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*Modelling Functional Innovation and Technology Transfer Units for Research Commercialisation: A Kenyan Higher Education Perspective*

# Modelling Functional Innovation and Technology Transfer Units for Research Commercialisation: A Kenyan Higher Education Perspective

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**Abstract**
Kenyan universities struggle to turn research into technologies, enterprises and services because of fragmented structures, limited capacity and weak industry linkages. Existing studies diagnose these barriers but do not specify what makes an Innovation and Technology Transfer Unit (ITTU) functional. Using an integrative review of scholarly literature and Kenyan policy documents, this paper develops a conceptual, institution-level model with eight interdependent dimensions: governance and strategy; innovation identification and assessment; intellectual property management; technology development and validation; incubation and enterprise development; industry and market linkage; commercialisation and technology transfer; and monitoring, evaluation and learning. The ITTU leads core functions and coordinates existing units, supported by seven enabling conditions. The paper contributes a portfolio-based approach, institutional configurations, cohort-based performance measures, public-value safeguards and seven testable propositions. The model is untested, and a validation agenda is proposed.

## Introduction

Universities traditionally teach, research and serve their communities. Knowledge-based economies now also expect them to drive innovation, entrepreneurship, competitiveness, jobs and solutions to societal challenges (Etzkowitz & Leydesdorff, 2000; Etzkowitz et al., 2000). This underpins the entrepreneurial university and university–industry–government relationships.

Converting knowledge into products, services and enterprises is not automatic. Technology Transfer Offices (TTOs) and similar structures bridge this gap and can facilitate patenting, licensing, collaborative research and spin-offs (Siegel et al., 2004; Siegel et al., 2007). Their effectiveness depends on organisational design, staffing, incentives, positioning, resourcing and relationships with researchers and industry, not on mere existence (Siegel et al., 2003; Siegel et al., 2007). Without authority, expertise, financing or integration, a TTO becomes an administrative office rather than a commercialisation intermediary.

These concerns are acute in Kenya. The Science, Technology and Innovation (STI) Act No. 28 of 2013 created NACOSTI, the National Research Fund (NRF) and the Kenya National Innovation Agency (KeNIA) (Republic of Kenya, 2013); KeNIA manages the national innovation system (KeNIA, n.d.-a). Yet commercialisation remains difficult: the Kenya Innovation Outlook reported unclear TTO mandates, inadequate staffing and skills, limited funding, low visibility, unclear positioning, weak procedures and insufficient researcher incentives (Atela et al., 2022). KeNIA's

Institutional Commercialisation Support programme targets these systems (KeNIA, n.d.-b), and Kenyan scholarship examines governance barriers (Aluora & Kimani, 2026) and Technology and Innovation Support Centres (TISCs) (Lugasi & Odhiambo, 2022). TISCs run under a World Intellectual Property Organisation (WIPO) programme, with the Kenya Industrial Property Institute (KIPI) as national focal point under a 2011 agreement (KIPI, n.d.). Any model must work alongside these bodies.

The question is therefore what makes a unit functional in the Kenyan ecosystem. The paper develops a conceptual model of the Innovation and Technology Transfer Unit (ITTU), an integrated platform linking research, intellectual property (IP), technology development, incubation, industry and commercialisation rather than a narrow IP function. It does not claim to resolve national constraints (Section 1.2).

**Problem statement and research gap**

Kenya's research base is growing, yet institutions alone do not guarantee transfer. The NRF Strategic Plan 2023–2027 stresses funding, infrastructure, capacity and partnerships (NRF, 2024), and, as reported at its launch, the 2026–2036 masterplan lists limited commercialisation and fragmented financing as challenges (NRF, 2026). Many TTOs struggle with funding, staffing, unclear mandates, weak positioning and low researcher awareness (Atela et al., 2022); KeNIA supports TTO review, policy development and industry linkages (KeNIA, n.d.-b).

The paper's premises are structural. Innovation structures are often isolated units rather than systems spanning research, invention, IP, validation, incubation, financing, adoption and impact. Conventional indicators (publications, graduates, grants) also miss licensing, start-ups, adoption and societal impact (Siegel et al., 2003; Siegel et al., 2007).

The gap is twofold. International studies describe TTOs and performance drivers; Kenyan work diagnoses barriers or addresses components such as IP or support centres (Aluora & Kimani, 2026; Lugasi & Odhiambo, 2022); national documents prescribe strengthening (KeNIA, n.d.-b). Missing is an integrated, context-sensitive model specifying functions, division of labour with existing units, enabling conditions and a performance framework, together with how far each lies within institutional control.

**Scope, key terms and analytical boundaries**

An ITTU is a university- or research-institution-level unit with a formal mandate for moving research outputs towards use. It is functional when it has a defined mandate, authority and reporting line, covers the whole pathway to adoption (itself or through formal coordination), and is judged by outcomes suited to each technology type, not activity counts. This is a normative design standard to be tested, not an empirical finding.

Constraints operate at macro (national policy, law and financing), meso (institutional governance, staffing, incentives and procedures) and market (demand, including jua kali enterprises) layers. The model addresses the meso layer, treats macro conditions as given (Section 5.10) and reaches the market through industry and community linkage. An ITTU cannot fix national funding deficits, but it can use and mobilise resources well. It seldom replaces existing legal, incubation, research or finance offices. As lead integrator, it leads assessment, IP strategy, industry linkage, negotiation and evaluation, and coordinates the rest through formal agreements (Table 2). The audience is public research universities, and Section 5.11 offers untested configurations for others.

Effective means achieving stated outcomes for portfolio technologies, measured by the Section 6 indicators. Commercialisation means a signed licence, assignment, spin-off equity, joint venture or open-licence agreement, counted from documented use. Strategic positioning means a written mandate, a reporting line to the Vice Chancellor or a senior-led committee, and a role in research and resource decisions, unlike an administrative office, which only registers IP and processes

agreements (Table 2). Validation means independent testing or external-user pilot evidence of a stated readiness-level (Section 5.5; Mankins, 1995). Professional capacity is the share of ITTU staff time held by people trained in technology assessment, IP, contracting or enterprise development.

The seven enabling conditions affect the dimensions but are not ITTU functions, and P5 treats professional capacity as a possible moderator. Where Table 2, Table 3 and Section 5.2 list mandate, positioning, staff or budget under Dimension 1, they mean what the ITTU proposes and uses, while institutional leadership, financing, human capital and policy coherence supply approval, staff and budget (Table 6).

**Objectives and research questions**

The main objective is a conceptual functional model for ITTUs to strengthen research commercialisation in Kenyan universities and research institutions. The specific objectives are to:
(a) identify the functions required for an effective ITTU;
(b) examine institutional and ecosystem factors, including documented Kenyan challenges;
(c) develop an integrated model, including the division of labour with existing units;
(d) propose performance indicators (RQ4; Section 6); and
(e) derive implications and recommendations.

**Contribution and structure of the paper**

The paper makes four conceptual contributions, with no new primary data (Whetten, 1989). It specifies the ITTU as an integrated, eight-dimension platform rather than an IP office and defines what makes it functional. It introduces a portfolio-based approach that matches technologies, categorised by commercial and public-good potential, to differentiated transfer pathways. It proposes a balanced indicator set, with cohort-based formulas and safeguards for public-value work. And it derives seven propositions to guide validation.
Section 2 sets out the theory, Section 3 the literature and Kenyan context, Section 4 the methodology, Section 5 the model, Section 6 the performance framework and Section 7 the discussion and propositions. Section 8 gives implications, Section 9 limitations and a validation agenda, and Section 10 concludes.

**Theoretical foundations**

Four perspectives supply design rules and a coherence check (Section 4). Because the works presenting them are also sources in Table 2, they are not independent of the model.

***Triple Helix theory***

The Triple Helix (Etzkowitz & Leydesdorff, 1995, 2000) holds that innovation emerges from university–industry–government interaction. Universities generate knowledge, industry supplies markets and capabilities, and government sets policy and funding. The ITTU is the interface among them, a design rule for Dimension 6 and for early industry input to Dimension 4. Transfer involves negotiation, IP, financing, regulation and tacit knowledge, not just moving an artefact.

***National innovation systems***

Innovation results from interactions among organisations, policies, capabilities and networks (Nelson, 1993). Two rules follow: the ITTU is a node drawing on shared infrastructure such as KeNIA, the NRF and KIPI's TISC network (KIPI, n.d.), and policy coherence and partnerships are enabling conditions, not functions.

***The entrepreneurial university***

The entrepreneurial university applies knowledge to economic and societal development (Etzkowitz et al., 2000), through start-ups, patenting, licensing, consultancy and industry partnerships (Rothaermel et al., 2007). The ITTU coordinates these activities and manages IP and commercialisation professionally.

### *Contingent effectiveness of technology transfer*

Effectiveness depends on the transfer agent, medium, object, recipient and demand environment, and is judged on multiple criteria: out-the-door, market impact, economic development, political reward, opportunity cost, and scientific and technical human capital (Bozeman, 2000). This cautions against uniform treatment of technologies and single indicators, and informs Section 6.

## Literature review and the Kenyan context

### *University technology transfer and TTO effectiveness*

Transfer occurs through licensing, patents, research contracts, consultancy, joint ventures, spin-offs and collaborative research (Siegel et al., 2004; Siegel et al., 2007). Markman et al. (2008) treat TTOs, licensing and venture creation as interdependent, and Perkmann et al. (2013) distinguish commercialisation from academic engagement, so a patent-and-licence-only unit misses major channels. Siegel et al. (2003) found that organisational practices, faculty rewards, TTO staffing and university–industry relationships matter, and Siegel et al. (2007) urged coherent strategies beyond establishing TTOs. These findings are mainly American and European, but the weaknesses Atela et al. (2022) report in Kenya (Section 3.4) suggest they apply.

### *Research commercialisation and intellectual property*

Commercialisation spans identification, evaluation, IP protection, proof-of-concept, development, market assessment and financing. IP is critical but not an end: a university can hold patents without commercialising, so the ITTU treats IP as one component of the path to impact. A draft national IP policy treats technology transfer as a policy area in its own right (Ministry of Investments, Trade and Industry, 2026), and KeNIA's priorities include IP capacity (KeNIA, 2024a).

### *University–industry linkages*

Industry contributes knowledge of customers, technical and regulatory requirements, production, financing and distribution. The ITTU should cultivate these relationships actively (Etzkowitz & Leydesdorff, 2000) through sponsored research, joint R&D, attachments, consultancy, licensing, co-development, proof-of-concept funding, joint ventures and start-up investment. In Kenya the market also includes jua kali enterprises and community organisations, where formal licensing may not fit.

### *The Kenyan innovation and technology transfer context*

The STI Act provides for NACOSTI, KeNIA and the NRF (Republic of Kenya, 2013). KeNIA's mandate covers the national innovation system (KeNIA, n.d.-a), its priorities include academia–industry–government linkages and IP commercialisation (KeNIA, 2024a), and KIPI is the TISC focal point (KIPI, n.d.).

The Kenya Innovation Outlook identified eight TTO weaknesses: unclear missions; insufficient skills; limited career pathways; low visibility; inadequate funding; unclear positioning; inadequate procedures; and insufficient researcher incentives. Not all institutions have TTOs (Atela et al., 2022). The draft national IP policy lists similar weaknesses (Ministry of Investments, Trade and Industry, 2026, Section 2.8.4). These point to institutional design, not technology supply.

Support is becoming more systematic: KeNIA's Institutional Commercialisation Support programme (KeNIA, n.d.-b), a planned national framework for TTOs (KeNIA, 2024a), and the Technology Transfer Office as a Service (TTOaaS) pilot at Embu, Kabianga, Dedan Kimathi, Meru and Egerton (KeNIA, 2025). Related work covers TISC implementation (Lugasi & Odhiambo, 2022) and governance barriers (Aluora & Kimani, 2026), and NRF documents prioritise commercialisation and financing (NRF, 2024; NRF, 2026, as reported at launch).

## Methodology

The study is a conceptual, integrative review of scholarly literature and Kenyan policy documents, suited to theory-informed model building where evidence cannot be combined statistically (Torraco, 2005). It is not a systematic review and reports no search protocol or dates. The propositions in Section 7.2 are the formal output of model building (Whetten, 1989).

The purposive corpus has 25 sources: 14 scholarly and technical works (1993 to 2026) on technology transfer, TTO performance, entrepreneurial universities, innovation systems and university–industry relationships, and 11 Kenyan policy and institutional documents (2013 to 2026 where dated). Methodological works (Kaplan & Meier, 1958; Torraco, 2005; Whetten, 1989) and two statutes (the Industrial Property Act, 2001; the Copyright Act, 2001) are excluded. Table 2 maps sources to dimensions, and Appendix A (Table A1) links them to dimensions, lens and indicators.

The model was built in four steps. The author, as sole coder, first extracted the functions and conditions the sources identified, counting one as repeated if named in two sources or in both a scholarly and a Kenyan source, and recording whether it was evidence, policy intent or recommendation (Table A1 is the audit trail). These were then grouped along the pathway from knowledge to impact. The four theoretical perspectives were next applied as a coherence check (Table 1), not to draft dimensions, and because some theoretical works are also in the corpus (Bozeman, 2000), the check shows coherence, not independent support. Finally, indicators were specified at process, output, outcome and impact levels (Table 9) from Bozeman's (2000) criteria.

Checking the model against the Kenya Innovation Outlook weaknesses (Atela et al., 2022; Table 3) shows internal consistency only, not an empirical test, and several dimensions rest on author synthesis identified in Table 2. The model is untested and does not prescribe restructuring of individual institutions. Section 9 outlines validation with universities, researchers, technology transfer professionals, industry and policymakers.

## The proposed functional ITTU model

### *Overview*

An effective ITTU should be an integrated innovation and commercialisation platform, not an administrative office. The model has eight interdependent dimensions arranged along the pathway from research to impact, and Table 2 shows for each whether the ITTU leads it or coordinates it with an existing unit, and its basis. Where that basis is the author's synthesis, the dimension is a design judgement.

In Figure 1, governance and strategy (Dimension 1) frames the system and supplies the mandate and resources. Dimensions 2 to 7 move technologies towards use, from selection and ownership through risk reduction, enterprise creation and demand identification to agreed terms of use. Monitoring, evaluation and learning (Dimension 8) feeds results back into strategy, and seven enabling conditions support the whole. Table 8 cross-references the dimensions, Figures 1 and 2, Table 5 pathways and Table 9 indicators.

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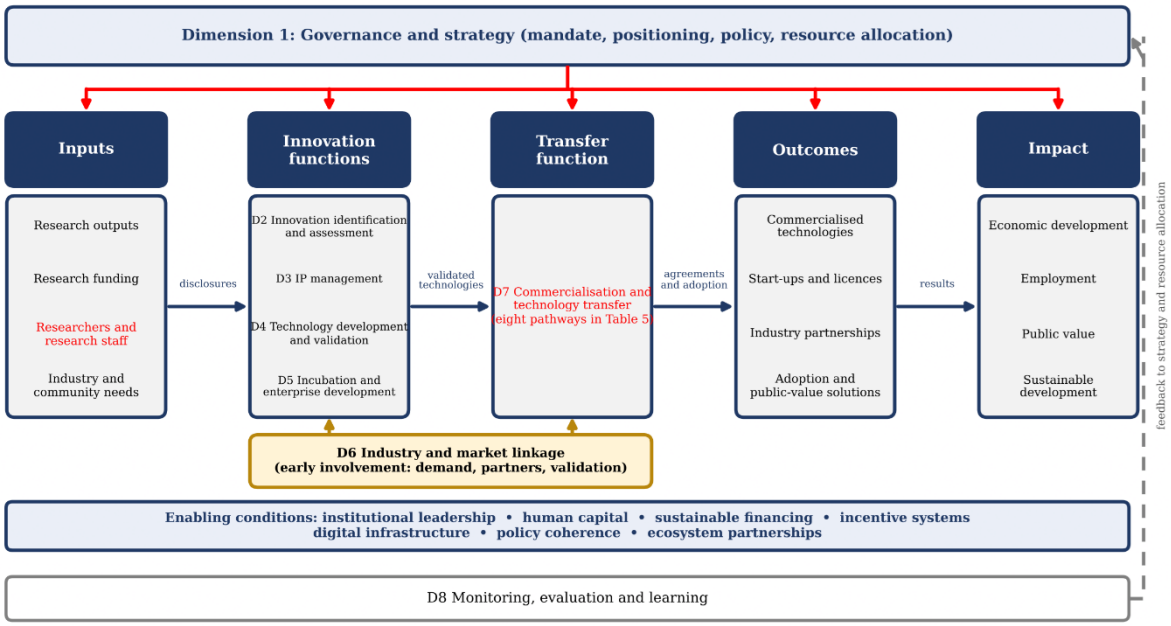



*Figure 1: Conceptual framework of the functional ITTU model*

Table 3 maps each TTO weakness in the Kenya Innovation Outlook (Atela et al., 2022) to the model element addressing it. This is a consistency check, not a test: because the weaknesses informed the design, it shows only that none was left without a corresponding element. Table 3 also records two limits. National financing constraints are not resolved, and institutions without a TTO are addressed through the configurations in Section 5.11, not the eight dimensions. Evidence the model was not built from, such as KeNIA's commercialisation support reviews or expert review by Kenyan ITTU staff, is the first stage of the validation agenda in Section 9.

***Dimension 1: governance and strategic positioning***

A functional ITTU needs a defined mandate, an approved strategy, operational autonomy, professional staff, a budget and authority to coordinate across the institution, with access to senior management through a committee chaired by the deputy vice chancellor responsible for research. The ITTU proposes the mandate, reporting line, staff and budget, and leadership grants them (Section 5.10). Because unclear positioning was a documented weakness (Atela et al., 2022), the model favours strategic positioning over routine administrative placement. Figure 2 shows one arrangement: the ITTU reports through a Research, Innovation and Technology Transfer Committee, which includes a public-interest member, to the Vice Chancellor or Principal. The ITTU leads innovation assessment, IP strategy, industry linkage, transfer negotiation, and monitoring and evaluation, and coordinates legal drafting, laboratory development, incubation and financial administration with existing units through formal agreements..

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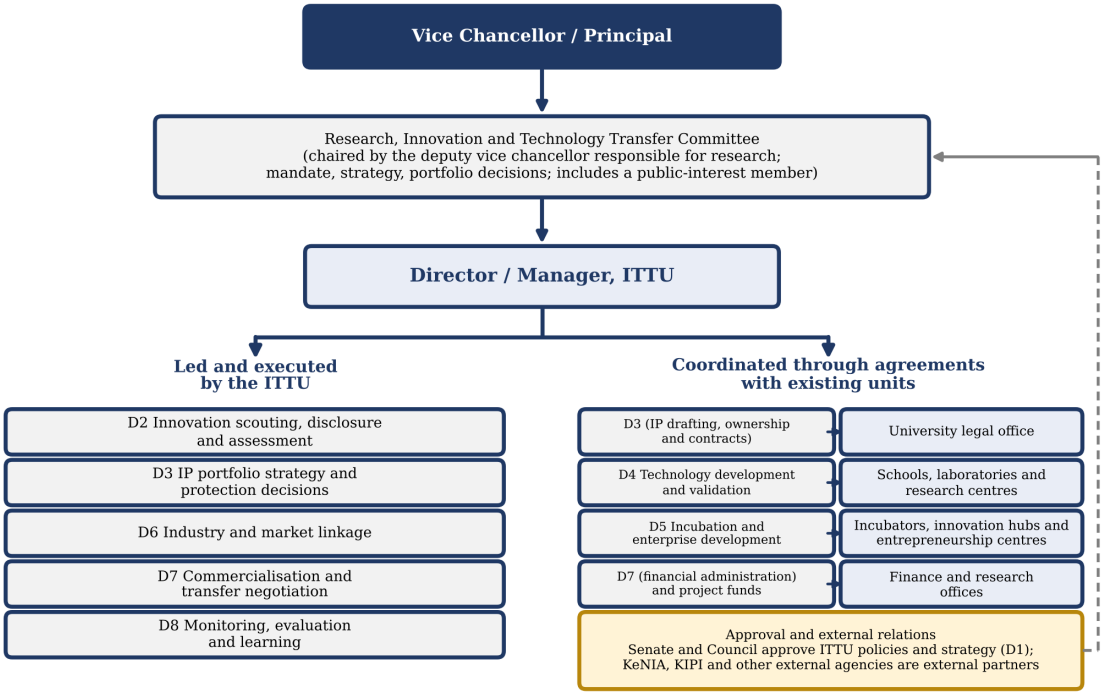



*Figure 2: Illustrative institutional positioning and delivery modes of an ITTU*

***Dimension 2: innovation identification and assessment***

The ITTU should scout innovations actively rather than wait for submissions. The pipeline is:

> *idea → disclosure → screening → assessment → protection → development → validation → commercialisation → adoption.*

This is the main route only. At Gate 2 a technology can go to open licensing or copyright instead of a patent, and Category D technologies return to research (Table 4). Assessment precedes protection, so scarce IP resources go only to technologies whose technical and market viability has been examined.

Assessment covers feasibility, readiness-level, market attractiveness, competing technologies, regulation, IP position, scalability and social and environmental implications. Each technology is then placed in one class by its intended route to use (Table 4): A, revenue-generating transfer; B, development towards that route; C, adoption without revenue as the aim; D, further research. Secondary value is recorded, and the category can change at Gates 2 and 4. The conversion rate by category and Proposition P7 use the category assigned. Consistent with contingent effectiveness (Bozeman, 2000), each class has its own route and success measure.

Five stage gates release resources only when criteria are met, and each has a stop criterion:

a. **Gate 1, disclosure screening:** confirms completeness, ownership and an initial category. It stops technologies with unresolved ownership or no novelty or public benefit.
b. **Gate 2, protection decision:** approves filing only after assessment, or approves non-patent routes. It stops filing where there is no market, freedom to operate or adopter.
c. **Gate 3, validation funding:** releases proof-of-concept funds against readiness targets. It stops funding if targets are missed.
d. **Gate 4, transfer route:** selects the pathway in Table 5 and the negotiating mandate. It stops negotiation that conflicts with the IP policy's public-interest provisions.

e. **Gate 5, post-transfer review:** records adoption, revenue and public-value for Dimension 8. Dormant IP is licensed non-exclusively, released openly or abandoned.

The ITTU decides at each gate with the committee in Figure 2 and records decisions in the portfolio database.

***Dimension 3: intellectual property management***

ITTU runs structured IP management, from disclosure and prior-art assessment to protection strategy, registration, licensing and monitoring of use. Protection is distinct from commercialisation: a patent never used is not a transfer success. Three policy matters build trust:

a. **Ownership:** the policy states who owns which outputs, including externally funded and collaborative work, consistently with the Industrial Property Act, 2001 and the Copyright Act, 2001 (Republic of Kenya, 2001a, 2001b) and funder terms.
b. **Benefit sharing:** transparent rules divide revenue and equity among inventors, departments, the ITTU and the institution, with part reinvested in the commercialisation fund.
c. **Public-good outputs:** for Category C, the policy allows non-exclusive, open or humanitarian licensing and does not penalise unrevenued adoption.

The function aligns with KeNIA's IP priorities (KeNIA, 2024a), the draft national IP policy (Ministry of Investments, Trade and Industry, 2026) and KIPI and its TISC network (KIPI, n.d.). The ITTU leads IP strategy and protection decisions, while the legal office and KIPI draft and register. Policy should also cover conflicts of interest, publication delay, academic freedom and community consent for traditional knowledge.

***Dimension 4: technology development and validation***

Many technologies need prototyping, proof-of-concept, validation or pilot production before licensing. The ITTU manages this with explicit readiness criteria and dedicated proof-of-concept funding. Technology readiness levels (Mankins, 1995) suit hardware, materials and processes, most of Categories A and B, but fit software, services and social innovations poorly. For Category C technologies the model proposes KeNIA's Localised Technology Readiness Levels Framework (KeNIA, n.d.-c), subject to a fit check. Technical, market and regulatory readiness are recorded separately: Gate 3 sets technical targets and Gate 4 draws on market and regulatory evidence. Laboratories do the technical work, and the ITTU coordinates it and controls gates and funds.

***Dimension 5: incubation and enterprise development***

The ITTU should connect with hubs, incubators, accelerators, investors and development partners, and coordinate with, not duplicate, existing incubation. Table 5 says when a spin-off is preferable to licensing. A spin-off is feasible only where seed finance is accessible, academic staff may take founder roles and the university has a clear equity rule. These are proposed design requirements, not findings on Kenyan universities, and the paper cites no evidence on which fields suit spin-offs in Kenya.

***Dimension 6: industry and market linkage***

Industry should join early. The model adopts early user and industry involvement (Perkmann et al., 2013), called market-informed research commercialisation, covering problem identification, prototyping, validation, funding, regulation, manufacturing and adoption. Because paying firms might set the research agenda, the Section 6.3 safeguards limit that risk. For community technologies, "industry" includes jua kali enterprises and community organisations, consistent with the Triple Helix (Etzkowitz & Leydesdorff, 1995). Government agencies set the frame, fund and register IP, large firms licence and co-develop, SMEs adopt early, investors provide venture

finance, and communities define problems and benefit. The ITTU assigns actors by category (Table 4) and records their roles in agreements.

***Dimension 7: commercialisation and technology transfer***

The ITTU offers multiple pathways (Table 5), chosen by technology, policy, ownership, market and public-interest. Where the market is informal or the value societal, supported community adoption and open innovation are legitimate pathways.

***Dimension 8: monitoring, evaluation and learning***

This dimension closes the loop. The ITTU tracks the portfolio, records revenue, adoption and impact, reports to the committee, and adjusts strategy and resources, including portfolio balance across categories (Section 6.3). Indicators follow in Section 6.

***Enabling conditions***

Table 6 classifies the seven conditions by type and controller, with mitigations where control is limited.

Table 6 classifies the seven conditions by type and controller, with mitigations where control is limited.

a. **Institutional leadership:** management sustains the ITTU's mandate, positioning and resources.
b. **Human capital:** multidisciplinary professionals with career paths.
c. **Sustainable financing:** dedicated funds for prototyping, proof-of-concept, patenting and pilots, plus external windows. National documents stress research financing (NRF, 2024) and, as reported at launch, fragmented financing (NRF, 2026), and national funding levels are beyond a university's control.
d. **Incentives:** promotion rules should recognise technology transfer (Siegel et al., 2003); where these are external, begin with appraisal and awards.
e. **Digital infrastructure:** disclosure systems and portfolio databases make the Section 6 indicators computable.
f. **Policy coherence:** policies on IP ownership, revenue-sharing, conflicts and equity should agree with each other, the STI Act (Republic of Kenya, 2013) and the two 2001 Acts, since the STI Act does not govern IP ownership.
g. **Ecosystem partnerships:** ties with agencies, hubs, investors, KIPI and the TISC network (KIPI, n.d.; Lugasi & Odhiambo, 2022) extend capacity.

***Configurations for different institutions***

Table 7 proposes three indicative configurations that differ in which functions are performed in-house and which come through shared services or partnerships. They are untested design hypotheses to adapt after institutional diagnosis. A minimum viable ITTU, the smallest arrangement meeting the definition of functional in Section 1.2, has:a written mandate and reporting line (Dimension 1); a named head with dedicated professional time; disclosure and screening with the Table 4 categories (Dimension 2);an IP policy on ownership and benefit sharing, with access to legal drafting (Dimension 3); a route to validation funding or partners (Dimension 4); an industry contact and a route to negotiate transfers, directly or through a shared-service (Dimensions 6 and 7); a portfolio log of disclosures, gate decisions and outcomes (Dimension 8). Incubation (Dimension 5) may come through partners. Table 8 shows which dimensions each configuration includes.

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## Performance measurement framework

### *Indicators by dimension and level*

Bozeman (2000) argues against single indicators. The contribution here is a matrix by dimension and level, tied to portfolio categories and stage gates. Table 9 gives example indicators for each dimension at process, output, outcome and impact levels, distinguishing activity from results. They draw on Bozeman's criteria: out-the-door (licences), market impact (revenue, adoption), economic development (start-ups, jobs), political reward (visibility), opportunity cost (the efficiency ratio) and human capital (researchers trained). Table 10 gives each key indicator's definition, data source and Bozeman criterion. The indicators are examples, not yet validated.

### *Summary measures*

The conversion rate is computed per disclosure cohort:

$$CR_{g,k,T} = ( N_{c,g,k,T} / N_{d,g,k} ) \times 100 \quad (1)$$

Here $N_{d,g,k}$ counts all disclosures in category $g$ and cohort year k, including those stopped at Gate 1, so screening cannot inflate CR. $N_{c,g,k,T}$ counts those reaching commercialisation within $T$ years, and g is the category last assigned under Section 5.3. CR lies between 0 and 100. Commercialisation is defined in Section 1.2, and a technology enters the numerator when use under its agreement is documented, not at signature; signed agreements are reported separately (Table 10). The efficiency ratio is:

$$TTER = O_c \; / \; R_c \quad (2)$$

Here $R_c$ is commercialisation expenditure in a financial year at constant prices, in Kenya shillings, and $O_c$ is outputs recorded T years later (the window of Equation 1), because outputs lag spending. Outputs are first reported as separate counts per unit of expenditure. Any composite $O_c = \Sigma\, w_j\, n_j$, j uses weights the committee publishes beforehand, with sensitivity analysis. Speed is the median time from disclosure to commercialisation:

$$TTC = \min \{ t : \hat{S}(t) \le 0.5 \} \quad (3)$$

Here $\hat{S}(t)$ is the Kaplan–Meier estimate (Kaplan & Meier, 1958) of the probability that a disclosed technology is not yet commercialised t months after disclosure. Uncommercialised technologies are censored at the window's end, and if $\hat{S}(t)$ stays above 0.5 the median is “not yet reached”. Measures should be computed within categories, since Category C is valued for adoption and Category D is not expected to convert, and read over multi-year windows. They are operational definitions proposed for testing (Section 9).

### *Protecting the public-value mission*

A performance-oriented intermediary risks drifting towards commercial measures alone, which would under-reward technologies whose value is mainly public. The model therefore includes four safeguards. First, each technology is assessed against the measure assigned to its category in Table 4, so Category C technologies are judged by adoption and beneficiaries, not revenue. Second, the committee reports commercial and public-value results separately, with portfolio balance (the share of effort and funding going to each category), so a fall in Category C activity is visible. Third, a committee-set minimum share of proof-of-concept funding is ring-fenced for Category B and C technologies. Fourth, the committee includes a public-interest member, and revenue targets are not the sole basis for staff appraisal. Suitable Category C indicators include users or beneficiary organisations reached, community or public-sector adoptions, documented changes in practice or service delivery, and policy uptake. The indicators and safeguards are proposed for testing and need institution-specific definitions and verification.

## Discussion

### *Contribution to theory and practice*

Traditional TTOs concentrate on patenting and licensing, but other channels are significant (Markman et al., 2008; Perkmann et al., 2013). In Kenya many innovations need prototyping, validation, incubation or financing first, and support for community adoption is built into Dimensions 4, 6 and 7 and Category C. The model positions the ITTU as an intermediary that leads the commercialisation-defining functions and coordinates the rest, consistent with the Triple Helix (Etzkowitz & Leydesdorff, 2000). It aligns with KeNIA's Institutional Commercialisation Support initiative (KeNIA, n.d.-b) and its planned national TTO framework (KeNIA, 2024a). Its significance is integration within one architecture tied to a performance framework. An ITTU alone cannot overcome national funding or infrastructure constraints.

## Implications and recommendations

### *Implications for Kenyan universities*

These recommendations follow from an untested model and do not show that the steps raise effectiveness. Cheap steps can start now: a disclosure system and portfolio log, categorisation, impact plans in proposals and recording industry contacts. Costly or risky steps (new professional cadres, a proof-of-concept fund, promotion changes, university equity in spin-offs) should be piloted first.

1. Position the ITTU strategically, in the configuration suited to the institution (Table 7).
2. Staff it professionally, with recruitment, remuneration and career progression.
3. Create proof-of-concept and prototype funds.
4. Build commercialisation into research management, measured by the share of new funded projects with a commercialisation or impact plan (Table 9).
5. Reward technology transfer alongside publications.
6. Build structured institutional industry relationships that support, not replace, researchers' own links (Perkmann et al., 2013).
7. Manage innovation as a portfolio using the Table 4 categories.

### *Implications for national policy*

Agencies may set minimum functional standards for ITTUs, support shared services for under-resourced universities (consistent with KeNIA's TTOaaS pilot at five universities; KeNIA, 2025), create commercialisation funding windows, and measure adoption, licensing, enterprise creation and impact, not just publications and patents.

## Limitations and future research

The model is conceptual and untested, so its dimensions, indicators, formulas, configurations and propositions are provisional. No primary data were collected, the evidence base is not a systematic sample, and some sources are drafts that may change. The model fits Kenyan public research universities best and may need adaptation elsewhere. Validation would combine a Delphi study or expert panel, comparative case studies across institution types, retrospective computation of the three summary measures from institutional records, and multilevel or case-based tests of P1 to P7, suited to the small number of Kenyan units (at least 20 institutions have TTOs; Ministry of Investments, Trade and Industry, 2026).

## Conclusion

ITTU effectiveness in Kenya should be judged by the ability to move knowledge through the full pathway from research to socioeconomic value, not by existence. The model integrates eight dimensions: governance and strategy; innovation identification and assessment; IP management; technology development and validation; incubation and enterprise development; industry and market linkage; commercialisation and transfer; and monitoring, evaluation and learning. It

responds to documented weaknesses (Atela et al., 2022), draws on evidence that university–industry relationships shape performance (Siegel et al., 2003), and aligns with national STI direction (NRF, 2024, 2026; Republic of Kenya, 2013).

An effective ITTU should evolve from an administrative office into a strategic innovation intermediary. The guiding question shifts from "How many innovations and patents have we generated?" to "How effectively are we converting knowledge into technologies, enterprises, services, partnerships and societal impact?" Because commercial-only judgement risks mission drift, the model pairs outcome measurement with category-specific measures and safeguards. Empirical validation is required before it can be considered a validated national framework.

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*Modelling Functional Innovation and Technology Transfer Units for Research Commercialisation: A Kenyan Higher Education Perspective*



## Appendix A: Traceability of sources

Table A1 links each of the 25 sources in the corpus to the dimensions, the theoretical lens and the element of the model or indicator framework that it informs. Entries are the author's judgement of the main use of each source and are given so that readers can trace the model to its evidence. The three methodological works (Kaplan & Meier, 1958; Torraco, 2005; Whetten, 1989) are also listed and are marked as outside the corpus. The two statutes cited for legal context are not listed.

*Table 1A: Traceability of sources to dimensions, theoretical lens and indicators*

| Source | Type | Dimensions | Lens | Element or indicator informed |
|---|---|---|---|---|
| Aluora & Kimani (2026) | Kenyan scholarship | 1, 3, 7 | National Innovation Systems | Policy coherence; IP indicators |
| Atela et al. (2022) | Kenyan report | 1 to 8 | National Innovation Systems | Table 3; Dimension 1 and 8 indicators |
| Bozeman (2000) | Review | 2, 4, 7, 8 | Contingent effectiveness | Table 4 categories; Table 10 criteria |
| Etzkowitz & Leydesdorff (1995) | Theory | 6 | Triple Helix | Dimension 6 design rule |
| Etzkowitz & Leydesdorff (2000) | Theory | 6 | Triple Helix | Partnership and industry-research indicators |
| Etzkowitz et al. (2000) | Theory | 5; incentives | Entrepreneurial university | Start-up and spin-off indicators |
| Kaplan & Meier (1958) | Methodological work (outside corpus) | 7, 8 | None | Time to commercialisation (Equation 3) |
| KIPI (n.d.) | Institutional page | 3 | National Innovation Systems | IP and TISC interface |
| Ministry of Investments, Trade and Industry (2026) | Draft policy | 3 | National Innovation Systems | IP ownership and benefit-sharing rules |
| KeNIA (n.d.-a) | Institutional page | 1, 6 | National Innovation Systems | Ecosystem partnerships |
| KeNIA (n.d.-b) | Programme page | 1, 5, 6 | National Innovation Systems | Institutional strategy and procedures |
| KeNIA (n.d.-c) | Framework | 4 | None | Readiness scale for software, services and social innovations (Gate 3) |
| KeNIA (2024a) | Strategic plan | 1, 3, 6 | National Innovation Systems | National TTO framework; IP capacity |
| KeNIA (2025) | Annual report | Configurations | National Innovation Systems | Shared-service configuration (Table 7) |
| Lugasi & Odhiambo (2022) | Kenyan scholarship | 3 | National Innovation Systems | TISC interface |
| Mankins (1995) | Technical paper | 4 | None | Readiness levels; validation |
| Markman et al. (2008) | Review | 2, 3, 7 | Entrepreneurial university | IP and transfer indicators |

| Source | Type | Dimensions | Lens | Element or indicator informed |
|---|---|---|---|---|
| NRF (2024) | Strategic plan | 4; financing | National Innovation Systems | Financing condition |
| NRF (2026) | News release | Financing | National Innovation Systems | Financing condition |
| Nelson (1993) | Theory | Enabling conditions | National Innovation Systems | Policy coherence |
| Perkmann et al. (2013) | Review | 3, 6, 7 | Entrepreneurial university | Engagement and transfer indicators |
| Republic of Kenya (2013) | Statute | 1 | National Innovation Systems | Institutional landscape |
| Rothaermel et al. (2007) | Review | 5 | Entrepreneurial university | Incubation indicators |
| Siegel et al. (2007) | Evidence review | 1, 7; enabling conditions | None | Strategy and staffing |
| Siegel et al. (2004) | Empirical study | 2, 6 | None | Process of transfer |
| Siegel et al. (2003) | Empirical study | 1, 8; incentives | None | Productivity and incentive measures |
| Torraco (2005) | Methodological work (outside corpus) | Section 4 | None | Integrative review design |
| Whetten (1989) | Methodological work (outside corpus) | Sections 4 and 7.2 | None | Propositions as conceptual output |

*Table 2A: Theoretical perspectives and their implications for ITTU design*

| Perspective | Core proposition | Design rule used in the model |
|---|---|---|
| Triple Helix | Innovation emerges from interaction among university, industry and government. | ITTU as institutional interface (Dimension 6); early industry and government input to problem definition and validation (Dimensions 4 and 6). |
| National innovation systems | Innovation outcomes depend on interactions among organisations, institutions, policies and networks. | ITTU as a node using shared national infrastructure and services; policy coherence and ecosystem partnerships as enabling conditions. |
| Entrepreneurial university | The university mission extends to creating and using knowledge for economic and social development. | Incubation and spin-off support (Dimension 5); reform of incentives and rewards (enabling conditions); coordination of entrepreneurial activity. |
| Contingent effectiveness | Transfer effectiveness depends on agent, medium, object, recipient and demand environment, and is judged on multiple criteria. | Portfolio categorisation (Dimension 2); differentiated pathways (Dimension 7); multi-criteria performance measurement (Dimension 8 and Section 6). |

*Table 3A: Functional dimensions of the proposed ITTU model*

| Dimension | Core functions | Mode of delivery | Principal basis | Expected output |
|---|---|---|---|---|
| 1. Governance and strategy | Proposed mandate and policy, strategy and planning, allocation of the unit's own resources, support to committee oversight | Lead; ITTU proposes, and Senate, Council and management approve | Siegel et al. (2003, 2007); Atela et al. (2022); KeNIA (2024a); author's synthesis | Approved innovation strategy and policies |
| 2. Innovation identification and assessment | Scouting, disclosure, screening, portfolio categorisation | Lead and execute | Markman et al. (2008); Bozeman (2000); Atela et al. (2022) | Categorised innovation portfolio |
| 3. IP management | Disclosure, ownership, protection strategy, registration, licensing strategy, benefit sharing | Lead strategy; coordinate drafting and registration with the legal office and KIPI | Markman et al. (2008); Perkmann et al. (2013); Ministry of Investments, Trade and Industry (2026); KeNIA (2024a) | Protected and managed IP assets |
| 4. Technology development and validation | Proof of concept, prototyping, readiness assessment, validation | Coordinate with schools, laboratories and research centres; ITTU controls gates and funds | Mankins (1995); Bozeman (2000); author's synthesis | Validated, market-ready technologies |
| 5. Incubation and enterprise development | Incubation, acceleration, mentoring, business modelling, venture support | Coordinate with incubators and innovation hubs | Rothaermel et al. (2007); Etzkowitz et al. (2000); KeNIA (n.d.-b) | Start-ups and spin-offs |
| 6. Industry and market linkage | Industry engagement, market analysis, partnerships, community and informal-sector engagement | Lead and execute | Etzkowitz & Leydesdorff (2000); Perkmann et al. (2013); Siegel et al. (2004) | Commercial partners, markets and co-development projects |
| 7. Commercialisation and technology transfer | All pathways in Table 5: licensing, assignment, spin-off company, joint venture, contract research, consultancy, open innovation and supported community adoption | Lead negotiation; coordinate legal and financial administration | Markman et al. (2008); Siegel et al. (2007); Bozeman (2000) | Transferred technologies |
| 8. Monitoring, evaluation and learning | KPIs, portfolio tracking, revenue, adoption, impact, feedback | Lead and execute; coordinate with planning and quality offices | Bozeman (2000); Siegel et al. (2003); author's synthesis | Evidence of institutional impact and learning |

*Table 4A: Alignment of documented Kenyan TTO weaknesses with the proposed model*

| Documented weakness | Response in the model (control) |
|---|---|
| Unclear missions and mandates | Dimension 1 (proposal) and institutional leadership (approval): approved mandate, innovation and commercialisation strategy, defined reporting structures (within institutional control) |
| Insufficient skills and manpower | Human capital: multidisciplinary professional staff in place of ad hoc assignment to researchers or administrators |
| Limited career pathways | Human capital and incentives: professional technology transfer careers with recruitment, remuneration and progression |
| Low institutional visibility | Dimension 1 (access to senior management through a committee chaired by the deputy vice chancellor responsible for research) and Dimension 8 (reporting of outcomes and impact) |
| Inadequate funding | Sustainable financing: dedicated commercialisation and proof-of-concept funds, and mobilisation of external windows; Dimensions 4 and 5 (partly within institutional control) |
| Unclear positioning within university leadership | Dimension 1 (proposal) and institutional leadership (approval): strategic positioning under the Vice Chancellor or Principal with a dedicated committee (within institutional control) |
| Inadequate commercialisation procedures | Dimensions 2, 3, 4 and 7: structured pipeline, IP process, technology assessment and defined transfer pathways |
| Insufficient incentives for researchers | Incentive systems and Dimension 8: recognition of technology transfer in promotion and reward |
| Limited national research and commercialisation financing (macro layer) | Partly addressed through sustainable financing and external mobilisation; national funding levels lie outside institutional control and are not resolved by the model |
| Absence of a TTO in some institutions | Addressed through the lean and shared-service configurations in Table 7 |

*Table 5A: Technology portfolio categories (indicative)*

| Category | Description | Indicative route | Primary success measure |
|---|---|---|---|
| A: high commercial potential | Strong market attractiveness, defensible IP position and feasible production | Priority investment; licensing or spin-off; investor engagement | Licences, revenue, venture creation |
| B: promising, requires development | Potential evident but readiness or market evidence insufficient | Proof-of-concept and validation funding; industry co-development | Progress in readiness; conversion to Category A |
| C: primarily social or public-good value | Value is mainly societal rather than commercial | Open innovation; partnership with government, NGOs and communities | Adoption and beneficiaries |
| D: requires further research | Not yet at a stage suitable for transfer | Return to research programme; seed research funding | Progression to Category B or C |

*Table 6A: Technology transfer pathways*

| Pathway | Description | Most suitable when |
|---|---|---|
| Licensing | The university grants a third party rights to use the technology in return for financial or other consideration. | An existing firm can absorb the technology, and the IP position is clear. |
| Assignment | Ownership of IP is transferred to another entity. | The university does not need continuing control and fair value is offered; for publicly funded research, the assignment includes a diligence or reversion clause so that rights return to the university if the technology is not put to use. |
| Spin-off company | A new enterprise is established to commercialise university technology. | The technology is early-stage or platform-like, or no existing firm is well placed to commercialise it. |
| Joint venture | The university collaborates with an external organisation to develop and commercialise technology. | Complementary assets are needed or risk must be shared. |
| Contract research | Industry funds research addressing a specific commercial or technological problem. | Industry has a defined problem and will fund the work. |
| Consultancy | Researchers provide specialised knowledge to industry or government. | Transfer is expertise-based rather than IP-based. |
| Open innovation | Knowledge or technology is made available under defined conditions to encourage wider adoption. | Public-interest value or wide adoption outweighs revenue (typically Category C). |
| Supported community adoption | A technology is demonstrated, documented and shared with community groups, informal-sector enterprises or public agencies, with training and extension support. | Value is mainly societal or the market is informal (typically Category C). |

*Table 7A: Enabling conditions by type and by who controls them (indicative judgements)*

| Condition | Type | Who controls it | Typical constraint | Mitigation when control is limited |
|---|---|---|---|---|
| Institutional leadership | Governance | University management and Council | Competing priorities; changes of leadership | Council-approved mandate and strategy that survive changes of leadership |
| Human capital | Resource | University management; staffing rules may be set by public-service norms | Scarcity of specialist skills; remuneration rules | Shared or part-time specialist services; training of existing staff; secondments; phased recruitment |
| Sustainable financing | Resource | The institution for internal funds; the state and funders for external funds | National and institutional budget limits; competing demands | Ring-fenced share of income; phased proof-of-concept fund; external windows from national funders and partners |

| Condition | Type | Who controls it | Typical constraint | Mitigation when control is limited |
|---|---|---|---|---|
| Incentive systems | Institutional rules | Senate and Council; in public universities, possibly wider frameworks | Promotion criteria may be set outside the unit | Recognition through appraisal and awards where promotion rules cannot change; advocacy through Senate and Council |
| Digital infrastructure | Resource | The institution | Cost and connectivity | Open-source or shared platforms; phased adoption |
| Policy and regulatory coherence | Institutional rules and external law | The institution for its own policies; the state for national law | National law and policy lie outside the institution | Align institutional policy with national law; give evidence to policymakers; engage KeNIA and KIPI |
| Ecosystem partnerships | Relational | Shared between the institution and external actors | Depends on the willingness and capacity of external actors | Formal agreements with KeNIA, KIPI, other universities, hubs and industry; shared-service arrangements |

*Table 8A: Indicative ITTU configurations by institution type*

| Configuration | Typical institution | Led in-house | Obtained through partners or shared services |
|---|---|---|---|
| A. Full unit | Research-intensive public or private university with substantial research output and internal incubation | All eight dimensions, with dedicated professional staff and a proof-of-concept fund | Specialised services only, such as regulatory expertise or venture finance |
| B. Lean coordinating unit | Mid-sized institution with growing research output and limited staff | Dimensions 1, 2, 6 and 8, IP strategy within Dimension 3, and transfer negotiation, with a small professional team | Legal drafting, technology development and incubation through partner units or other institutions |
| C. Networked or shared-service arrangement | Teaching-focused, specialised or small institution with little commercialisable output | A focal point for awareness and disclosure (Dimension 2) and local liaison | Assessment, IP management, transfer negotiation and evaluation through a shared-service, such as the TTOaaS approach that KeNIA has operationalised and is piloting in five universities (KeNIA, 2025), or through a consortium; the pilot is direct evidence that the shared-service configuration is workable, though not yet of how well it performs |

*Table 9A: Crosswalk of the eight dimensions to Figures 1 and 2, Table 5, Table 9 and the minimum viable unit*

| Dimension | Position in Figure 1 | Delivery in Figure 2 | Pathways or indicator row | In minimum viable unit |
|---|---|---|---|---|
| 1. Governance and strategy | Bracket across all five columns; frames the system | Committee and Director; approval and external relations in a separate box | Table 9, row 1 | Yes |
| 2. Innovation identification and assessment | Innovation functions | Led by the ITTU | Table 9, row 2; categories in Table 4 | Yes |
| 3. IP management | Innovation functions | Strategy led by the ITTU; drafting and registration coordinated | Table 9, row 3 | Yes (policy and access to legal drafting) |
| 4. Technology development and validation | Innovation functions | Coordinated with schools and laboratories | Table 9, row 4 | A funding route or partner |
| 5. Incubation and enterprise development | Innovation functions | Coordinated with incubators and hubs | Table 9, row 5 | May be obtained through partners |
| 6. Industry and market linkage | Band spanning innovation and transfer functions (early involvement) | Led by the ITTU | Table 9, row 6 | Yes (focal contact) |
| 7. Commercialisation and technology transfer | Transfer functions | Negotiation led by the ITTU; legal and finance coordinated | All eight pathways in Table 5; Table 9, row 7 | Yes, directly or through a shared-service |
| 8. Monitoring, evaluation and learning | Feedback band | Led by the ITTU | Table 9, row 8 | Yes (portfolio log) |

*Table 10A: Proposed ITTU performance indicators by dimension and level*

| Dimension | Process | Output | Outcome | Impact |
|---|---|---|---|---|
| 1. Governance and strategy | Mandate, strategy and reporting line approved; committee meets as scheduled; sustained institutional budget line secured for the ITTU | IP, revenue-sharing and conflict-of-interest policies adopted | Share of research projects with a commercialisation or impact plan | None of its own (via Dimension 7) |
| 2. Innovation identification and assessment | Scouting activities held; researchers sensitised; share of disclosures screened within the target time | Disclosures received, by category (A to D) | Portfolio balance across categories (Section 6.3) | None of its own (via Dimension 7) |

| Dimension | Process | Output | Outcome | Impact |
|---|---|---|---|---|
| 3. IP management | Disclosures assessed for protectability | IP applications filed; IP assets registered | Share of IP assets licensed or in use | Revenue and adoption attributable to protected IP |
| 4. Technology development and validation | Proof-of-concept funds applied for and awarded | Proofs of concept completed; readiness-level gains | Technologies reaching the agreed readiness threshold | Technologies adopted after validation |
| 5. Incubation and enterprise development | Teams admitted to incubation or acceleration | Start-ups and spin-offs incorporated | Start-ups surviving three years; follow-on funding raised | Jobs and enterprise revenue created |
| 6. Industry and market linkage | Industry and community engagements held | Partnership agreements, sponsored and contract research agreements signed | Value of industry-funded research; co-development projects under way | Industry and community adoption of university technology |
| 7. Commercialisation and technology transfer | Negotiations opened | Licences, assignments, spin-offs, joint ventures and open-licence agreements | Cohort conversion rate (CR); time to commercialisation (TTC) | Revenue; adoption; beneficiaries reached |
| 8. Monitoring, evaluation and learning | Portfolio data captured in the database | Annual performance report issued | Strategy and resource decisions revised using evidence | Improvement in CR, TTER and TTC over successive cycles |

***Table 11A:*** *Definitions, data sources and Bozeman criteria for key indicators*

| Indicator | Definition | Data source | Bozeman criterion |
|---|---|---|---|
| Approved mandate and strategy | Written mandate, strategy and reporting line approved by Council or Senate | Council and Senate minutes | Political reward |
| Share of projects with an impact plan | New funded projects with a commercialisation or impact plan divided by all new funded projects, per year | Research office grant records | Out-the-door |
| Disclosures by category | Complete disclosures received per year, by category (A to D) | ITTU disclosure register | Out-the-door |
| Screening time | Median days from complete disclosure to the Gate 1 decision | Portfolio log | Opportunity cost |
| IP applications and registered assets | Applications filed and rights granted, per year | KIPI and ITTU IP register | Out-the-door |
| IP utilisation rate | IP assets under licence or in documented use divided by all IP assets | IP register; agreements | Market impact |
| Readiness-level gain | Increase in readiness-level between entry to and exit from Gate 3 | Gate 3 reports | Out-the-door |

| Indicator | Definition | Data source | Bozeman criterion |
|---|---|---|---|
| Start-up survival | Start-ups trading three years after incorporation divided by start-ups incorporated | Incubator and company records | Economic development |
| Industry-funded research value | Value of sponsored and contract research agreements per year, at constant prices | Finance office; agreements | Market impact |
| Signed agreements | Licences, assignments, spin-off equity, joint venture and open-licence agreements signed per year | Agreement register | Out-the-door |
| Conversion rate (CR) | Equation 1, by disclosure cohort and category | Portfolio log | Market impact |
| Time to commercialisation (TTC) | Equation 3, by disclosure cohort and within category | Portfolio log | Opportunity cost |
| Revenue and adoption | Licence and equity income; documented users or adopters of transferred technologies | Finance office; adopter follow-up | Market impact |
| Category C reach | Beneficiary organisations or users reached by Category C technologies | Follow-up records; partner reports | Economic development |
| Researchers trained | Researchers completing ITTU commercialisation training per year | Training register | Scientific and technical human capital |
| Decisions revised using evidence | Strategy or resource decisions in committee minutes that cite portfolio results | Committee minutes | Political reward |

*Table 12A: Operational terms, test design and controls for the propositions*

| Proposition | Operational terms | Design and data source | Controls |
|---|---|---|---|
| P1 | Strategic positioning as defined in Section 1.2; cohort conversion rate (Equation 1) within category | Comparison of disclosure cohorts across institutions; portfolio logs; comparative cases | Disclosure volume, category mix, institution size, research intensity, age of unit, integration (P6) |
| P2 | Dedicated fund: ring-fenced, with published criteria; validation as defined in Section 1.2 (independent test or pilot with an external-user, not release of Gate 3 funds) | Comparison of disclosure cohorts in institutions or periods with and without a dedicated fund; fund records; independent test or pilot reports | Technology category, field, institution size, research funding |
| P3 | Recognition: technology transfer counted in promotion rules; disclosure rate: disclosures per 100 researchers per year | Policy review, researcher survey and panel data on disclosures | Research output, discipline, staff mix |

| Proposition | Operational terms | Design and data source | Controls |
|---|---|---|---|
| P4a, P4b | Early involvement: industry input recorded before Gate 3; outcomes: more licences and fewer spin-offs (P4a), adoption by users (P4b) | Matched comparison or case study; adopter follow-up | Sector, technology maturity |
| P5 | Professional capacity as defined in Section 1.2 | Unit of analysis: the disclosure, nested within the ITTU. The draft national IP policy counts at least 20 universities and research organisations with TTOs (Ministry of Investments, Trade and Industry, 2026), so units will number about 20 at most, too few for an interaction test across units. Test: multilevel model with a unit-level random effect, or a case-based test across contrasting units | Budget, size of unit, discipline mix |
| P6 | Integration: formal coordination agreements with legal, research, incubation and finance units | Comparative cases or survey; outcomes are CR and TTC; separable from P1 only among units where positioning and integration vary independently | Institution size, configuration (Table 7), strategic positioning (P1) |
| P7 | Portfolio approach: categorisation with differentiated resources and measures | Comparative cases; share of technologies reaching adoption | Category mix, resources |