

Supporting Businesses through Adaptive Intervention: Reviewing national policy and university engagement towards a principles-led entrepreneurial development framework

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ABSTRACT

Since the turn of the century, a number of initiatives aiming to inspire and promote entrepreneurialism and business development were championed by the incumbent United Kingdom (UK) government, including *Local Enterprise Partnerships* (2010, coalition-led policy) (HM Government, 2010), the *Northern Powerhouse* (emerging from 2014) (Northern Powerhouse, 2016), *Levelling Up* agenda (from 2019) (HM Government, 2022), and the *Innovation Strategy* (DBIS, 2021). More recently, the Scottish Government's 2023 *National Innovation Strategy and Entrepreneurial Campus* reports outline bold plans which emphasise the need for a fair, green, and enterprising society, with tertiary education institutions working together as a core, contributing factor. Internationally, the intersection of enterprise, education, and industry is evidenced by several publications and policy-driven developments – including those from the European Commission, reported on by the Global Entrepreneurship Monitor, and the United Nations' work in highlighting the efficiency of firms towards achieving sustainability – influencing universities to educate and promote their programmes and activities with enterprise in mind. However, issues of policy alignment, institutional collaboration, and enduring cohesion remain.

This paper reviews UK business, enterprise and innovation policy over the last 25 years, across government and academia domains, acknowledging the role of universities and their engagement towards skills development and the promotion of business growth. Subsequently, it highlights the essential function of enduring universities as timely, regional hubs of knowledge, skill enhancement, and collaborative partners. However, necessary multistakeholder communication, apt collaboration, and evaluation are either fragmented or fantasy.

As a result, a principles-led *Adaptive Intervention Framework (AIF)* is constructed to assist policymakers, educators, and business leaders in emboldening institutional initiatives in line with the unique needs of businesses. This is valuable in promoting sustainable collaborations, and innovation and business growth, contributing to the national economy through entrepreneurial ecosystems.

Keywords: universities, knowledge transfer, industry collaboration, entrepreneurial ecosystems, sustainable growth policy, United Kingdom

Introduction

Entrepreneurialism and new ventures are vital drivers of economic growth, innovation, and community resilience, with Small and Medium-sized Enterprises (SMEs) representing over 99% of global businesses and providing significant employment opportunities (Crammond, 2020; OECD, 2017; Tocco et al., 2025). Nonetheless, businesses of all shapes and sizes often face challenges, including resource limitations, skills gaps, and barriers to commercialisation (Crammond, 2020; 2023b; 2024a; Prokop, 2022). Recent research indicates an increase in university connections among businesses (Bruneel et al. 2010; Hruskova, 2024; Uyarra, 2010; Wilson, 2012). However, overall collaboration with SMEs, specifically, in some sectors and regions have weakened or diminished, indicating a necessity for improved engagement initiatives (ERC, 2024). Such differences in fortunes present particular challenges for SMEs, which often lack the capacity to navigate multi-level governance and therefore depend on universities to act as policy intermediaries (Benneworth & Hospers, 2007; Crammond, 2024a; Jones et al., 2021). Without sufficient alignment between UK-wide commercialisation frameworks and devolved economic strategies, the full potential of universities to contribute to SME innovation and regional development may remain unrealised. Therefore, this policy review paper focuses on three specific aspects.

Firstly, UK policy and university-based support mechanisms: evaluating policy, industry development, training programmes, continuing professional development activities, and partnerships that address regional challenges (Audretsch et al., 2019), SME-context challenges and enhance resilience (Crammond, 2020; Gibb, 2000; Normand and Anderson, 2017; Rossi & Rosli, 2014). National policy for entrepreneurial development in the UK, and beyond, has increasingly positioned Higher Education Institutions (HEIs) as key drivers of innovation, regional growth, and knowledge commercialisation (Bradley et al., 2021; Crammond, 2023a). Government initiatives such as the Higher Education Innovation Fund (HEIF) have provided sustained support for knowledge exchange activities, including business collaboration, spin-out support, and enterprise education (HESA, 2016; Hughes & Kitson, 2012). More recent UK government strategies, including the aforementioned UK Industrial (2017) and Innovation (2021) strategies, have reinforced the role of universities as anchors of local innovation ecosystems.

Secondly, the themes of collaboration and commercialisation (Lam, 2011; Perkmann et al., 2013): examining existing approaches by universities within the UK that aim to help businesses develop new ideas through applied research, sharing knowledge, and engagement (Crammond, 2024a; Perkmann et al., 2013). Strategies attempt to promote university–industry collaboration, translational research, and infrastructure development through mechanisms such as the Catapult Centres and innovation districts (Perkmann et al., 2013; Uyarra, 2010). In response, universities have institutionalised enterprise strategies, established intermediary units such as innovation and research offices, expanded incubator spaces, and strengthened support for start-ups (Katimertzopoulos & Vlado, 2017) and IP commercialisation (Crammond, 2020; 2024b; Philbin, 2008).

Finally, future proofing and legacy building, and the assessing of the roles of universities in linking research to marketable solutions, emphasises the need for durable and effective engagement frameworks (Bradley et al., 2021; Crammond, 2023b; Perkmann & Walsh; 2007; Philbin, 2008). Universities, as pivotal centres of knowledge, are ideally equipped to tackle these difficulties through collaborative initiatives that promote innovation, skill enhancement, and capacity development (Crammond, 2020; 2023a; 2023b; Etzkowitz & Leidesdorff, 2000). These initiatives are represented through taught provision and skills building (as this paper regards as promoting *enterprising behaviours*), encouraging action from individuals and/or groups

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(ongoing *entrepreneurialism*), and (supported) new venture creation within markets (termed commonly as *enterprise(s)* or *entrepreneurship*) (Crammond, 2020; Decker-Lange et al., 2024).

This paper confronts remarkable deficiencies in existing engagement policies and models between universities and industry while outlining both pedagogical and institutional solutions to enhance these relationships. Adopting a time-sensitive document analysis methodology (ERC, 2024; European Commission, 2021), this review triangulates academic literature, government policy documents, and reports from sector bodies. Sources are evaluated based on their relevance to entrepreneurial ecosystems, higher education engagement, and SME policy (Blenker et al., 2012; Bradley et al., 2021; Crammond, 2023a; 2024a).

The structure of this paper first includes an appreciation of enterprise-related policy in the UK, and the supportive role of universities, government and industry. This acknowledges business support and development provided by universities, business and enterprise concepts, and highlights strengths and weaknesses. In response, the paper presents a novel and principles-led ‘*Adaptive Intervention Framework*’ (AIF) model, which crystallises significant and phased practice, pedagogy, and policy ‘*PRISE*’ principles. These integrated principles outline stakeholder responsibility and processes, within evaluated contexts, for establishing and sustaining university-based entrepreneurial engagement. This framework and principles-led endeavour concerns the development for business, guided and inspired by national level initiatives and interests. We close this review paper with accompanying implications and recommendations for both academic practice and application of the framework.

Universities and enterprise policy in the UK

Across the varied and fragmented enterprise support landscape, the UK’s devolved and reserved governance architecture has had a significant impact on how universities engage in collaboration and commercialisation activities.

Since the advent of devolution in 1998, Scotland, Wales, and Northern Ireland have developed distinct policy frameworks in areas such as education, skills, and economic development. All the while, key levers including company law, intellectual property, fiscal policy, and much of the innovation funding architecture remain reserved to Westminster (Scottish Government, 2022). Whilst Scotland has built a coherent policy framework around inclusive, place-based university-business partnerships in recent years (*National Framework* and *Entrepreneurial Campus* publications), national misalignments and post-Brexit centralisation present their challenges.

In this century, business enterprise and knowledge initiatives, technology application, transfer departments and enterprise support offices are a main fixture within universities (Advance HE, 2022; Ankrah & Al-Tabbaa; 2015; Crammond, 2023a; Hughes & Kitson, 2012; Jones et al., 2021). These are championed by policy, as seen in Table 1.

Table 1 Timeline of Relevant UK Policy (pre-2010s - 2025) (Compiled by Authors)

Period	Year	Policy and/or Frameworks	Entrepreneurial Themes & Educational Recommendations
Pre – 2010s:	2003	Lambert Review (Lambert, 2003)	Promoted structured university–business collaboration and improved IP practices to stimulate innovation and

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Policy review and infrastructure for entrepreneurial engagement and knowledge transfer			entrepreneurship. Introduced enterprise education and regional engagement as key HEI missions.
	2004	<i>Science & Innovation Investment Framework</i> (DIUS, 2007)	Long-term UK strategy to grow R&D, enterprise, and innovation skills. Positioned HEIs as regional economic actors and laid funding foundations for HEIF and KEF to support university–business entrepreneurship.
2010 - 2015: Big society, economic reform, regional development and policy formalisation	2010	<i>Local Enterprise Partnerships</i> (HM Government, 2010)	Encouraging regional collaboration, to increase support, business growth, and regeneration.
	2011	<i>Catapult Centres</i> (Hauser, 2010)	Establishing centres for high-growth sectors, and supporting business acceleration and innovation.
	2012	<i>Scottish Enterprise Areas</i> (Scottish Enterprise, 2020)	Sector-focused zones offering infrastructure and financial incentives. Enhanced SME development, inward investment, and university–industry collaboration in place-based clusters.
	2013	<i>Witty Review</i> (DBIS, 2013)	Promoting initiatives to encourage economic growth within local and regional areas. This included recommending ‘Arrow Projects’, focussing on the commercialising of research, towards creating impact.
	2014	<i>Northern Powerhouse</i> (Northern Powerhouse, 2016)	A focussed agenda aiming to boost northern parts of England, in raising socio-economic and industry conditions.
	2014	<i>University Enterprise Zones (UEZs)</i> (DBIS, 2014)	Targeting areas to improve collaboration and promote an appetite for enterprise and innovative activity.
2015 – 2020: Post-Brexit repivoting and alignment, fresh emphasis on innovation and business support	2017	<i>UK Industrial Strategy</i> (HM Government, 2017)	A national-level strategy focus, recommending activity to improve productivity and profitability in key and emerging sectors.
	2018	<i>QAA Enterprise and Entrepreneurship Education Guidance</i> (QAA, 2018)	Education focussed guidance on approaches and institutional advances to embed and encourage enterprise and entrepreneurship education.
	2018	<i>Strength in Places Fund</i> (GOV.UK, 2018)	Funding opportunities, supported by UKRI.
	2019	<i>Levelling Up Agenda</i> (HM Government, 2022)	Regional regeneration and (re)allocation of resources, improved infrastructure, and implemented growth strategies for identified areas across the country.
2020 – date: Internationalisation , geo-politically minded policy, emerging ecosystem-focus, trade and tariff responsive	2020	<i>Advance HE (with QAA) Entrepreneurship Education Case Studies</i> (Advance HE, 2023)	Contextual appreciation of entrepreneurship education in action, and highlighted toolkit resources.
	2021	<i>UK Innovation Strategy</i> (DBIS, 2021)	A strategy emphasising research and development, innovation support, and investment to support innovative business.
	2021	<i>Help to Grow: Management Programme</i> (GOV.UK, 2021)	Educational and mentoring programme, supported by government and facilitated by universities, training business managers and confirming action planning and

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			goals setting towards increased productivity and profitability.
	2022	<i>Levelling Up Agenda</i> (HM Government, 2022)	An agenda to confront regional differences and inequalities across the UK, in terms of education, health, infrastructure and the local economy.
	2022	<i>National Strategy for Economic Transformation</i> (NSET, Scotland) (Scottish Government, 2022)	Mission-led innovation strategy focused on inclusive growth, skills, and university–industry collaboration. Promotes entrepreneurial thinking across education and support for start-ups and social enterprises
	2023	<i>National Innovation Strategy (Scotland)</i> (Scottish Government, 2023a)	Focuses on inclusive, mission-driven innovation and commercialisation. Emphasises regional strengths, entrepreneurial ecosystems, and stronger university–SME collaboration to drive economic resilience.
	2023	<i>Entrepreneurial Campus (Scotland)</i> (Scottish Government, 2023b)	Promotes institution-wide entrepreneurship in Scottish HE; supports student start-ups and leadership development
	2023	<i>Science and Technology Framework</i> (DBIS, 2025)	UK-wide strategy advancing commercialisation in frontier technologies; impacts university–industry entrepreneurship through national investment and regulation.

The early-2000s witnessed the release of the *Lambert Review* in 2003 (Lambert, 2003). The review called for improved and consistent engagement and collaboration between higher education and business. The latter part of the decade witnessed economic downturns and a global recession, with an emphasis on the impact of such collaborations. This was, and remains to be, chiefly evidenced by Research Excellent Frameworks (REF, formally RAE) cycles and medium-to-long term projects and partnerships spanning sectors.

As this relationship between economic growth, and the role of universities and industry working together intensified (2010s' local partnerships and centres – HM Government, 2010), 2013 witnessed the publication of the *Witty Review* (DBIS, 2013) which proposed *University Enterprise Zones* (UEZs). Along with further engagement with *Local Enterprise Partnerships* (LEPs), UEZs were established as pilots a year later in order to regenerate regional economics and aid development.

From 2017 to the time of the COVID-19 pandemic and amidst an eventual post-Brexit landscape, the UK government recognised the significance of the research, collaborative, and knowledge exchange capabilities of universities. This also includes their role in the country reaching a 'nation of innovation' status. As a result, the *UK Industrial Strategy* was published in 2017 (HM Government, 2017). During this time, the UKRI was formed to sharpen a focus on impactful and productive research and innovation funding opportunities, including projects involving high-growth industries specialising in clean energy, advancing sectors, and emerging technologies such as Artificial Intelligence (AI). Innovate UK also established 'Catapult Centres' aiming to strengthen ties between research and commercialisation within manufacturing, digitisation and energy.

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Post-COVID, the UK government maintained a strong focus on regional development and socio-economic parity across the country, with a repeated rhetoric on '*levelling up*'. This was represented by aspirational levelling up funding and a *Strength in Places* fund for arguable areas of need or potential. The *UK Innovation Strategy* was launched in 2021 (DBIS, 2021), promoting a drive for equitable investment, innovative activity (including Knowledge Transfer Partnerships (KTPs) and 'Innovation Vouchers'), corporate equity and Intellectual Property (IP) support, and increased spinouts and commercial activity across the country. This was to encourage activity not merely originating from the typical 'Golden Triangle' zone of Cambridge, Oxford and London universities, and associated research and innovation centres. With this in hopeful progression, the ongoing consequence is the witnessing of entrepreneurship ecosystems (Crammond, 2024b; Hruskova, 2024; Knox & Arshed, 2022) and a legacy of strategic regional regeneration, with entrepreneurial universities and their innovative capacities and offerings being at the heart of sustained change (Jongbloed & Kottmann; 2022).

In this current decade, the then Conservative Government championed the *Help to Grow: Management Programme* (GOV.UK, 2021) which reinforced this tie. Universities of today facilitate institutional awards and competitions, arguably as standard, within their co- and extra-curriculum. Examples include student enterprise, idea generative business development, and 'kick start' style incubation support and funding opportunities with national banks and innovation competition organisations (Crammond, 2024b; Pattanasak et al., 2022).

Aligned to these continued efforts, within the UK HEI context, bodies such as the Quality Assurance Agency for Higher Education (QAA) and Advance HE play a significant role in shaping the standards and frameworks that underpin entrepreneurial education and institutional engagement (Crammond, 2024; Jones et al., 2021). Similarly, the QAA's (2018) *Enterprise and Entrepreneurship Education Guidance*, for instance, provides a structured approach to embedding entrepreneurial learning across curricula, emphasising design thinking, experiential learning, and reflective practice as core pedagogical principles. These guidelines advocate for an integrated, practice-based approach that mirrors real-world business support environments. Furthermore, Advance HE supports the professional development of educators and institutional leaders to foster inclusive and innovative learning cultures that align with broader policy priorities, including enterprise and employability (Advance HE & QAA, 2021; Decker-Lange et al., 2024; QAA, 2021).

Within the Scottish context, their universities are particularly active in aligning enterprise and knowledge exchange activities with devolved regional strategies. Programmes such as Interface, Scotland CAN DO, and the Innovation Centres exemplify a distinct model of place-sensitive collaboration that prioritises SME access, co-creation, and mission-oriented outcomes (Crammond, 2023b)

Interface, for instance, is a Scotland-wide intermediary coordinated by the Scottish Funding Council, which facilitates university-SME collaboration (Interface, 2025). It supports the ethos of Scotland's National Innovation Strategy (Scottish Government, 2023a), which emphasises regional economic resilience and community-led innovation. Moreover, the Scottish Funding Council's University Innovation Fund (UIF) directly rewards institutions for demand-led, inclusive engagement, in contrast to the more output-driven metrics of England's Higher Education Innovation Fund (HEIF), which priorities quantifiable outcomes such as patents, spinouts, and licensing revenue (Hughes & Kitson, 2012). These institutional and policy divergences illustrate how Scotland's devolved powers enable universities to act as anchor institutions in their local ecosystems, responding to specific socio-economic challenges and leveraging contextual expertise, and sources of intellectual, financial, and social capital (Crammond, 2024b; Normand &

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Anderson, 2017). This regional framing contrasts with the broader UK approach, where English universities often operate in a more centralised and less place-responsive environment.

Despite strengths and strides across sectors and within regional networks, notable weaknesses and challenges persist:

- Short-term funding, leading to finite, nationally-fragmented or inconsistent support
- Clash of academic vs. commercial objectives within the nexus
- Constrained entrepreneurial cultures within institutions
- Lack of access to development capital, in scale and scope
- Skills gaps in research, innovation, and commercialisation activity
- Inequity in support, infrastructure or accessibility
- Intellectual Property (IP) disagreements

The Adaptive Intervention Framework

Chiefly among the above challenges is the misalignment of institutional goals. While universities are often driven by academic metrics and long-term research outputs, businesses of all sizes typically prioritise short-term, application-oriented outcomes (Ankrah & Al-Tabbaa, 2015; Lam, 2011). This divergence can lead to ineffective collaboration or unmet expectations in the longer term. Furthermore, many partnerships suffer from a lack of continuity beyond the lifespan of funded projects, raising concerns about sustainability and long-term impact (Hruskova, 2024; Philbin, 2008). The uneven distribution of institutional capacity across the higher education sector also creates inconsistencies in SME engagement experiences (Crammond, 2020). Structural barriers, including limited SME awareness of available support, time and resource constraints, and the complexity of navigating university systems further inhibit effective collaboration (Bruneel et al., 2010; Crammond, 2023a).

Additionally, cultural differences between academic and business environments, particularly regarding timescales, communication styles, and risk tolerance, continue to undermine mutual understanding (Siegel et al., 2003). Intellectual Property (IP) negotiations often compound these challenges, with concerns over ownership and exploitation acting as a deterrent to open engagement (Crammond, 2024b; Perkmann & Walsh, 2007).

Furthermore, a key tension lies in the institutionalisation of entrepreneurialism, where metrics-driven cultures can favour quantifiable outcomes over qualitative legacies such as community empowerment, cultural enrichment, or capacity-building (Adeeko & Treanor, 2022).

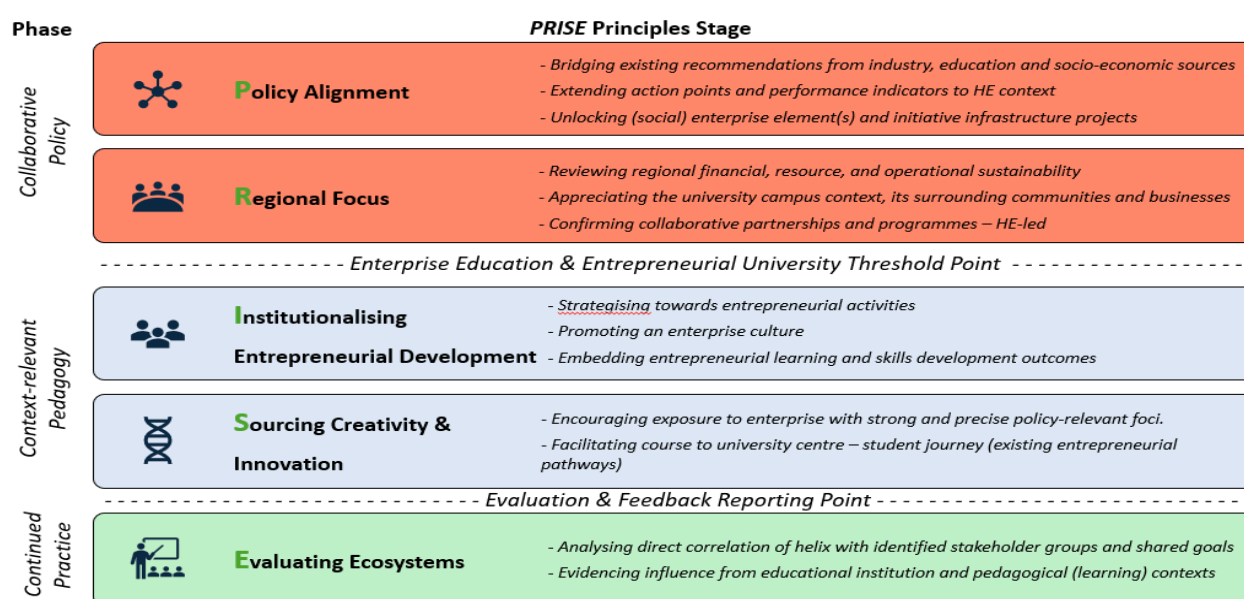
In some cases, the legacy of entrepreneurial initiatives is uneven, benefiting dominant stakeholders while leaving gaps in rural or under-resourced contexts (Tocco et al., 2025). Recent reflections from sector leaders, including those shared through QAA enterprise education consultations and Knowledge Exchange Framework (KEF) narrative submissions, reveal a shift toward more critical and values-based approaches to enterprise support (Marshall et al., 2022). These include calls for participatory evaluation, co-designed indicators of success, and stronger alignment between entrepreneurial practice and the public mission of higher education institutions. Eventually, legacy building requires a balance between innovation and

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stewardship-ensuring that today's interventions lay the groundwork for adaptable, equitable, and resilient systems of support that extend beyond policy cycles and institutional leadership changes.

In sum, despite supportive architecture, several criticisms persist regarding the design and implementation of support mechanisms. Firstly, issues of access and inclusivity remain central. Many support schemes are more readily accessible to urban-based, well-networked, or highly educated entrepreneurs, while underrepresented groups and rural enterprises often lack visibility and voice within support infrastructures (Tocco et al., 2025). Secondly, there are concerns about efficacy and impact. Evaluations frequently highlight a lack of robust, long-term data linking specific support interventions to measurable business success or innovation outcomes (Bradley et al., 2021). The complexity of entrepreneurial journeys makes attribution difficult, and many programmes operate without systematic feedback loops or user-centred design processes. A further critique relates to institutional coherence and sustainability. As universities assume increasingly entrepreneurial roles, tensions can arise between academic integrity, public mission, and commercial interests. Scholars argue that HEIs risk becoming market-driven service providers, potentially undermining their educational and civic roles (Turnbull et al., 2024). Also, dependency on short-term funding or fragmented policy initiatives may lead to piecemeal support, lacking the strategic continuity necessary for deep, systemic change.

In response to these challenges, there is growing advocacy for design-led approaches to support mechanisms: ones that are participatory, context-sensitive, and iterative (Aman et al., 2024; De Bruin et al., 2023). Design principles, when applied to policy and institutional strategy, offer a means of aligning support with real user needs, local opportunities, and the dynamic realities of entrepreneurial life (Crammond, 2023b). This reframing moves beyond transactional models of support towards relational, adaptive systems that prioritise learning, inclusion, and long-term capability development. Therefore, to navigate ecosystem complexity and political complication, a more integrated and adaptive policy framework is both required and presented in this paper (Figure 1).



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Figure 1 The 'Adaptive Intervention' Framework (AIF): PRISE Principles (constructed by authors; adapted from Crammond 2023a; 2024a)

The *Adaptive Intervention Framework (AIF)* presents a novel model which advances from, and is cognisant of, enterprise ecosystem models acknowledging institutions, individuals, and change agents which engage from a variety of spheres of both influence and expertise (Clark, 1998; Crammond, 2023a; Flanagan et al., 2011; Gibb, 2000, 2002; Philbin, 2008). Support mechanisms for entrepreneurial development are critical components of national innovation systems and local economic strategies. Previously, this interconnection involving universities, industry, and government have been well-discussed and conceptualised in university-based learning.

The framework's *collaborative*, *context-relevant pedagogy*, and *continued practice* phases of this framework, in screening, testing, and analysing enterprise policy, comprise of five novel *PRISE* principles. These phases and principles are outlined below:

Phase I – collaborative policy

Inter-governmental dialogue and regional awareness creates platforms where devolved and UK government departments can co-develop collaborative commercialisation strategies, avoiding duplication and funding fragmentation (Etzkowitz & Leydesdorff, 2000).

University collaboration with industry is essential towards fostering business and innovation, SME birth and growth, regional economic development (Benneworth & Hospers, 2007; Knox & Arshed, 2022), and a broader knowledge economy (Aman et al., 2024). Across advanced economies, the role of universities in supporting business development has intensified, particularly as governments recognise the knowledge economy as a driver of growth and business scalability within flourishing sectors (Hewitt-Dundas, 2012; Johnson, 2022; Perkmann et al., 2013). Universities are increasingly expected to engage not only in teaching and research, but also in the 'third mission' of economic and social engagement, acting as innovation intermediaries, capacity-builders, and engines of regional growth (Crammond, 2020; Rossi & Rosli, 2014a).

For example, the introduction of the Knowledge Exchange Framework (KEF) in 2020 further incentivised transparency and performance in collaboration and commercialisation, prompting universities to demonstrate impact through metrics such as business income, licensing revenue, and graduate enterprise (Rossi & Rosli, 2014). In addition to economic objectives, national policies have embraced social (De Bruin et al., 2023) and civic dimensions of entrepreneurship, as exemplified by the Civic University Agreements and 'levelling up' agenda, which encourage inclusive and community-embedded innovation (Wright et al., 2008; Universities UK, 2020). Despite progress, challenges persist, including resource disparities between institutions, low absorptive capacity in SMEs, and tensions between academic and commercial incentives (Bruneel et al., 2010; Lam, 2011; Siegel et al., 2003).

However, recent findings from the Enterprise Research Centre (ERC, 2024) reveal a growing disparity in engagement patterns between universities and different categories of SMEs in the UK. While collaboration with medium-sized enterprises has increased, particularly concerning applied research, innovation co-creation, and skills development initiatives, there has been a concurrent decline in partnerships with micro and small businesses. This shift may reflect differential absorptive capacities, resource availability, and strategic alignment between firms and academic institutions (Perkmann et al., 2013). Therefore, the HE sector must continue to evolve toward a model of the entrepreneurial university, and one that integrates collaboration, commercialisation, and civic engagement into its core mission.

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Clark's (1998) well-known 'entrepreneurial university' model, which aided in framing our understanding of the changing nature of the university sector, identified five key elements:

1. A core and agenda which steers enterprise
2. A surrounding ecosystem which is open to entrepreneurial development
3. Mechanisms for diverse funding and investment opportunities
4. An innovative and broad academic base, for enterprise and entrepreneurial activities, and
5. An embedded entrepreneurial culture

This model influenced a seismic shift in university objective, and activity towards entrepreneurialism, leading to emerging perspectives and contexts explored (Crammond, 2020; Nabi et al., 2017; Neck & Greene, 2011).

Triple (Etzkowitz & Leydesdorff, 2000), quadruple and quintuple (Carayannis & Campbell, 2010) helix models and frameworks have been notable examples at conceptualising the links, interactions, and responsibilities concerning universities, government, wider industry, and broader society. Latterly, these models have incorporated the natural environment and discussion surrounding these, within educational contexts, intersect with stakeholder theory and case study analysis or appreciation.

Consensus amongst researchers (e.g. Jongbloed et al., 2008) argue that the progressive stages of collaboration, involving universities and industry, include:

1. Embryonic
2. Initiation
3. Engagement
4. Established
5. Consistent knowledge sharing and boundary spanning
6. Ongoing (shared) goals
7. Embracing and fostering an enterprise ecosystem and educational environment
8. Communities towards creativity and innovation

(Adapted from Jongbloed et al., 2008; Jongbloed & Kottmann, 2022)

Perkmann et al. (2013) provide a systematic review of literature on university–industry relations, distinguishing between '*academic engagement*' – activities like collaborative research, consulting, and informal interactions and '*commercialisation*', which includes patenting and academic entrepreneurship. They find that academic engagement is more prevalent and closely aligned with traditional academic research, often driven by the pursuit of resources and knowledge exchange.

Medium-sized firms often possess more formalised innovation processes and internal capabilities that make them more attractive and effective partners for universities (Rossi & Rosli, 2014; Wright et al., 2008). However, small firms frequently encounter significant barriers, including limited financial and human capital, lack of awareness of university offerings, and perceived complexity in accessing academic expertise (Ankrah & Al-Tabbaa, 2015; Bruneel et al., 2010; Hughes & Kitson, 2012). Despite multiple UK government

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efforts, such as the Higher Education Innovation Fund (HEIF) and Knowledge Transfer Partnerships (KTPs), to bridge these divides, structural and cognitive obstacles persist (HESA, 2016; Philbin, 2008). These findings highlight the need for more differentiated and inclusive engagement models that account for the heterogeneity of the new venture and SME support sector (Crammond, 2020; Lam, 2011).

Without improved frameworks for collaboration, such as the *Adaptive Intervention Framework (AIF)*, especially those that consider motivation, incentives, and intermediary roles, university-industry knowledge exchange may remain suboptimal. This limits broader innovation and regional development outcomes (Perkmann & Walsh, 2007; OECD, 2017).

Phase 2 – Context-relevant pedagogy

Institutional intermediaries and cultivating creativity and innovation, through continued investment in mediating bodies can act as translation mechanisms between university missions and industry needs (Rossi and Rosli, 2014).

Crucially, within any functioning, aspirational economy, is the role of education. Notably, this involves the activity and vision of tertiary education in educating and inspiring future workers (Smith, 2016) and leaders; embracing a plethora of pedagogical and practical approaches (Tasler et al., 2023) towards producing enterprising graduates (Crammond, 2020; Normand & Anderson, 2017); and creative additions to the economy (Blenker et al., 2012). This is partly achieved through engagement with business communities, and regional or national ecosystems.

However, sector conditions inevitably impact institutional engagement with industry and society going forward (Crammond, 2023a, 2023b), putting into focus the needs of industry, the entrepreneurial landscape, how students learn (Gimmon, 2014; Karadzov et al., 2024; McKinnon et al., 2015) and the institutional reaction. Nevertheless, the role and remit of enterprise educators, in response to industry need and the entrepreneurial context, endures:

1. Design and delivery enterprise curriculum
2. Facilitate enterprising activities towards developing entrepreneurial mindsets
 - Business cases and Problem-based Learning (PBL) (Rae, 2006)
 - Business simulations and (serious) games (Pittaway & Cope, 2007)
 - Storytelling and role playing (Crammond, 2024a; Gibb, 2002)
 - Experiential education, reflection and action planning (Blenker et al., 2012; Nabi et al., 2017)
3. Confirming and affirming industry links (Crammond, 2024a; Jongbloed et al., 2008; Wright et al., 2008)
4. Support student startups
 - Incubators (Crammond, 2023a, 2023b; Neck & Greene, 2011; Pattanasak et al., 2022)
 - Accelerators
 - Hackathons
 - Competitions and funding
 - Knowledge exchange (Johnson, 2022)
5. Evaluate formative and summative assessment, and provide feedback

These pedagogical objectives reinforce the need to prevent ‘collaboration frictions’ in understanding, purpose, and towards improving functionality in the ecosystem. This includes aspects and activities in relation to IP and funding, law and jurisdiction, and regulatory compliance, exacerbated by the differing strategic objectives of governments.

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While the Scottish Government, for example, appears to prioritise community wealth-building and inclusive growth, UK policy tends to emphasise productivity, export potential, and high-growth sector outcomes (Scottish Government, 2022). Universities are thus left to navigate challenges between delivering local educational impact aligned with devolved missions and meeting national performance metrics dictated by reserved frameworks and wider socio-economic goals. This dual expectation creates strategic and operational complexity, particularly for institutions working with SMEs, as they must balance inclusive, regional engagement with the pursuit of quantifiable outputs such as patents, licensing income, and spinouts (Hughes & Kitson, 2012; Perkmann et al., 2013).

Phase 3 – continued practice

Dual metrics and ecosystem evaluations, in developing evaluation systems, recognise both devolved objectives (e.g. sustainability, community impact) and reserved metrics (e.g. IP generation, economic returns) (Crammond, 2023b).

Conceptually, practical support mechanisms align with models of the entrepreneurial ecosystem (Hruskova, 2024; Knox & Arshed, 2022; Prokop, 2022), emphasising the systemic interaction between various actors: entrepreneurs, universities, government bodies, and private sector partners.

Despite the benefits of devolved autonomy, universities face challenges in aligning their commercialisation efforts with both devolved and reserved policy logics. SMEs located in Scotland, for example, may benefit from devolved funding and ecosystem support through Scottish Enterprise or Highlands and Islands Enterprise (HIE), but find inconsistencies in cross-border collaborations, especially with English institutions or UKRI-funded initiatives (ERC, 2024).

The impact of Brexit further intensified misalignments. EU Structural Funds, particularly the European Regional Development Fund (ERDF), were crucial in supporting regional university-business collaboration. In Scotland, these funds enabled knowledge exchange and innovation infrastructure, particularly in rural and remote regions. Their replacement by the UK Shared Prosperity Fund (UKSPF), a centrally managed programme, has been criticised for diluting the devolved nations' influence over regional economic development and undermining long-standing place-based funding approaches tailored to local needs (Scottish Government, 2022). This shift has potentially constrained the ability of Scottish universities to plan long-term, regionally focused commercialisation activities aligned with national strategies such as the '*National Strategy for Economic Transformation*' (NSET) (Scottish Government, 2022). It also challenges the coherence of Scotland's place-based approach to economic development, particularly in areas where SMEs are heavily reliant on bespoke university support.

These jurisdictional distinctions create divergent policy environments across the UK's nations, which in turn affect how universities engage with businesses, particularly SMEs. In Scotland, for example, devolved powers have facilitated the development of a policy landscape that places strong emphasis on place-based development, inclusive growth, and mission-led innovation — values that inform university engagement strategies (Scottish Government, 2022, 2023). However, these devolved priorities must be reconciled with UK-wide frameworks that continue to shape research funding (e.g. UK Research and Innovation), commercialisation regulation (e.g. Intellectual Property Office (IPO)), and broader economic incentives often without adequate regard for the regional diversity of institutional missions or business needs (ERC, 2024).

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This dual policy regime has led to what some scholars describe as a ‘multi-level governance challenge’ in UK higher education and innovation policy, where universities must simultaneously respond to overlapping and sometimes conflicting national and regional agendas (Flanagan et al., 2011). For Scottish universities, this means operating in a context where collaboration and commercialisation activities are embedded in devolved regional policy, but constrained or shaped by centralised mechanisms around intellectual property rights, competition law, or research commercialisation funding (Perkmann et al., 2013)

In practice, mechanisms include financial interventions such as institutional fundings, business grants, tax incentives (Brown & Mason, 2014), infrastructural supports such as incubators, accelerators, science parks (Crammond, 2023b; Normand & Anderson, 2017; Pattanasak et al., 2022; Rossi & Rosli, 2014), capability-building such as enterprise education, mentoring, consultancy (Crammond, 2020; Decker-Lange et al., 2024; Gimmon, 2014), and network facilitation such as knowledge exchange hubs, university-industry partnerships, and professional associations (Crammond, 2023a, Crammond, 2024). The design and delivery of such mechanisms are increasingly viewed not just as technical provisions but as strategic frameworks that shape entrepreneurial ecosystems.

Five PRISE principles

This paper’s *Adaptive Intervention Framework (AIF)* reflects the political (*economic and social policy – principle 1*) and pedagogical considerations of embedding enterprise for individuals and business, illustrating adhered principles. The framework also encourages the development of enterprising skills (*principle 3*), institutional strategies for enterprise (*principle 4*), and the advancing of enterprise ecosystems (*principle 5*) cognisant of ongoing regional (*principle 2*) policy initiatives and cross-sector endeavours:

1. Policy alignment
 - Cognisance of multistakeholder involvement and ambition
2. Regional focus
 - Reviewing and appreciating resources and contexts
3. Institutionalising entrepreneurial development
 - Embedding enterprise and acknowledging the industry need, as indicated by policy
4. Sourcing creativity and innovation
 - Establishing and maintaining university-based opportunities (programmatic or co/extra-curriculum), which align with policy agenda
5. Evaluating Ecosystems
 - Correlation and performance indicator analysis, evidencing impact

(Adapted from Crammond 2023a; 2024a)

UK policies have made significant strides in positioning universities as central drivers of innovation and regional growth through engagement with SMEs. Nonetheless, the persistence of engagement disparities, institutional misalignments, and structural barriers indicates the need for more inclusive, flexible, and context-sensitive policy approaches. Recognising business heterogeneity, fostering cultural alignment, and

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supporting sustainable partnerships within the university context (*phase 2, principles 3 and 4*) are essential to unlocking the full potential of university–industry collaborations and fostering equitable, innovation-led regional development.

Evaluations of university–industry collaborations often rely on subjective perceptions, which can differ based on varying success criteria among academic and industry stakeholders (Crammond, 2024a). There is a necessity for more objective indicators, such as patents, products, and publications (*principle 5*). Though the adequacy of these measures in reflecting real value and justifying costs remains a topic of debate. Additionally, there are ongoing questions about the effectiveness of university spin-out strategies and what constitutes appropriate measures of their success, such as financial returns or survival rates (Lockett & Wright, 2005).

Notably, the academic impact of collaborations especially on teaching and student learning is often overlooked, despite its potential to uncover intangible yet significant benefits (*principle 4* and Perkmann et al., 2013). Universities must be supported to operate effectively across both devolved and reserved systems (*principles 1 and 2*) without constraint and jurisdictional ambiguity.

Considering these issues, through contextual application of this framework, underlines the pressing need for more coherent and adaptive engagement that connects divides, fosters sustained collaboration, and facilitates more effective knowledge exchange and commercialisation pathways (*phase 3, principle 5*).

Implications

From a practical perspective, this paper’s AIF framework identifies key stakeholder groups and outlines a mechanism for increased engagement, collaboration, and achievement of shared goals concerning business support and wider economic growth. From a pedagogical perspective, it explicitly states educational principles upon which courses, programmes, university activities and agenda can suitably respond to the business support need and contextualise this within their role as educational providers and places of idea generation and business incubation.

As emphasised in the framework, collaboration between universities and industry represents a crucial mechanism for facilitating the commercialisation of research and fostering innovation-led growth. These partnerships provide (new) businesses access to academic expertise, cutting-edge facilities, and applied research capabilities that can significantly enhance their innovative potential and competitiveness (Perkmann et al., 2013; Wright et al., 2008).

From the university perspective, such engagements enable the translation of theoretical research into practical applications, contributing to broader impact agendas and regional economic development (Hughes & Kitson, 2012; Rossi & Rosli, 2014). Notably, initiatives such as Knowledge Transfer Partnerships (KTPs) and Innovate UK funding streams have demonstrated the potential of structured collaborative frameworks to support mutual objectives (HESA, 2016) over a period of time, harnessing relationships and expertise.

In the context of enterprise, and the role of education, helix modelling highlights the necessity of collaboration and an active enterprise ecosystem as precursors and instigators of innovation (Figure 2). Helix modelling, reconceptualised in this paper, also displays significant stakeholders of relevance to the framework and its implied action.

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Figure 2 emphasises the role(s) of each as key change agents and institutions which shape socio-economic landscapes through their activities and cultures (Adeeko & Treanor, 2022).

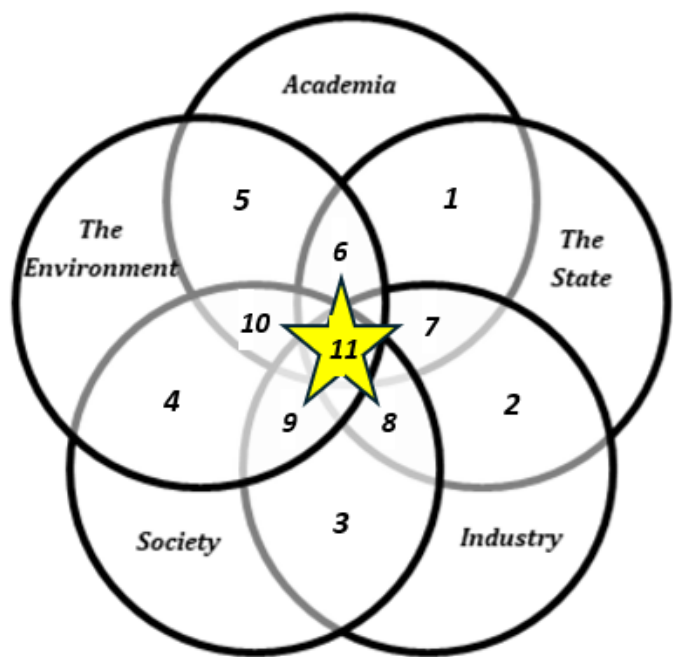


Figure 2 Quintuple Helix Enterprise Development Model: A relationship-development context (Model illustrated by authors; adapted from Audretsch et al., 2019; Carayannis & Campbell, 2010, 2014; Crammond, 2020; Etzkowitz & Leydesdorff, 2000)

Table 2 Enterprise Helix Responsibilities (Constructed by Authors)

No.	Institutions and/or Domains	Relationship & (Enterprise) Responsibilities
1	Academia & The State	• Knowledge development and dissemination • Enterprising skills development • Nurturing work-ready graduates
2	The State & Industry	• Maintaining economic state • Encouraging new business and student enterprise • Civic and legal duties (CSR Hierarchy)
3	Industry & Society	• Ethical and legal responsibility • Generation of innovative jobs, wealth, and socio-economic prosperity
4	Society & The Environment	• Moral and ethical duties; wellbeing • Responsible and sustainable activity
5	The Environment & Academia	• Enterprising, problem-focussed research • Responsive and research-based contributions

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		Developing knowledge and understanding of wider society and natural environment
6	Academia, The State & The Environment	- Collaboration towards entrepreneurial, novel outcomes - Responding to wider agenda (UN SDGs, WEF, EC, etc.)
7	Academia, The State & Industry	- Local, regional, and national (economic) growth - Entrepreneurial development, by sector and ecosystem(s)
8	The State, Industry & Society	- Regulation and Law - Taxation and Trade - Organisational operations, industry codes of conduct, and duty of care - Free market and international economies
9	Industry, Society & The Environment	- Ecological, environmental and social responsibilities - Incentivisation - Inclusive and Equitable - Fair, true, and transparent
10	Society, The Environment & Academia	- Appreciating societal concerns and (cross-sector / geographic / contextual) challenges - Witnessing entrepreneurial trends and advancements
11	All	The embracing enterprise ecosystem and mass society

As entrepreneurial ecosystems become increasingly interconnected, international models of collaboration and commercialisation are reshaping how national institutions, particularly universities and policy agencies, support business development. In the UK, this influence is visible through initiatives such as UEZs and expanded Technology Transfer Offices (TTOs), both of which seek to replicate globally successful practices of co-locating research, talent, and capital (Hughes & Kitson, 2012; Wilson, 2012). Frameworks such as the Higher Education Innovation Fund (HEIF) and the Knowledge Exchange Framework (KEF) explicitly benchmark performance against international standards, encouraging universities to deliver tangible commercial outcomes from publicly funded research (Johnson, 2022). Furthermore, UK institutions are increasingly participating in international consortia and transnational research partnerships, supported by schemes like Horizon Europe and the European Institute of Innovation and Technology (EIT) (European Commission, 2021). These collaborations provide both funding and global market access, accelerating the commercial potential of spinouts and startups. Internationalisation also enhances institutional learning (Marginson, 2011), as UK universities adopt global best practices in governance, IP licensing, and innovation policy (Wright et al., 2008). Yet, such models are not without critique.

Critics caution against over-commercialisation, warning that short-term revenue goals may compromise academic freedom, research integrity, and broader societal missions (Marginson, 2011). Global competition may also exacerbate inequities between research-intensive and teaching-focused institutions, both within the UK and internationally. Nonetheless, international influences continue to serve as both a benchmark and a catalyst, encouraging UK universities and policy bodies to refine their approaches to collaboration and commercialisation. By embedding global lessons into local contexts, there is potential to strengthen entrepreneurial ecosystems in ways that are both competitive and inclusive.

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As a result, the *Adaptive Intervention Framework (AIF)* acts as a technical guide towards the development and growth of businesses, placing the enterprising activities of educational institutions and supportive agencies (Table 2) at the core – embracing regional and national interests.

Recommendations

As entrepreneurial development becomes a central objective within higher education and national policy agendas, questions of legacy building have taken on increasing importance (Crammond, 2023a). Beyond short-term outputs, such as start-up counts or patent filings, there is a growing demand to understand the long-term value and sustainability of support mechanisms, particularly in how they contribute to regional resilience, institutional identity, and societal wellbeing (Brown, 2021). Recent discourse within the UK higher education sector, influenced by frameworks such as the Knowledge Exchange Concordat and Advance HE's civic engagement strategies, has highlighted the importance of embedding legacy thinking into the design of enterprise and innovation strategies (Advance HE, 2022; UUK, 2020; 2025).

UK enterprise and economic development policy remains highly aspirational. While national rhetoric is ambitious, persistent challenges around funding, infrastructure, and institutional alignment limit the translation of strategy into sustainable practice. Drawing from both the review of existing (policy) literature and the application of the framework developed in this study, the following recommendations are presented (Table 3). They are organised into two categories: network-perspective recommendations emerging from the review, and AIF framework-specific recommendations highlighting the model's practical applications.

Table 3 Network and AIF Framework Recommendations (Constructed by Authors)

	Recommendation	Implementation	Impact
Network-perspective	Reaffirm the role of universities as hubs of regional socio-economic development	Universities should embed enterprise strategies within civic agendas, collaborate closely with Local Enterprise Partnerships, and establish dedicated liaison units to coordinate regional partnerships.	This would position universities more explicitly as anchor institutions, ensuring entrepreneurial activity supports regional resilience, skills development, and inclusive growth.
	Strategically integrate universities within enterprise ecosystems and policymaking	Sustained HEI representation in regional growth boards and national enterprise consultations should be formalised, while government should create mechanisms for universities to co-shape policy instruments.	This alignment reduces fragmentation and maximises the return on investment in enterprise initiatives, linking university outputs directly to long-term regional and national priorities.
	Prioritise entrepreneurial mindsets and measure skills outcomes	Enterprise education should be mainstreamed across curricula and adopt longitudinal tracking of graduate entrepreneurs, with interdisciplinary modules, accelerator programmes, and lifelong learning pathways accessible to alumni.	This enhances graduate employability and adaptability, capturing the legacy value of entrepreneurial activity, embedding entrepreneurship not only as venture creation but as a mindset for innovation across sectors.

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	Strengthen coaching, mentoring, and equitable ownership in startups and spin-offs	Structured mentoring networks with alumni and industry practitioners should be paired with seed funding schemes, while policies on equity and ownership are clarified and standardised.	Improves the survival and scalability of ventures, fosters confidence among student and staff entrepreneurs, and ensures that the benefits of innovation are shared fairly.
	Expand global commercialisation and international collaboration with governmental enterprise initiatives	Universities should co-design regional and international initiatives with local and national authorities, embedding enterprise within net-zero, levelling-up, and sustainability agendas.	Aligns HE activity with broader social priorities, heightens competitiveness, and ensures entrepreneurial ecosystems contribute to inclusive and sustainable development in leading sectors.
Framework-Specific	Adopt the framework as a strategic planning tool	Universities can apply the model to map enterprise initiatives, identify gaps, and reorient strategies toward long-term and legacy-focused goals.	Encourages coherence across activities, moving institutions away from fragmented projects toward integrated entrepreneurial ecosystems.
	Use the framework for evaluation and accountability	Policymakers and funding bodies can employ the framework to assess how university enterprise activity contributes to resilience, wellbeing, and intergenerational benefits.	Provides clearer evidence of impact and return on investment, strengthening the case for continued funding and targeted policy support.
	Leverage the framework to structure stakeholder dialogue	The model can serve as a shared language for conversations between universities, government, and industry, framing enterprise in terms of sustainability, civic benefit, and legacy.	Enhances trust, improves alignment, and builds collective ownership of enterprise ecosystems across diverse stakeholder groups.

These recommendations highlight both the systemic challenges within the UK enterprise landscape and the potential contributions of the proposed framework. Their successful implementation depends on three key enablers. Firstly, clarity of agenda across stakeholder groups; secondly, the creation of developmental spaces where new ideas can be tested; and thirdly, sustained and targeted funding streams.

Embedding a legacy perspective ensures that entrepreneurial development is not reduced to short-term outputs but instead contributes to enduring ecosystems, resilient regions, and intergenerational societal wellbeing. Nevertheless, successful outcomes from directed policy are reliant on a clear agenda being understood across stakeholder groups, the fostering of developmental spaces, and expert collaboration between academia and industry. These are reinforced by sustained and targeted funding, and inspiring entrepreneurial initiatives towards realising desired levels of economic growth.

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