Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Institutionalizing University–Industry Collaboration in Fragile Economies: The Case of the American University of Beirut

Riad Chedid
American University of Beirut
Ahmad Smaili
asmaili@aub.edu.lb
American University of Beirut
Nadine Nakad
American University of Beirut

Article

Keywords: University–industry collaboration, fragile economies, innovation ecosystems, Lebanon, Institutionalization framework, knowledge transfer, experiential learning

Posted Date: November 20th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11428882/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

It is widely recognized that University-industry collaboration (UIC) drives knowledge transfer, technological innovation, human-capital development, and economic competitiveness. However, the institutional prerequisite for effective UIC differs substantially in fragile economies characterized by political instability, economic uncertainty, weak innovation ecosystem, limited industrial research and development capacity, and severe brain drain. Using the American University of Beirut (AUB) as an exploratory institutional case in Lebanon, this study examines how higher education institutions can institutionalize UIC under adverse conditions by addressing three research questions: (1) how can universities institutionalize UIC within fragile and economically unstable contexts; (2) which institutional mechanisms and organizational conditions enable universities to transition from fragmented, transactional interactions toward sustained partnerships; and (3) what operational lessons does the AUB experience offer for institutions in comparable fragile economies? Drawing on three complementary sources of evidence - institutional reports, the AUB UIC project database, and the authors' direct involvement in managing and developing UIC initiatives - the analysis indicates that universities can serve as critical institutional anchors amidst systemic ecosystem fragility. By institutionalizing robust boundary-spanning mechanisms, universities maintain vital knowledge flows and establish pathways for applied research, technology-transfer, interdisciplinary collaboration, entrepreneurship, and human-capital retention. The study offers a context-sensitive framework for UIC and proposes institutional and policy mechanisms to strengthen UIC in Lebanon and comparable contexts.

1. Introduction

University–industry collaboration (UIC) refers to structured interactions between academic institutions and industrial organizations intended to generate and exchange knowledge, promote technological innovation, and strengthen economic and societal development (Ankrah & Al-Tabbaa, 2015) Such collaboration can occur directly between universities and firms or through intermediary organizations and institutional platforms that facilitate knowledge exchange, partnership development, and technology transfer (Alexandre et al., 2022). UIC has received considerable scholarly attention because of its potential to address the gap between academic knowledge and industrial needs while creating value for universities, businesses, students, and society.

The role of universities has expanded considerably in recent decades. Universities are increasingly expected not only to educate students and produce knowledge but also to contribute to entrepreneurship, technological development, commercialization, regional development, and broader socioeconomic progress. At the same time, firms operate in increasingly complex environments characterized by technological disruption, changing customer expectations, global competition, and rapid innovation cycles. Emerging technologies, including artificial intelligence and digital technologies, further increase the importance of access to specialized knowledge and highly skilled human capital. Collaboration between universities and industry can therefore enable organizations to combine

complementary knowledge, expertise, resources, and capabilities (Awasthy, 2020; Ankrah & Al-Tabbaa, 2015; Ahmed et al., 2022; OECD, 2019; Yasin et al., 2023; de Wit, et. al., 2019).

UIC encompasses relationships that range from relatively short-term and transactional interactions to long-term and transformative partnerships. Transactional activities include consulting, professional training, contract research, internships, technology transfer, and access to shared resources. More integrated relationships can involve joint research, co-development, entrepreneurship, spin-off formation, and the development of new products, processes, and technologies (Bishop et al., 2011; Perkmann & Walsh, 2007; Hayter et al., 2020; Isaeva et al., 2022; Rossi et al., 2022). Dedicated infrastructures such as research parks, innovation hubs, centers of excellence, and university-industry liaison organizations can support these relationships.

The importance of UIC is particularly pronounced in countries facing political instability, economic fragility, institutional disruption, and persistent talent outmigration. In such environments, universities may have to operate in the absence of a coherent national innovation framework and under conditions in which firms have limited resources for long-term research and development. Political uncertainty can discourage firms from making long-term commitments, while economic hardships reduce available funding for collaborative research. Weak infrastructure, bureaucratic barriers, unclear intellectual-property arrangements, and brain drain can further undermine the continuity of collaborative activity.

Lebanon represents a particularly relevant context in which to examine these challenges. The country has experienced prolonged political and economic instability, institutional fragmentation, limited industrial R&D capacity, and substantial migration of skilled graduates and professionals. The resulting environment makes it difficult to establish the stable, long-term relationships on which effective UIC often depends. Existing initiatives involving universities, industry, government, and other stakeholders have frequently remained fragmented and insufficiently coordinated (Takieddine, 2019).

At the same time, universities may possess capabilities that can help compensate, at least partially, for weaknesses in the wider innovation ecosystem. Through dedicated institutional structures, universities can connect academic expertise with industrial needs, support technology transfer, facilitate entrepreneurship, provide industry-integrated education, and create relationships among stakeholders that might otherwise remain disconnected.

The American University of Beirut (AUB) provides a particularly relevant case. AUB has developed a set of institutional initiatives intended to connect academic research and expertise with industry, government, entrepreneurship, and societal needs. These include the Talal and Madiha Zein AUB Innovation Park (iPark), the Government Engagement Platform (GEP), the Office of Research, the Office of Business Development, the Abdullah Al Ghurair Hub for Digital Teaching and Learning, the Research, Innovation and Creativity Hub (RICH), the MSFEA Institute, and industry-integrated educational initiatives such as the Vertically Integrated Projects (VIP) (modelled after Georgia Tech's program that carries the same name (https://vip.gatech.edu/)) and industry-supported Final Year Projects (FYPs).

The case is particularly significant because several of these initiatives were developed or expanded during a period of severe disruption in Lebanon. The MSFEA Institute, for example, was established in 2020 amid the financial crisis in Lebanon, the COVID-19 pandemic, and the aftermath of the Beirut Port explosion. Its purpose was to translate AUB's academic and technical capabilities into practical solutions for industry, innovation, and economic development.

While the literature on UIC is extensive, limited research explores how institutions can institutionalize collaboration within fragile economies characterized by fragmented innovation systems. Most existing studies focus on stable institutional environments. Consequently, there remains a gap in understanding how university-level infrastructure can offset systemic national weaknesses and sustain partnerships when local firms, governments, and other stakeholders face acute resource and institutional constraints.

This study addresses that gap by examining the AUB experience as an exploratory institutional case by addressing three complementary research questions. (1) How can universities institutionalize UIC in fragile and economically unstable contexts? (2) What institutional mechanisms and organizational conditions enable universities to move UIC from fragmented, transactional interactions toward sustained partnerships? And (3) How does the AUB model address the structural constraints facing UIC in Lebanon, and what lessons does it offer for other fragile economies?

The study does not seek to establish a causal relationship between UIC and national economic growth. Rather, it examines the institutional mechanisms through which a university can organize, sustain, and expand collaboration and identifies the outputs and emerging outcomes associated with those mechanisms.

The remainder of the paper is structured as follows. Section 2 reviews the literature on UIC and develops the conceptual framework. Section 3 presents the methodology. Section 4 examines the Lebanese innovation and UIC context. Section 5 presents AUB as the institutional case, with particular attention to the MSFEA Institute and industry-integrated learning. Section 6 synthesizes the findings. Section 7 discusses the findings in relation to the research questions and existing literature. Section 8 presents institutional and policy recommendations, and Section 9 concludes the paper.

2. Literature Review and Conceptual Framework

2.1. Forms and Functions of UIC

Universities and industry represent complementary components of knowledge-based socioeconomic development. Universities generate and disseminate knowledge and develop human capital through education and research, while industry applies knowledge to products, services, processes, and markets. UIC provides mechanisms through which these complementary capabilities can interact.

The forms of collaboration vary considerably in scope and intensity. At one end of the spectrum are relatively transactional activities such as consulting, contract research, professional training, internships,

and access to facilities. At the other are long-term partnerships involving joint research, co-development, entrepreneurship, technology commercialization, and the creation of new ventures (Bishop et al., 2011; Perkmann & Walsh, 2007; Hayter et al., 2020; Pertuzé, et. al., 2010).

Intermediary organizations can play an important role in facilitating these relationships. Such organizations reduce the institutional distance between universities and industry by identifying opportunities, connecting stakeholders, translating requirements, managing projects, and supporting knowledge transfer (Alexandre et al., 2022). The need for such boundary-spanning mechanisms becomes particularly important when the two sectors have different organizational cultures, incentives, expectations, and time horizons.

UIC can also be distinguished between programmatic and relational dimensions. Programmatic success is concerned with specific project outputs, whereas relational success involves the development and maintenance of durable relationships between participating organizations (He et al., 2021). This distinction is particularly relevant in fragile environments. A project can successfully deliver a technical output without producing a sustainable relationship, while a relationship that initially generates limited measurable output may establish the foundation for future collaboration.

2.2. Benefits and Outcomes of UIC

The benefits to universities, industries, students, and the broader economy derived from UIC is well documented. For universities, industry engagement can provide access to real-world problems, technologies, data, facilities, and expertise. Interaction with firms can help researchers identify new research questions, validate findings, develop applied expertise, and increase the practical relevance of academic research. Industry engagement can also provide opportunities for universities to update curricula and teaching practices in response to changing technological and labor-market requirements.

Industry benefits from access to specialized knowledge, research expertise, highly skilled talent, and emerging technologies. Academic collaboration can help firms address technically complex problems, develop products and processes, improve operations, and strengthen their innovation capabilities (Bishop et al., 2011; Rossi et al., 2022; Tian et al., 2022).

Students represent a third major beneficiary. Internships, cooperative education, industry-sponsored projects, applied research, and other forms of work-integrated learning allow students to apply theoretical knowledge to real-world problems. These experiences can strengthen technical, interpersonal, communication, teamwork, and problem-solving capabilities while improving understanding of professional expectations.

The broader socioeconomic benefits of UIC include knowledge exchange, human-capital development, innovation, productivity improvements, entrepreneurship, investment, and the development of local industries. Strong university–industry connections can also create employment and entrepreneurial opportunities that may contribute to talent retention.

However, these benefits should not be assumed to occur automatically. UIC outcomes depend on institutional structures, partner motivations, relationship quality, governance arrangements, incentives, resource availability, and the wider policy environment (Cantner et al., 2024; Kamal et al., 2024; Tseng et al., 2020).

2.3. Barriers to Effective UIC

The literature identifies several interrelated barriers to UIC. Universities and industry often differ in organizational culture, institutional objectives, incentives, governance structures, approaches to decision-making, and expectations regarding knowledge sharing (Alexander et al., 2020; Abu Sa'a & Yström, 2024; Chryssou, 2020; Steinmo, 2015; Klelner-Schaefer & Schaefer, 2022; Yang, et.al., 2025).

These differences can affect the allocation of resources, evaluation of performance, management of intellectual property, and definition of project success. Academic institutions may emphasize publications and knowledge dissemination, whereas firms often prioritize commercial outcomes, confidentiality, speed, and return on investment.

Financial and administrative constraints can further restrict collaboration. Bureaucratic procedures, institutional bottlenecks, limited R&D funding, and insufficient commercialization capabilities can prevent promising research from progressing toward practical application (Kirby & El Hadidi, 2019; Kleiner-Schaefer & Schaefer, 2022).

Differences in time horizons are also important. Academic research may require extended periods for investigation, validation, and publication, whereas firms may operate under shorter product-development and market cycles. These differences can create disagreements regarding project priorities, deliverables, publication, resource allocation, and intellectual property.

Trust and confidentiality represent another major challenge. Firms may be concerned about disclosure of commercially sensitive information, while universities may be concerned that excessive confidentiality restrictions could constrain academic freedom and dissemination (de Wit-de Vries et al., 2019; Pertuz et al., 2021). Effective collaboration therefore requires explicit arrangements concerning confidentiality, intellectual property, publication, ownership, and commercialization.

A further challenge is the mismatch between academic education and workplace requirements. Traditional educational environments frequently deal with structured problems and established knowledge, whereas industry often confronts ambiguous and open-ended problems subject to time, resource, technological, and market constraints. Industry-integrated education can help bridge this gap by exposing students to real-world problems and requiring them to integrate knowledge and exercise judgment under uncertainty.

Finally, UIC may be constrained by the absence of individuals capable of coordinating relationships across organizational boundaries. Limited numbers of trained technology-transfer professionals,

partnership managers, commercialization specialists, and institutional champions can make it difficult to convert individual interactions into sustained institutional relationships.

2.4. Enabling Conditions for UIC Success

A set of factors has been identified in the literature as important for successful UIC, including trust, communication, institutional structures, boundary-spanning individuals, organizational commitment, and supportive policy structures (Ankrah & Al-Tabbaa, 2015; Awasthy et al., 2020; OECD, 2019; Pertuz et al., 2021; Tucker et al., 2025; Santoro, 2002; Ahmed, et. al., 2022; Edmondson, 2012; Rhinehart, 2022; Yang, et. al., 2025).

Trust develops through repeated interaction, open communication, personal relationships, and sustained engagement (Kamal et al., 2024; Lauvås & Steinmo, 2021; Rossoni et al., 2024; Abu Sa'a & Apslund; Bruneel, et. al., 2010). Face-to-face interaction can promote familiarity and cognitive proximity and facilitate deeper understanding between partners.

Universities also require institutional structures that recognize UIC as an integral part of their teaching, research, and engagement missions. Effective structures should establish procedures for initiating and managing partnerships, defining responsibilities, addressing intellectual property and confidentiality, allocating resources, and recognizing faculty contributions.

Industry partners likewise need to treat UIC as a strategic activity rather than merely a transactional service. Sustainable partnerships require clearly defined objectives, realistic expectations, long-term commitment, regular monitoring, and mechanisms for translating research into practical outcomes. Firms must also possess sufficient absorptive capacity to identify, assimilate, and apply external knowledge (Gioness, 2019).

Boundary-spanning individuals play a particularly important role. These actors understand the expectations and language of both academic and industrial environments and can translate requirements, manage expectations, coordinate activities, and resolve misunderstandings (Abu Sa'a & Yström, 2024; De Wit-de Vries et al., 2019; Mell et al., 2022; Rossi et al., 2022).

Government policy represents another enabling condition. by developing funding mechanisms, innovation policies, regulatory frameworks, infrastructure, incentives, and baseline institutional conditions, government can reduce some of the costs and risks associated with UIC collaborations ([1] Ankrah & Al-Tabbaa, 2015; Nugent et al., 2022).

The Triple Helix Model posits that innovation emerges non-linearly from the systemic interactions among academia, industry, and government (Ranga & Etzkowitz, 2013; El Hadidi & Kirby, 2017; Daradkah et al., 2023). Within this paradigm, universities generate knowledge and human capital, industry facilitates application and commercialization, and government creates supporting conditions. This framework is highly salient to fragile political economies, where the efficacy of any single institutional actor is contingent upon the capacity of the others. Deficient state institutions frequently obstruct university–

industry alliances; constrained industrial capacity depresses private-sector demand for academic research; and underdeveloped academic-corporate ties impede the translation of knowledge into tangible economic activity. Under such fragile ecosystem conditions, the conventional Triple Helix configuration often experiences structural failure. This raises a critical theoretical question: Can universities engineer localized institutional mechanisms to partially compensate for systemic deficiencies in the surrounding macro-ecosystem? The present study evaluates AUB as a critical case through which this inquiry can be empirically explored.

2.5. Research Gap

While existing literature extensively documents the benefits, barriers, and enabling conditions of UIC, limited academic focus has been directed toward the institutional architecture required to operationalize these dynamics within fragile political economies. This distinction is critical. In highly stable environments, academic institutions operate within mature funding structures, established industrial configurations, functional state institutions, and cohesive innovation policies. Conversely, fragile economies are frequently characterized by the deficit or absence of these supportive systemic elements. Consequently, universities face the dual challenge of fostering robust collaborations while navigating macro-environments that fail to reliably sustain such partnerships. The present study addresses this empirical gap by evaluating how a single institution has engineered multiple, interconnected structural mechanisms to sustain functional UIC despite systemic, ecosystem-level constraints.

3. Methodology

3.1. Research Design

This study adopts an exploratory, institutional case-study design to investigate the mechanisms through which a university can institutionalize UIC within a fragile economic environment. A case-study approach is appropriate for this inquiry, as the objective is to analyze organizational processes and institutional frameworks within their real-world context, rather than quantify the causal impact of UIC on macroeconomic growth. Specifically, this research evaluates the organizational structure, implementation strategies, and tangible outputs of the AUB's UIC ecosystem, benchmarking these findings against the systemic barriers and enablers documented in existing literature. While the case analysis targets institutional level initiatives, particular initiatives are examined as interconnected components of a comprehensive UIC architecture.

3.2. Case Selection

The AUB was selected as the focal case for this study because it represents a premier higher education institution that has systematically developed diverse mechanisms to bridge academic expertise with industry, government, entrepreneurship, and broader societal needs. The Lebanese context provides a critically informative setting for this inquiry; UIC in this region operates amidst severe political and macroeconomic instability, institutional fragmentation, constrained industrial R&D capacity, and

pronounced talent outmigration. Consequently, the convergence of these acute macro-environmental constraints and the institution's strategic responses offers a highly relevant landscape for addressing the core research questions of this study.

3.3. Data Sources

The empirical analysis relies on the triangulation of three primary sources of evidence. First, the study examines official institutional reports and records from the AUB, detailing the objectives, structural frameworks, activities, and outputs of university initiatives across industry engagement, industry-sponsored research frameworks, entrepreneurship, technology transfer, and experiential learning. Second, it utilizes the AUB UIC project database, which archives organizational partnerships, project classifications, and collaborative outcomes. Third, the study leverages the first author’s direct role in managing the Institute, granting deep contextual insight into institutional processes, partnership dynamics, and implementation challenges. To mitigate potential researcher and practitioner bias, these personal observations are not treated as independent empirical verification; rather, they are interpreted and substantiated in conjunction with the institutional records and project-level data.

3.4. Analytical Approach

To address the three core research questions within this challenging environment, this study presents empirical evidence across a four-tiered framework comprising context, institutional mechanisms, collaborative activities, and implications emergent outcomes.

- **Context**: Delineates the macroeconomic, institutional, and innovation-system contingencies conditioning UIC within Lebanon.
- **Institutional Mechanisms**: Encompasses the structural configurations and strategic initiatives deployed by the American University of Beirut (AUB) to incentivize and formalize industry engagement despite macro-environmental headwinds.
- **Collaboration pursuits**: Captures the scale, operational activities, and the direct, short-term outcomes of the resulting joint initiatives.
- **Implications**: Contemplates the subsequent educational, scholastic, relational, entrepreneurial, and socioeconomic impact stemming from these linkages.

Furthermore, this study relates AUB’s institutional mechanisms to the systemic barriers and enablers documented in the extant UIC literature. Methodologically, the research design is analytical and descriptive rather than causal. Accordingly, the integrated quantitative metrics serve to illustrate the scale, scope, and institutional footprint of these collaborations, rather than to establish empirical causality or attribute macroeconomic shifts directly to these micro-level initiatives.

3.5. Mitigating Subjectivity and Bias

The first author’s involvement in managing AUB’s UICs provide valuable practical insights, though it also introduces potential interpretive bias. To maintain balance and analytical objectivity, this study clearly

distinguishes between documented institutional outputs and the authors' subjective interpretations of the underlying processes how those results were achieved. Furthermore, where definitive evidence cannot prove broader socioeconomic impact, these impacts are framed as emerging possibilities rather than proven causal effects.

3.6. Scope and Limitations

By design, the study does not attempt to capture the full UIC spectrum; consequently, it introduces several limitations regarding the breadth of the findings. First, it focuses on a single university in one fragile national context. The findings therefore should not be interpreted as universally generalizable. Second, the evidence base emphasizes institutional records, project activity, and practitioner experience rather than independent impact evaluation. The study can therefore provide evidence concerning institutional mechanisms, engagement, and inferences but cannot establish causal effects on national economic performance. Third, longer-term outcomes, including changes in firm productivity, employment, commercialization success, talent retention, and economic growth, require longitudinal and comparative data that are beyond the scope of the present study.

These limitations do not diminish the value of the case. Rather, they define the study's contribution as an examination of how UIC can be institutionalized and operationalized under conditions of fragility.

4. The Lebanese Innovation and UIC Context

UIC in Lebanon remains highly fragmented and predominantly transactional. Consequently, this section critically examines the friction points - structural, institutional, and operational barriers - that impede the development of sustained, strategic partnerships between academia and the industrial sector.

4.1. Fragile Political and Economic Environment

In Lebanon, protracted socioeconomic instability, recurring political crises, bureaucratic inertia, and systemic institutional fragilities have exacerbated the structural barriers conventionally documented in UIC literature. Historically, fragmented interventions by state actors, higher education institutions, and private industry have lacked the strategic coordination and operational continuity necessary to sustain collaborative ecosystems.

Political volatility inherently intensifies market uncertainty, thereby disincentivizing private firms from committing capital to long-term research and innovation pipelines. Concurrently, macroeconomic fragility constrains the liquidity and capital allocation required for corporate R&D and joint academic ventures. Furthermore, fluid shifting of government and institutional priorities frequently disrupts policy continuity, while compounding infrastructure deficits directly bottleneck collaborative scientific inquiry. Cumulatively, these macro-environmental contingencies impede the creation of knowledge-transfer partnerships that fundamentally depend on sustained, long-term capital investments and institutional commitments.

4.2. Fragmented Innovation Ecosystem

The Lebanese innovation ecosystem operates in the absence of a cohesive national strategic framework, leading to structural fragmentation among key stakeholders—including academia, private enterprises, state institutions, and civil society. Consequently, the deficit in centralized institutional orchestration induces localized inefficiencies, such as the duplication of programmatic initiatives, asymmetrical information flows, resource dilution, and diminished project sustainability. Rather than engaging within a coordinated National Innovation System (NIS), universities and private firms are compelled to negotiate isolated, bilateral partnerships. This pronounced systemic fragmentation underscores the critical necessity of intermediary organizations tasked with identifying market opportunities, aligning institutional capabilities, mitigating stakeholder friction, and ensuring long-term relationship continuity.

4.3. Industrial Structure and R&D Capacity

The Lebanese industrial landscape is predominantly characterized by small and medium-sized enterprises (SMEs), a significant portion of which operate under family ownership. Consequently, these firms exhibit constrained internal research and development (R&D) capacities and a systemic reliance on imported technologies, which collectively impede their engagement in long-term, collaborative research. This structural deficit induces a mutual misalignment of expectations: industry actors frequently critique academia for its perceived inertia regarding immediate operational challenges, while higher education institutions often view local firms as lacking the requisite absorptive capacity or financial capital to integrate academic research. As a result, UIC remains highly fragmented and transactional, failing to evolve into sustained, strategic partnerships.

4.4. Brain Drain and Human Capital

Fragile macroeconomic conditions and underdeveloped UIC architectures generate a mutually reinforcing negative dynamic. The dearth of high-value employment opportunities drives the outmigration of skilled graduates and researchers, systematically eroding the human capital base available to both domestic firms and academic institutions, which further weakens the broader innovation ecosystem. This phenomenon is highlighted by a 2025 MSFEA exit survey, which revealed that 60 percent of the AUB’s engineering graduates departed Lebanon immediately upon graduation. The implication is not that UIC mechanisms alone can reverse human capital flight; rather, robust institutional alignment between universities and local firms can serve as a critical lever to generate more viable, high-quality employment, research, and entrepreneurial opportunities within the domestic economy.

4.5. Implications for UIC

The Lebanese context fundamentally redefines the strategic role of UIC. While UIC in stable innovation ecosystems primarily serves to accelerate technology transfer, commercialization, and industrial innovation, it assumes a critical resilience-building function within fragile environments. Even under weak institutional mechanisms, universities can act as vital anchors that sustain connectivity among

knowledge producers, private enterprises, students, governance bodies, and entrepreneurs. Consequently, the strategic objective shifts from merely maximizing the volume of university-industry interactions to designing robust institutional architectures that safeguard continuity, maintain social trust, facilitate knowledge flows, and preserve human capital development amidst macro-environmental volatility.

5. AUB as an Institutional Case of UIC

5.1. The AUB UIC Ecosystem

The American University of Beirut (AUB) has developed an institutional ecosystem designed (see Fig. 1) to catalyze innovation and formalize external engagement, spanning key dimensions of the university–industry interface, encompassing entrepreneurship, governance alignment, research commercialization, intellectual property (IP) management, corporate business development, continuing professional education, and experiential student learning. Central to this architecture is the Talal and Madiha Zein AUB Innovation Park (iPark), which delivers targeted incubation infrastructure to students, alumni, and faculty from the ideological phase through commercial market entry. Notably, iPark has mentored over 60 startups, facilitated more than $8 million in venture capital and funding, secured $445,000 in competitive awards, and sustained a 50% female founder participation rate. This venture-creation pipeline is further augmented by the engineering school's dedicated entrepreneurship initiative.

In parallel, AUB leverages several specialized operational arms to bridge the academia-market divide. The Government Engagement Platform institutionalizes evidence-based policymaking, public-sector modernization, and institutional capacity building by connecting AUB's scholarly expertise with state entities. Commercialization and technology transfer are managed via the Office of Research—which safeguards the university’s IP base—while the Office of Advancement and Business Development acts as a strategic intermediary matching corporate demands with AUB's research assets. To address contemporary skills deficits, the Abdullah Al Ghurair Hub for Digital Teaching and Learning provides scalable professional education, having deployed 12 advanced online curricula that have upskilled over 5,400 students in critical areas such as artificial intelligence, data science, cybersecurity, and sustainability. Additionally, the Research, Innovation, and Commercialization Hub (RICH) serves as a mechanism for translating external macroeconomic challenges into targeted academic research inquiries. Ultimately, these initiatives operate not as siloed programs, but as an integrated institutional

pathway that seamlessly transitions from problem identification and basic research to professional pedagogy, entrepreneurial incubation, and market implementation.

5.2. The MSFEA Institute

A cornerstone of the AUB innovation framework is the Institute at the Maroun Semaan Faculty of Engineering and Architecture (MSFEA). Established in 2020 amid the compounding crises of the Beirut Port explosion, a severe macroeconomic collapse, and the COVID-19 pandemic, the Institute was

conceptualized to leverage AUB's advanced academic and technical competencies toward industrial revitalization, endogenous innovation, and regional economic development across the Middle East and North Africa (MENA). Its operational mandates encompass industry-aligned research and development (R&D), functional prototyping, knowledge dissemination, design-thinking methodologies, institutional capacity building, technology transfer, process optimization, and comprehensive techno-economic feasibility assessments.

Consequently, the Institute executes a critical boundary-spanning function that mitigates the traditional academia-industry disconnect. By institutionalizing effective communication channels, it fosters long-term, high-trust relational capital between corporate entities and the university. The Institute effectively serves as a collaborative platform (see Fig. 2) where external organizations can articulate complex operational challenges and academic capabilities are strategically aligned to generate solutions, while simultaneously providing researchers with empirical data and practical pathways for technology application.

Since its inception, the Institute has entered into discussion with 73 external organizations, exploring engagement across a diverse matrix of consulting services, academic initiatives, doctoral-level research, institutional upskilling, corporate alliances, and student competitions. To date, these engagements have generated 41 completed and 11 ongoing projects, focusing on critical domains such as product and process engineering, healthcare technologies, industrial optimization, artificial intelligence, cybersecurity training, and diverse forms of applied research. Importantly, this portfolio of achievements should not be interpreted as a direct quantification of macroeconomic impact; rather, it serves as empirical evidence of highly effective institutional outreach. It demonstrates that a dedicated, boundary-spanning mechanism can catalyze a significant volume of bidirectional interaction between academic capabilities and external entities, even within a highly volatile macroeconomic environment.

Central to the Institute's operational paradigm is a strategic emphasis on repeated interaction rather than isolated, transactional exchanges. This approach aligns closely with established literature distinguishing between programmatic success—the localized achievement of project-specific outputs—and relational success, which focuses on long-term institutional alignment. While an individual project may yield a viable technical output, it is the process of repeated interaction that cultivates the mutual trust and structural familiarity requisite for more ambitious, future collaborative endeavors. For instance, the Institute hosts dedicated "Industry Days" as a networking mechanism for domestic and international stakeholders. By bringing together university researchers and industry representatives, these events lower communication barriers, catalyze knowledge exchange, and foster the sustained relational ties necessary to transition the ecosystem away from fragmented transactions.

5.3. Industry-Integrated Student Learning

To directly address the education–industry skills gap identified in literature, the MSFEA at AUB has extended UIC beyond conventional research and consulting frameworks into experiential learning pedagogy through three distinct curricular pathways. First, the VIP program facilitates multi-tier

collaboration by connecting undergraduate and graduate students with faculty-led, multidisciplinary initiatives that target active industrial challenges; currently, over 100 MSFEA students participate in projects spanning seven local and regional industries. Second, the capstone FYP deploy a two-semester framework where students engage with both faculty and corporate mentors to resolve empirical problems proposed by industry partners, accounting for more than 72 corporate-sponsored projects in the two most recent cycles. Third, MSFEA continually broadens its scope via cooperative education and work-integrated learning exchanges that embed structured, industry-linked training into the student experience. Through these initiatives, students tackle open-ended, ambiguous industry problems, synthesize multidisciplinary theoretical knowledge, engage with external stakeholders, and formulate engineering solutions within realistic socio-economic and technical constraints—thereby cultivating the precise professional competencies demanded by the contemporary workforce.

5.4. Interdisciplinarity as an Institutional Capability

Many contemporary industrial challenges cross traditional academic boundaries, as seen in fields like healthcare technologies, artificial intelligence, sustainability, industrial optimization, cybersecurity, and product development. Addressing these complexities requires a convergence of engineering, medicine, design, business, and economics. Consequently, the AUB model prioritizes institutional mechanisms that bridge disparate academic faculties with external organizations. Structural frameworks like the MSFEA Institute and the RICH hub serve as key institutional pathways to systematically identify these external challenges and mobilize interdisciplinary expertise. This infrastructure is critical, as contemporary industrial problems typically emerge from dynamic organizational and market contexts rather than isolated academic disciplines.

5.5. From Individual Partnerships to Institutionalization

A foundational tenet of the AUB model is the systemic transition from fragmented, individual-level networks to formalized institutional infrastructure. In the absence of institutionalization, UIC remains contingent to the personal connections and preferences of individual faculty members. This dependency risks partnership to go the wayside when key personnel exit, transition roles, or shift research priorities. Alternatively, dedicated institutional frameworks guarantees operational continuity by systemizing the management and progress monitoring of alliances to ensure cooperation endures beyond the lifecycle of individual projects. Furthermore, this structural centralization lowers transaction costs; it provides a transparent gateway for external firms to navigate university capabilities while simultaneously lowering barriers for researchers seeking market-driven opportunities. The AUB paradigm thus demonstrates that institutionalization transcends administrative boundaries; it functions as a strategic mechanism for cultivating sustained organizational memory, mutual trust, and bi-directional knowledge transfer.

6. Findings

In spite of Lebanon's fragile conditions, AUB has driven many proactive initiatives to advance UIC, offering valuable lessons that can serve as a beacon for other countries facing similar struggles.

Specifically, the following lessons emerges.

6.1. Institutionalization Can Compensate Partially for Ecosystem Fragmentation

The primary finding indicates that higher education institutions situated within fragile innovation ecosystems can develop internal institutional mechanisms to partially mitigate ecosystem deficiencies. In the context of Lebanon's fragmented and poorly coordinated innovation landscape, the AUB strategically established multi-sectoral platforms bridging academia, industry, governance, and entrepreneurship. While a university cannot substitute for a comprehensive national innovation ecosystem, localized institutionalization effectively creates critical hubs of coordination - minimizing transaction costs, streamline access to specialized expertise, and formalize cooperative relationships that would otherwise remain transient.

6.2. Boundary-Spanning Units Are Central to Sustainable UIC

The second finding highlights the critical role of "boundary spanners." Dedicated units like the MSFEA Institute, Office of Business Development, RICH, and GEP do not just handle standard academic administration; they act as vital market bridges. They identify industry challenges, match them with internal capabilities and talent, oversee project execution, and foster long-term relationships. This approach directly addresses the cultural gap between the business and academic worlds. In a fragile economic climate, these university-led bridging functions become essential survival tools, filling the gaps left by a lack of external networking infrastructure.

6.3. Sustained Engagement Is More Important Than Transaction Volume Alone

The third finding posits that university-industry collaboration (UIC) must be evaluated based on the volume of discrete projects but rather on the ability to harness sustainable relationships. While the Institute’s engagement with 73 organizations and its extensive project portfolio indicates significant operational activity, the long-term strategic efficacy of these initiatives hinges on the transition from transactional encounters to iterative collaboration, co-authored research, deep knowledge transfer, and enduring partnerships. Consequently, structured interventions—such as Industry Days, corporate site visits, sponsored graduate research, and systematic relationship management—constitute vital mechanisms within this institutional paradigm.

6.4. UIC Can Integrate Research, Education, and Talent Development

Furthermore, UIC gains strategic significance when research partnerships are integrated with student education and human-capital development. Institutional mechanisms such as VIP and FYPs effectively

translate industrial challenges into pedagogical experiences. This dynamic exposes students to authentic operational constraints while granting firms early access to emerging talent. Within the Lebanese context, where intellectual capital flight severely impedes innovation capacity, such initiatives are critical. While UIC frameworks cannot fully mitigate the macroeconomic drivers of migration, robust institutional ties offer a viable countermeasure by allowing students to address locally relevant challenges, interface with regional employers, and cultivate local professional and entrepreneurial pathways.

6.5. Interdisciplinarity Is Necessary for Complex Industrial Problems

A fifth finding indicates that institutionalized UIC should transcend single-discipline frameworks. Because complex external challenges inherently require multi-faceted, cross-functional solutions, the AUB model introduces structural mechanisms that integrate engineering, medicine, business, design, and other fields to address shared problems. This approach significantly expands upon conventional UIC paradigms, which traditionally restrict university–firm interactions to isolated disciplinary or technical domains.

6.6. Institutional Infrastructure Creates Potential for Resilience

The final finding demonstrates that UIC infrastructure enhances institutional resilience, irrespective of whether its immediate macroeconomic impacts are quantifiable. Amid severe national instability, the AUB initiatives examined in this study sustained vital networks among researchers, students, private firms, public institutions, and entrepreneurs. While this does not imply that UIC has catalyzed macroeconomic expansion or reversed intellectual capital flight, it highlights the capacity of academic institutions to preserve critical knowledge flows, facilitate continuous human-capital development, and maintain applied research and stakeholder engagement under highly adverse conditions.

7. Discussion

Although established literature acknowledges these general findings, it was rarely correlated with corresponding actionable strategies. Consequently, these findings bridge that gap and present a robust conceptual framework to address the primary research questions posed in this study and offer a roadmap for constructive engagement of universities, industries, and government.

7.1. Answering research questions

Institutionalizing UIC in Fragile Contexts. The empirical evidence indicates that institutionalization requires universities to abandon the assumption that successful UIC emerges organically from isolated faculty–firm networks. Rather, institutions must construct robust organizational infrastructure capable of facilitating the complete lifecycle of collaboration, encompassing problem identification, partner

matching, project formulation, research execution, knowledge transfer, relationship management, and subsequent follow-on initiatives. This requires dedicated human resources, standardized protocols, active industry outreach, and structural mechanisms designed to bridge distinct fields of institutional expertise.

While the AUB experience demonstrates that this localized institutional architecture can partially mitigate structural deficits within the broader innovation ecosystem, university-level institutionalization must be conceptualized as a complement to, rather than a substitute for, comprehensive national innovation policy. Higher education institutions cannot independently rectify systemic deficiencies in infrastructure, regulatory frameworks, industrial finance, intellectual property protections, or national macroeconomic policy.

Transitioning from Transactional to Sustained UIC. Making the shift from the translational to enduring UIC relies on five enabling mechanisms identified in the empirical findings:

- **Deploying Boundary-Spanning Units** to actively mitigate organizational divide and maintain continuity across distinct project lifecycles.
- **Cultivating Continuous Interaction** through targeted networking, Industry Days, and corporate site visits foster mutual trust necessary for long-term alignment.
- **Diversifying collaborative pathways** by involving industry partners simultaneously with research, curricular design, and students' projects.
- **Mobilizing Interdisciplinary expertise** across multiple scholarly disciplines to optimally address multi-faceted external challenges.
- **Institutionalizing collaboration platforms** to reduce reliance on fragile personal relationships and safeguard organizational memory.

These mechanisms shift UIC away from a series of fragmented, transactional interactions toward a cohesive, institutionalized ecosystem.

AUB Case as an Example to other Fragile Ecosystems. The primary takeaway is that academic institutions within fragile political economies may need to build constructs beyond thetraditional role within a stable innovation ecosystem. In fragile environments, institutions must assume broader coordination and boundary-spanning responsibilities. The AUB case study offers several transferable principles for such contexts:

1. **Institutionalize collaborations** to transcend reliance on isolated individual networks.
2. **Establish dedicated boundary-spanning infrastructure** to bridge institutional divides.
3. **Synthesize research, pedagogy, entrepreneurship, and external engagement** into a unified framework.

4. **Cultivate industry partnerships** as long-term, strategic alliances rather than transactional engagements.
5. **Implement interdisciplinary structures** capable of addressing multi-faceted socio-economic problems.
6. **Systematize assessment** of collaboration outputs and outcomes.
7. **Leverage institutional insights** to inform and shape broader national innovation policy.

While specific organizational structures will vary by institutional and national context, the fundamental premise endures - universities can function as vital institutional anchors when the surrounding innovation ecosystem is fragile.

7.2. Implications

The study contributes to UIC literature by emphasizing institutional resilience as a dimension of UIC. Research literature on UIC commonly examines collaboration in terms of knowledge transfer, innovation, commercialization, relational trust, and organizational benefits. The present case suggests that in fragile economies UIC may have an additional function: maintaining the connectivity of an innovation ecosystem during periods of institutional disruption. This perspective extends the Triple Helix model. Rather than assuming effective interaction among university, industry, and government, the case illustrates what can occur when those interactions are fragmented.

Implications for Universities. To respond to ecosystem fragility, universities can strengthen UIC by creating a diversified portfolio of complementary boundary spanning mechanisms that perform some of the coordination functions normally expected from a broader ecosystem to potentially safeguard innovation-system resiliency. The strategic objective is to construct seamless institutional pathways that enable external organizations to systematically progress from problem identification to expertise mobilization, collaborative project execution, student and researcher engagement, and ultimately, the cultivation of long-term strategic alliances. To achieve this comprehensive engagement, institutions should develop pathways that span the following functional domains:

- **Strategic Alliance Governance**: Formalizing corporate relations through dedicated industry liaison frameworks and partnership management protocols.
- **Applied Knowledge Generation & Transfer**: Delivering targeted applied research, consulting services, and structured technology transfer mechanisms.
- **Venture Creation & Commercialization**: Fostering ecosystem growth through entrepreneurship, incubation, and spin-off support.
- **Structural Alignment**: Designing formal government engagement protocols to align academic and industrial efforts with national policy.
- **Human Capital Development**: Facilitating workforce transformation via professional education and continuous upskilling activities.

- **Cross-Disciplinary Problem Solving**: Deploying interdisciplinary challenge platforms designed to tackle complex, market-driven issues.
- **Targeted Academic-Industrial Research**: Embedding industry-sponsored graduate research projects directly into advanced degree programs.
- **Experiential Pedagogical Interventions**: Integrating student experiential learning opportunities and work-integrated learning exchanges into the core curriculum.

Universities must also update internal rules that actively incentivize faculty participation in UIC, formalizing policies on workload relief, consulting boundaries, IP distribution rights, and the formal recognition of industry-engaged scholarship within tenure and promotion tracks.

Implications for Government. The main structural issue vexing the Lebanese UIC model is not necessarily a lack of localized initiatives, but rather the absence of a centralized mechanism that coordinate and sustain existing programs. Consequently, macro-level national coordination architecture spearheaded by the government is vital to systematically bridge and align the intersecting objectives of university, industry, state, and civil society actors—effectively activating a cohesive ecosystem. The macro-level regulatory structure must clarify and simplify legal frameworks that regulate intellectual property (IP), patent protocols, tech transfer licensing, research funding, and commercialization pathways.

Implications for Industry. Industrial actors must shift their perception of higher education institutions from transactional providers of ad-hoc consulting and training services to long-term, strategic partners in co-innovation and human capital development. Empowering this shift, firms can actively co-create value by articulating empirical market challenges, provisioning proprietary datasets and facilities, sponsoring advanced research initiatives, co-designing curricula, and mentoring students. Furthermore, establishing multi-year, collaborative research agenda enables industries to transition from short-term problem-solving to proactive capability building. Such deeply integrated engagement yields a reciprocal, bi-directional benefit: it systematically enhances the market relevance of academic curricula while simultaneously granting firms preferential access to cutting-edge knowledge frontiers and highly specialized talent pipelines.

7.3. Going Forward

In light of the aforementioned insights, the authors advance the following targeted recommendations to guide future policy and practice.

- Institutionalizing Dedicated UIC Infrastructure backed by explicit institutional mandates to link industrial needs to internal academic competencies, manage joint ventures, and cultivate long-term relational capital beyond singular project lifecycles.
- Establishing a coherent University–Industry–Government–Community (UIGC) coordination framework to formulate a unified national innovation strategy, pool and optimize resource allocation, audit institutional practices, set accountability measures, clear systemic bottlenecks, incentivize

faculty participation, simplify legal frameworks governing intellectual property (IP), patent protocols, tech transfer licensing, and commercialization pathways, and safeguard strategic continuity.

- Optimizing resource allocation that prioritize applied research with clear potential for functional prototyping, empirical validation, commercialization, and market adoption. Rather than scattering constrained financial capital across small, fragmented projects, funding mechanisms should strategically concentrate resources on a select portfolio of high-potential initiatives that directly aligned with national strategic priorities.
- Aligning pedagogy with Industry Needs by integrating applied pedagogy into co-curated industry curricula, interdisciplinary frameworks, and experiential learning models to cultivate a student's intellectual agility, critical thinking, and capacity to translate theoretical frameworks into actionable strategies for complex, non-linear challenges.
- Establishing Product Innovation hubs with a mandate to align academic multidisciplinary research spanning engineering, medicine, business, economics, design, and other fields with applied industrial applications.
- Developing a centralized UIC Knowledge database tracking partnership, projects, funding mechanisms, outcomes, policies, and lessons learned to empirically affect systematic improvement of UIC efficacy.
- Establishing an Impact Measurement Framework to generate quantitative evidence linking collaborative mechanisms to macro-level outcomes. Synthesizing insights from the broader literature and empirical data from the current case, this study proposes an evaluation framework structured around a five-tiered logic model
- *Inputs*: Financial capital, human resources, institutional infrastructure, and domain expertise.
- *Activities*: Formal partnerships, joint research projects, professional training initiatives, and experiential student engagement.
- *Outputs*: Deliverables such as completed projects, functional prototypes, peer-reviewed publications, patented intellectual property, spin-off ventures, and specialized graduates.
- *Outcomes*: Proximal impacts including industry technology adoption, commercialized products, high-value employment generation, firm-level productivity gains, and iterative, multi-year alliances.
- *Long-term impacts*: Distal systemic transformations manifesting as enhanced national innovation capacity, localized brain-drain mitigation, industrial competitiveness, and macroeconomic and social resilience.

Implementing such a multi-level conceptual framework is essential to decouple superficial metrics of activity from substantive metrics of impact, thereby establishing a robust empirical foundation for future evidence-based policy design.

8. Conclusion

the university–industry collaboration (UIC) in stable environments is viewed as a mechanism for knowledge transfer, innovation, and economic competitiveness; however, its role expands considerably in fragile economies. In these contexts, UIC serves a vital anchor to preserve knowledge flows, retain human capital, and stabilize institutional relationships amidst economic and political instability. This study utilizes an exploratory case study of the American University of Beirut (AUB) to examine how universities institutionalize UIC under such volatile conditions. By analyzing institutional records, AUB's UIC project databases, and the authors' insights developed in directly managing UIC activities, the research analyzes the mechanism AUB developed to bridge academic expertise with industry, government, entrepreneurship, and education.

The findings confirm that establishing dedicated boundary-spanning mechanisms and technology-transfer infrastructure is essential for sustaining university-industry collaboration (UIC) within fragmented environments. Furthermore, the American University of Beirut (AUB) case highlights the need to differentiate between activities, outputs, outcomes, and long-term impacts. While high levels of engagement, completed projects, student involvement, and partnerships reflect strong institutional activity and reach, assessing long-term effects on productivity, employment, commercialization, talent retention, and national economic growth will require further longitudinal and comparative studies.

The study's principal contribution is not to claim that a single university can fix the structural flaws of a fragile national innovation system, but rather to show how it can serve as an institutional anchor. By establishing mechanisms that link otherwise disconnected stakeholders, and by merging research, education, entrepreneurship, and corporate partnerships, universities can safeguard and reinforce regional innovation capabilities even in the absence of national supporting ecosystem.

For Lebanon, the next step should be to move from isolated initiatives toward greater coordination among universities, industry, government, and the wider community. A national University–Industry–Government–Community framework could provide the coordination, policy support, resource alignment, and accountability required to scale existing initiatives and develop a more coherent innovation ecosystem.

More broadly, the AUB experience suggests that fragile economies should not simply replicate UIC models developed in stable environments. They may require institutional arrangements explicitly designed for uncertainty, fragmentation, resource constraints, and talent outmigration.

Future research should build on this exploratory case by developing longitudinal measures of UIC outcomes, comparing institutional models across fragile economies, examining the perspectives of industry partners and students, and quantitatively assessing the relationship between specific UIC mechanisms and measurable research, educational, industrial, and socioeconomic outcomes.

Declarations

Ethical approval Statement

Ethical approval was not required for this study as it is a literature review and analysis of AUB generated reports about University-Industry Collaboration activities that did not involve human participants, live animals, or confidential primary data.

Informed Consent Statement

Not applicable. This study relies exclusively on publicly available research articles and reports and did not involve human participants or the collection of primary human data.

Author Contribution

R. C. supervised the project; R. C. and A. S. developed the concept and methodology, and analyzed sources; R.C., A.S., and N. N. prepared the original draft; wrote, reviewed, and edited the manuscript. N. N. and A. S. prepared the figures.

Acknowledgement

The authors would like to thank Dr. Alan Shihadeh, Dean of the Maroun Semaan Faculty of Engineering at the American University of Beirut for initiating the idea for this research article.

Data Availability

Data sharing is not applicable to this study as no new datasets were generated or analyzed during the current study. The authors relied exclusively on publicly available research articles and institutional reports and data published by the American University of Beirut regarding its university–industry collaboration initiatives. An uploaded excel File “UIC_Dataset.xlsx” contains all the following information and data used in the manuscript. Institutional Indicators : Summary metrics reported, including UIC projects, startups, online programs, VIP participation, FYPs, and exit survey results.Al Ghurair Hub Programs : Online certificates, diplomas, and degree programs offered through the Abdulla Al Ghurair Hub for Digital Teaching and Learning.FYPs Industrial : Industry-sponsored Final Year Projects, including project titles, industry partners, and academic yearsVIP Projects - Publicly listed Vertically Integrated Projects (VIP), including project themes and subject areas.iPark Startup Portfolio : Startup ventures supported through Talal and Madiha Zein AUB Innovation Park (iPark), including industry, stage, geography, and website information. UIC Database - Institute : University-industry collaboration activities managed through The Institute at MSFEA, including consulting projects, academic projects, capacity-building initiatives, corporate partnerships, and competitions.UIC Project Count : Aggregated counts of projects by academic year and engagement type. MSFEA Exit Survey 2025 : Aggregated graduate outcomes including employment, graduate school enrollment, entrepreneurship, and destination region. Institute Events: Industry engagement events organized by The Institute at MSFEA.Institute Visits : Records of visits to industry partners and organizations. Data Dictionary Completed Projects: Number of

projects completedAwarded Projects : Number of awarded projects VIP Students: Students participating in VIP VIP Industry Partners: Industry organizations in VIP Industry Sponsored FYPs: Industry linked final year projects Online Programs Developed: Online programs documented Upskilled Learners: Participants in online learning programs Startups Mentored: Startups supported by iPark Academic Project : University-industry academic project Consulting Service: Industry consulting engagement Capacity Building :Training or workforce development activity Corporate Partnership: Formal organizational partnership

References

1. Abu Sa'aE, Asplund F (2025) Unpacking social capital in University–Industry Collaborations: Pathways to cross-industry knowledge sharing. Technovation 140:103160
2. Abu Sa'a E. and, Yström A (2024) Exploring enablers of internal knowledge dissemination for boundary-spanning industrial PhD students. Creative Innov Manage 33:530–550
3. Ahmed F, Fattani MT, Ali SR, and Enam R. N (2022). Strengthening the Bridge Between Academic and the Industry Through the Academia-Industry Collaboration Plan Design Model. Front Psychol 13:875940. https://doi.org/10.3389/fpsyg.2022.875940
4. Alexander A, Martin DP, Manolchev C, Miller K (2020) University–industry collaboration: using meta–rules to overcome barriers to knowledge transfer. J Technol Transf 45:371–392. https://doi.org/10.1007/s10961-018-9685-1
5. Alexandre F, Costa H, Faria AP, Portela M (2022) Enhancing University–Industry collaboration: the role of intermediary organizations. J Technol Transf 47:1584–1611
6. Ankrah S, Al-Tabbaa O (2015) Universities—industry collaboration: A systematic review. Scand J Manag 31:387–408
7. Awasthy R, Flint S, Sankarnarayana R, Jones RL (2020) A framework to improve university–industry collaboration. J Industry-University Collab 2(1):49–62. https://doi.org/10.1108/JIUC-09-2019-0016
8. Bishop K, D'Esteb P, Neely A (2011) Gaining from interactions with universities: Multiple methods for nurturing absorptive capacity. Res Policy 40:30–40
9. Bruneel, D'Esteb P, Salter A (2010) Investigating the factors that diminish the barriers to university–industry collaboration. Res Policy 39:858–868
10. Cantner U, Kalthaus M, Yarullina I (2024) Outcomes of science-industry collaboration: factors and interdependencies. J Technol Transf 49:542–580
11. Chryssou EC (2020) University–industry interactions in the Sultanate of Oman: Challenges and opportunities, Industry and Higher Education. 34(5):342–357
12. Daradkah AM 2023. A Proposed Model for Integration and Cooperation between University, Industry, and Government in Arab countries Innovation Triple Helix Model (similar to the double helix of the DNA). Appl Math Inf Sci 17(6): 1109–1144

13. de Wit–deVries E, Dolfsma WA, van der Windt HJ, Gerkema MP (2019) Knowledge transfer in university–industry research partnerships: a review. J Technol Transf 44:1236–1255
14. D'Este P, Patel P (2007) University–industry linkages in the UK: What are the factors underlying the variety of interactions with industry? Res Policy 36:1295–1313
15. Edmondson G (ed) 2012. Making Industry-University Partnerships Work - Lessons from successful collaborations, Science-Business Innovation Board AISBL
16. El Hadidi HH and Kirby D. A (2017) University–industry collaboration in a factor-driven economy: The perspective of Egyptian industry. Ind High Educ 31(3):195–203
17. Giones F (2019) University–industry collaborations: an industry perspective. Manag Decis 57(12):3258–3279
18. Hayter CS, Rasmussen E, Rooksby JH (2020) Beyond formal university technology transfer: innovative pathways for knowledge exchange. J Technol Transf 45:1–8
19. He VF, von Krogh G, Siren C, Gersdorf T (2021) Asymmetries between partners and the success of university-industry research collaborations. Res Policy 50(10)
20. Isaeva I, Steinmo M, Rasmussen E (2021) How firms use coordination activities in university–industry collaboration: adjusting to or steering a research center? J Technol Transf 47(5):1–35
21. Kamal MA, Guha S, Begum NN, Taher MA (2024) Drivers of strengthening university–industry collaboration: implications for favorable outcomes. High Educ Skills Work-Based Learn 14:237–254. https://doi.org/10.1108/heswbl-10-2019-0151
22. Kirby DA, El Hadidi H (2019) University technology transfer efficiency in a factor driven economy: the need for a coherent policy in Egypt. J Technol Transf 44:1367–1395
23. Klelner-Schaefer T, Schaefer KJ (2022) Barriers to university–industry collaboration in an emerging market: Firm–level evidence from Turkey. J Technol Transfer 47:872–905
24. Lauvås T, Steinmo M (2021) The role of proximity dimensions and mutual commitment in shaping the performance of university-industry research centers. Innovation: Organ Manage 23(2):182–208. https://doi.org/10.1080/14479338.2019.1662725
25. Mell J, van Knippenberg D, van Ginkel WP, Heugens P (2022) From Boundary Spanning to Intergroup Knowledge Integration: The Role of Boundary Spanners' Metaknowledge and Proactivity. J Manage Stud 59:7. https://doi.org/10.1111/joms.12797
26. Nugent A, Chan HF, Dullek U (2022) Government funding of university–industry collaboration: exploring the impact of targeted funding on university patent activity. Scientometrics 127:29–73. https://doi.org/10.1007/s11192-021-04153-0
27. OECD (2019) University-Industry Collaboration: New Evidence and Policy Options. OECD Publishing, Paris. https://doi.org/10.1787/e9c1e648-en
28. Perkman M, Walsh K (2007) University–industry relationships and open innovation: Towards a research agenda. Int J Manage Reviews 9(4):259–280

29. Pertuz V, Miranda LF, Charris-Fontanilla A, Pertuz-Peralta L (2021) University-industry collaboration: a scoping review of success factors. Entrepreneurship Sustain Issues 8(3):280–290. http://doi.org/10.9770/jesi.2021.8.3(16)
30. Pertuzé JA, Calder ES, Greitzer EM, Lucas WA (2010) Best Practices for Industry-University Collaboration. MIT Sloan Management Review
31. Ranga M, Etzkowitz H (2013) Triple Helix Systems: An Analytical Framework for Innovation Policy and Practice in the Knowledge Society. Ind High Educ 27(4):237–262
32. Rhinehart RR (2022) Operations & Management, Best Practices for Collaboration Between Industry and Academe. InTech, ISA
33. Rossi F, De Silva M, Baines N, Rosli A (2022) Long-Term Innovation Outcomes of University–Industry Collaborations: The Role of 'Bridging' vs 'Blurring' Boundary-Spanning Practices. Br J Manag 33:478–501
34. Rossoni AL (2024) Eduardo Pinheiro Gondim Vasconcellos E. P. G, & Renata Luiza Castilho Rossoni R. L. C. Barriers and facilitators of university-industry collaboration for research, development and innovation: a systematic review. Management Review Quarterly 74(3): 1841–1877
35. Santoro MD, Betts SC (2002) Making Industry-University Partnerships Work. Res Technol Manage 45(3):42–46
36. Steinmo M (2015) Collaboration for Innovation: A Case Study on How Social Capital Mitigates Collaborative Challenges in University–Industry Research Alliances. Ind Innovat, 22(7)
37. Takieddine AR (2019) Building Strategic University-Industry Partnerships and Sustainable Growth: The Lebanese Experience. J Manage Sustain 9(1)
38. Tian M, Su Y, Yang Z (2022) University–industry collaboration and firm innovation: an empirical study of the biopharmaceutical industry. J Technol Transf 47:1488–1505
39. Tseng F, Huang M, Chen C (2020) Factors of university–industry collaboration affecting university innovation performance. J Technol Transf 45:560–577
40. Tucker RC, Robinson SJ, Lasanthi CL (2025) What Makes University–Enterprise Collaborations Successful? An Integrative Review. J Knowl Econ 17:532–562
41. Yang Q, Wang C, Ying H, Jiang H, Fu Z (2025) Review on barriers and drivers of university–industry collaborative innovation: A stakeholder perspective. Sustainable Futures 9 (2025) 100771. https://doi.org/10.1016/j.sftr.2025.100771
42. Yasin N, Gilani SAM, Nair G (2023) Establishing a nexus for effective university-industry collaborations in the MENA region: A multi-country comparative study. Ind High Educ 37(6):838–859

Figures

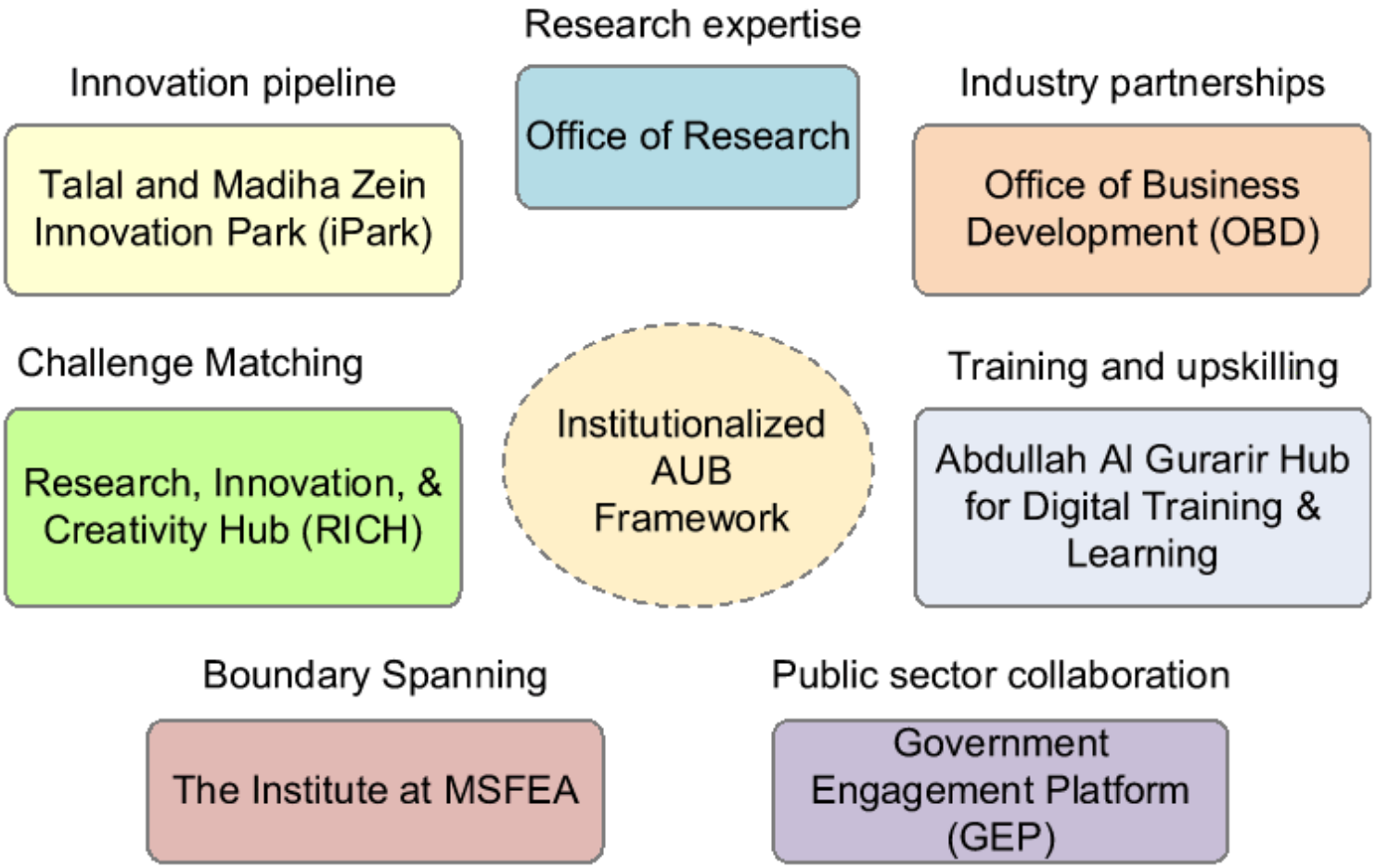


Figure 1

AUB initiatives to drive local and regional development

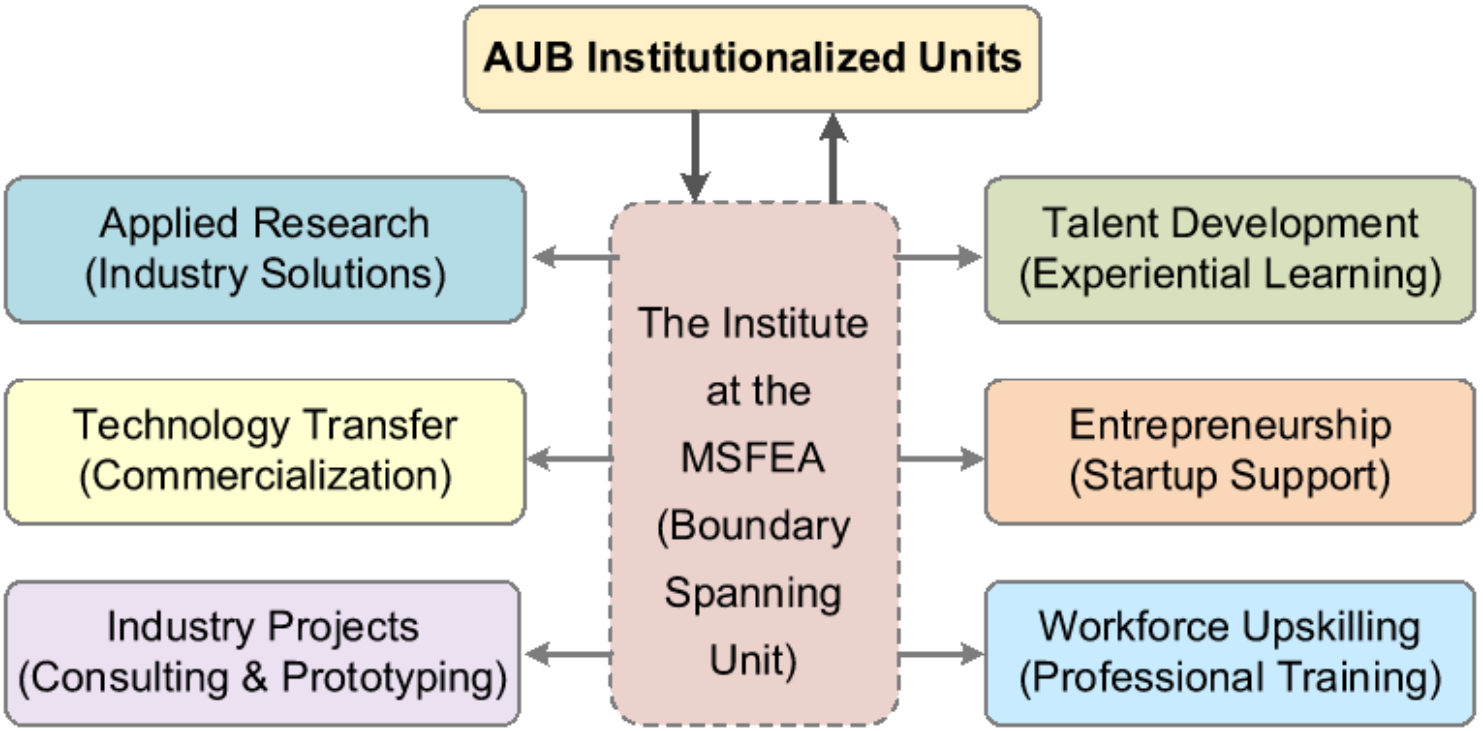


Figure 2

Structure, Objectives, and Collaboration Pathways of the Institute at MSFEA

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- UICDatabase.xlsx