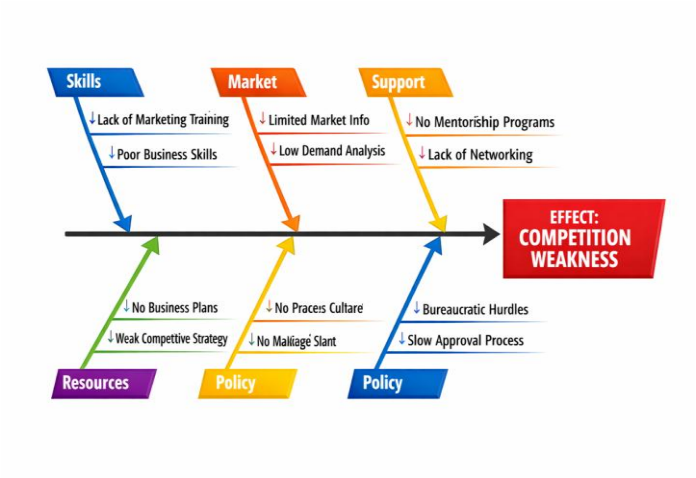

Figure 2. Fishbone Diagram – Root Causes of Competition Weakness

Source: *Fishbone root-cause analysis, 2025.*

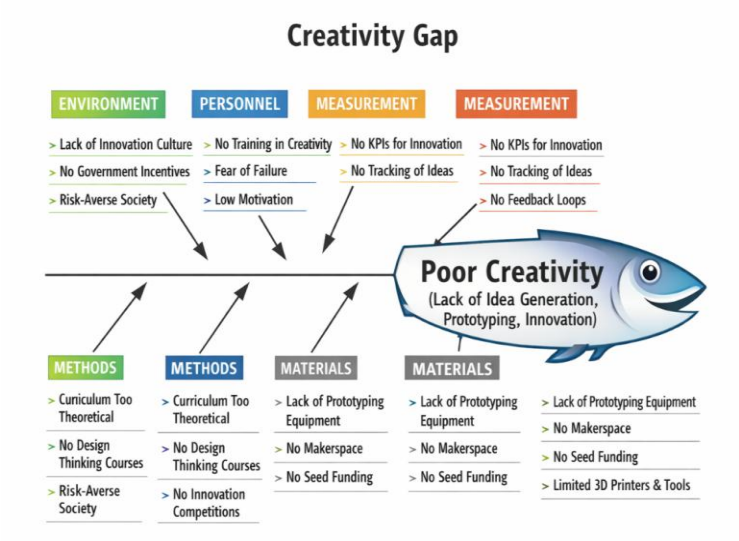

Figure 3. Fishbone Diagram – Root Causes of Creativity Gap

Source: *Fishbone root-cause analysis, 2025.*

Qualitative Findings

Thematic analysis of the 15 key-informant interviews (142 transcript pages) yielded consistent themes that corroborated the quantitative results (Table 7). All 15 interviewees (100%) described institutional isolation between the university, TVET college, industry and SMEs, despite their physical proximity. As one sugar-factory manager stated: "The university is just down the road, but I have never met any of their engineering professors". All 15 interviewees also described an absence of competitive pressure: as one SME owner explained, "Why should I innovate? My customers buy the same gate they bought last year". Fourteen of 15 interviewees (93%) cited the absence of any physical space to prototype or exhibit ideas, and 12 of 15 (80%) noted that university research is oriented toward promotion criteria rather than industrial impact. Despite these constraints, 14 of 15 interviewees (93%) expressed that the zone possesses substantial untapped potential given its combination of a university, a TVET college, a large anchor industry, and numerous SMEs.

Table 7. Major Qualitative Themes from Key-Informant Interviews (n = 15)

Theme	Description	Frequency
Institutional isolation	No collaboration between university, TVET, industry and SMEs	15/15 (100%)
No competitive pressure	Captive markets, no differentiation, no incentive to improve	15/15 (100%)
Resource constraints	Lack of equipment, funding and qualified staff	15/15 (100%)
No space to innovate	Absence of prototyping, exhibition and collaboration infrastructure	14/15 (93%)
Untapped potential	Strong belief that connecting existing institutions would transform the zone	14/15 (93%)
Policy-implementation gap	National policies exist but are not implemented at zonal/institutional level	11/15 (73%)
Research for promotion, not impact	Faculty research is oriented to publication/promotion, not industry needs	12/15 (80%)

Source: *Thematic analysis of interview transcripts (NVivo 12), 2025*

Integrating the quantitative and qualitative strands showed strong convergence for the two vital-few gaps: the Pareto finding that Competition Weakness accounts for 35.7% of complaints aligned with the universal (100%) interview theme of "no competitive pressure," and the Creativity Gap finding aligned with the theme of "no space to innovate" (93%) and a theoretical curriculum (87%). The qualitative data further suggested that lower-ranked Technical Skill and Linkage gaps may be downstream symptoms of the creativity gap; e.g., the skill gap traced to a theoretical curriculum, and the linkage gap to the absence of any institutional venue where linkage could occur, implying that interventions targeting the vital few may also alleviate the trivial many.

Proposed Framework: Center for Competitiveness and Innovation

Based on the vital-few gaps and their root causes, the study proposes a Center for Competitiveness and Innovation (CCI): a zonal, multi-stakeholder hub governed by a board representing the zonal administration, the university, the TVET college, the sugar factory, SME associations, and development partners in an observer capacity (Figure 4). The CCI comprises five integrated units: an Innovation Hub, a Competition Office, an R&D Liaison Unit, a Training Academy, and a Linkage Desk (Table 8) – with approximately 80% of resources directed at the Innovation Hub and Competition Office in proportion to the vital-few gaps they address. Implementation is proposed over three phases across five years: Year 1 (governance set-up, seed funding, makerspace establishment, first Innovation Challenge and market-intelligence report); Years 2–3 (scale-up of all units, an MOU network across institutions, and the first zonal Technology Expo); and Years 4–5 (transition to a cost-recovery and industry-sponsorship model, with replication of the CCI approach in other zones).

Table 8. Proposed CCI Units, Targeted Gaps and Key Activities

CCI Unit	Primary Gap Targeted	Key Activities
Innovation Hub	Creativity Gap (35.7%)	Makerspace (3D printers, laser cutter, basic tools); annual Innovation Challenge; monthly demonstration sessions; seed funding for prototypes
Competition Office	Weakness in Competition (35.7%)	Quarterly market-intelligence reports; inter-zone benchmarking visits; SME quality/innovation awards; one-on-one competitiveness advisory
R&D Liaison Unit	Weakness in R&D (14.3%)	Researcher–industry matchmaking; grant-writing support; quarterly "Research Meets Industry" forums
Training Academy	Technical Skill Gap (7.1%)	Short courses in IP management, commercialization, prototyping and design thinking; train-the-trainer for TVET instructors
Linkage Desk	Linkage Gap (7.1%)	Facilitated internships; formal MOUs between institutions; annual zonal Technology Expo

Source: *Authors' design, based on study findings, 2025.*

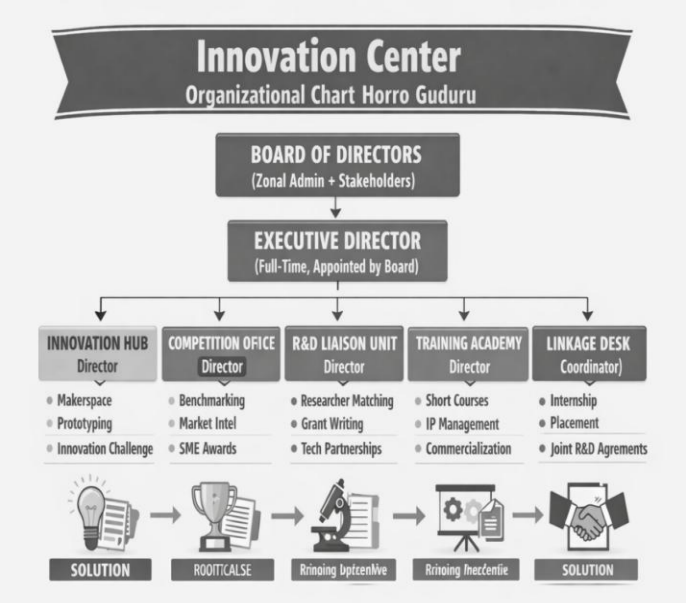

Figure 4. Proposed Organizational Structure of the Center for Competitiveness and Innovation (CCI)

Source: *Authors' design, 2025.*

DISCUSSION

The finding that Wollega University's TTI office exists but is less functional echoes earlier findings that Ethiopian university TTOs are largely "paper exercises" established to comply with the 2012 STI Policy rather than functioning mechanisms (Assefa & Mesfin, 2022), and is consistent with the Ethiopian Academy of Sciences' (2019) conclusion that most TTI offices lack dedicated staff, budgets, and performance metrics. (Adugna, 2024) documents a similar pattern in a dissertation-based assessment of university–industry linkage across several Ethiopian public universities, finding that formally mandated linkage structures were rarely matched by functioning practice. A comparable resourcing deficit appears to drive outcomes elsewhere on the continent: (Fadeyi *et al*., 2019) found that Nigerian universities with stronger technology-transfer resourcing, including dedicated technology-transfer staff and consortium-funded linkage projects, reported correspondingly higher licensing, royalty and spin-off outputs, reinforcing the resourcing explanation offered here. This suggests that mandating TTOs without accompanying resourcing and accountability requirements, such as minimum staffing and budget thresholds and mandatory Key Performance Indicators (KPI) reporting, is unlikely to produce functional technology transfer, a conclusion consistent with the Ministry of Science and Technology's (2022) own acknowledgement of "significant implementation gaps."

Preliminary stakeholder consultations indicated that, despite this institutional density, no formal or systematic technology-transfer

mechanism connects them: university research is rarely shared with industry, TVET training remains largely theoretical, the sugar factory's internal R&D is disconnected from the university and TVET college, and SMEs operate with no access to technical assistance or innovation support.

Comparison with other African contexts situates the zone's status within, and in some respects below, regional norms: South African universities show materially higher technology-transfer activity, attributed to more functional TTOs at research-intensive institutions, although still below OECD benchmarks (Kruss *et al*., 2015); Kenyan technology transfer has concentrated on agriculture, a sector in which the Horro Guduru zone shows little activity despite its agricultural economy; and Nigerian universities report modestly higher patenting and licensing activity than found here (Olayinka & Ojo, 2017). A distinctive feature of the present case is the presence of a large anchor industry (Fincha Sugar Factory) that is well resourced but entirely disconnected from the university and TVET college – a "silent anchor industry" configuration that may be characteristic of zones built around large parastatal enterprises and that represents a specific, underexploited entry point for intervention.

Theoretically, the findings are inconsistent with a linear model of innovation, in which technology transfer is assumed to flow from basic research through applied research to diffusion (Godin, 2018); the constraint identified here is not a shortage of research activity but a shortage of demand-pull from industry and of translation infrastructure. This is more consistent with interactive and Triple Helix models of innovation, which emphasize bidirectional flows among university, industry and government and the role of intermediary structures (Etzkowitz & Leydesdorff, 2000). The magnitude of the competition-weakness finding (35.7% of complaints) supports evolutionary-economics accounts in which competitive pressure is a primary driver of the demand for innovation (Nelson, 2019): where markets are captive, as with the sugar factory's guaranteed government-set market and SMEs' undifferentiated product lines, firms have little incentive to seek or adopt new technology regardless of its availability. Equally, the creativity-gap finding is consistent with the absorptive-capacity literature (Cohen & Levinthal, 2020), which holds that firms and individuals require physical infrastructure, cultural support for risk-taking, and relevant human-capital development in order to generate and absorb innovation – conditions that were largely absent in the study area. Taken together, these findings imply that technology-transfer interventions in comparable settings should address demand-side competitive pressure and creative/absorptive capacity concurrently with, rather than instead of, conventional technology-supply measures such as research funding and TTO establishment.

CONCLUSION

Technology transfer for knowledge and innovation in the Horro Guduru Wollega Zone is critically weak: awareness of technology-transfer mechanisms is very low, there are very few institutions that operate a functional technology transfer office, few patents, licenses, or spin-offs have been generated in at least five years, and university–industry collaboration is almost entirely very low. Pareto analysis of 700 recorded complaints identified Weakness in Competition and Creativity Gap as the "vital few" gaps, jointly accounting for 71.4% of all complaints, while Weakness in R&D, Technical Skill Transfer Gap, and Linkage Gap constitute a comparatively "trivial many." Root-cause analysis traced these vital-few gaps to captive markets that remove competitive pressure to innovate and to the absence of physical and institutional innovation infrastructure, respectively. These findings indicate that generic, undifferentiated technology-transfer interventions are unlikely to be effective, and that resources should instead be concentrated on the two priority gaps identified.

The proposed Center for Competitiveness and Innovation (CCI) offers an evidence-based, phased framework for addressing these priorities through an Innovation Hub and Competition Office (targeting the vital few) alongside complementary R&D Liaison, Training Academy, and Linkage Desk functions. Priority actions include establishing a functional, adequately resourced Technology Transfer Office at Wollega University Shambu Campus with dedicated staff and a minimum operating budget; establishing a zonal makerspace and seed-funding mechanism for prototyping; introducing SME competitiveness measures such as quality/innovation awards and market-intelligence services; and formalizing an Industry–Academia Liaison Committee linking the university, TVET college and Fincha Sugar Factory. The study contributes methodologically through the novel application of Pareto and fishbone quality-improvement tools to technology-transfer diagnosis, empirically as the first systematic quantification of technology-transfer gaps in this zone, and practically through the CCI framework. Given the single-zone, cross-sectional design, future research should prioritize a longitudinal evaluation of CCI impact, replication of this Pareto-based diagnostic approach in zones with different economic structures, and a detailed cost–benefit analysis of CCI establishment to support investment decisions by government and development partners.

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Data Availability

The data supporting the findings of this study can be accessed from the corresponding author upon reasonable request.

Conflict of Interest

The authors declare that they have no competing interests.

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