

Innovation Infrastructure at Jordanian Universities

Ali Al Maqousi^{1*}, Mohammad Alauthman¹

¹Department of Information Security, University of Petra, Amman, Jordan

*Corresponding Author: amaqousi@uop.edu.jo.

mohammad.alauthman@uop.edu.jo

Abstract

Innovation has become a driving force in contemporary economic and social development, positioning universities as pivotal actors in nurturing research, entrepreneurship, and knowledge exchange. In emerging contexts such as Jordan, universities are increasingly tasked with contributing not only to human capital development but also to national innovation ecosystems. This paper provides an integrative analysis of university-led innovation capacity at Jordanian universities, offering both a broad overview of the current landscape and an in-depth exploration of major initiatives at the University of Petra (UOP). Drawing on key conceptual models—most notably the Triple Helix (adapted to recognize donors as a fourth actor)—and a six-element assessment framework, and backed by policy documents, institutional reports, and case-based evidence, the study examines how universities are establishing and expanding innovation centers, business incubators, and technology transfer offices. It also highlights the role of international collaborations (Tempus TEJ, SRTD, BITTCOIN-JO, and FREE) in accelerating capacity-building and facilitating knowledge transfer. While tangible progress is evident in entrepreneurship programs and nascent IP activity, challenges persist in funding sustainability, fragmented IP frameworks, and uneven industry engagement. The paper concludes by outlining strategies to sustain centers beyond donor cycles, formalize university–industry cooperation agreements, and strengthen IP commercialization pathways. Through a close look at UOP’s evolution, the study underscores opportunities and systemic reforms needed to fully leverage Jordanian universities as catalysts for innovation and development.

المخلص

أضحى الابتكار محركاً رئيساً للتنمية الاقتصادية والاجتماعية، ما يضع الجامعات في موقع محوري لرعاية البحث وريادة الأعمال وتبادل المعرفة. وفي سياق ناشئة كالأردن، تُطالب الجامعات بالإسهام في تنمية رأس المال البشري وفي منظومات الابتكار الوطنية معاً. يقدم هذا البحث تحليلاً تكاملياً للبنية التحتية للابتكار (القدرة الابتكارية الجامعية) في الجامعات الأردنية، جامعاً بين قراءة شاملة للمشهد الراهن ودراسة معمقة لمبادرات جامعة البترا (UOP). وانطلاقاً من نماذج مفاهيمية—أبرزها نموذج الحلقة الثلاثية بصيغة تراعي دور المانحين كفاعل رابع—ومع إطار تقييم مكوّن من ستة عناصر، وبالاستناد إلى وثائق سياسات وتقارير مؤسسية وأدلة حالة، يفحص البحث كيف تُنشئ الجامعات وتوسّع مراكز الابتكار وحاضنات الأعمال ومكاتب نقل التكنولوجيا. كما يبرز دور التعاونات الدولية (Tempus TEJ، SRTD، BITTCOIN-JO، ومشروع FREE) في تسريع بناء القدرات وتيسير نقل المعرفة. ورغم التقدّم الملموس في برامج ريادة الأعمال وبدايات نشاط البراءات وتحسّن التصنيفات، ما تزال تحديات استدامة التمويل وتجزؤ أطر الملكية الفكرية وضعف الانخراط الصناعي قائمة. يختتم البحث باقتراح استراتيجيات لتوسيع نطاق المراكز وضمان استدامتها بعد دورات التمويل، وتعميق روابط الجامعة–الصناعة–الحكومة، وإبرام اتفاقيات تعاون رسمية، وتعزيز مسارات تسويق الملكية الفكرية. ومن خلال تتبّع مسار تطوّر UOP تتجلى الفرص والإصلاحات البنوية اللازمة لتعظيم أثر الجامعات الأردنية في الابتكار والتنمية.

Keywords: Innovation, Jordanian universities, Entrepreneurship, Technology transfer, Intellectual property, Economic development, Digital transformation, Artificial intelligence.

1. Introduction

Innovation has assumed a central role in the strategic agendas of higher education institutions (HEIs) worldwide, influencing not only how universities deliver education but also how they engage with industry, government, and society. In parallel, many emerging economies are pursuing policies aimed at transforming traditional teaching-focused universities into entrepreneurial institutions, capable of producing groundbreaking research, commercializing intellectual property, and fostering startup ecosystems (Etzkowitz & Leydesdorff, 2000; Cai, 2022). Jordan, a country with a high literacy rate and a relatively advanced higher education sector by regional standards, has embraced this trajectory by increasingly integrating innovation and entrepreneurship programs

into university environments.

Historically, Jordan's universities concentrated on conventional educational practices, dedicating less emphasis to applied research, intellectual property (IP) generation, and industry linkages (Alawamleh, Bani Ismail, Aqeel, & Alawamleh, 2019; Al-Hanakta, 2022). Over the last decade, however, a shift has occurred: both national policymakers and university leaders have recognized that robust entrepreneurial ecosystem and knowledge-transfer architecture can help address pressing socio-economic challenges, including high youth unemployment and the need for knowledge-driven economic growth. Spurred by global rankings, donor-funded projects, and local success stories of tech-enabled entrepreneurship, Jordanian HEIs are increasingly establishing innovation centers, incubators, and technology transfer offices (Rifai, Al-Mimi, Rasmi, & Aldahoud, 2023).

In this context, the University of Petra (UOP) provides an instructive example of how a private university in Jordan can design and implement a comprehensive innovation ecosystem. Since 2012, UOP has launched multiple organizational units—an Innovation & Entrepreneurship Center (IEC), a Startup Incubation Quarter (SIQ), and a Technology Transfer & External Funding Office (TTO/OFFER). More recently, the university has participated in high-profile collaborations, including EU-funded projects such as Tempus TEJ (2013–2016), the Support to Research and Technological Development (SRTD) program, and BITTCOIN-JO Erasmus+ (2019–2022). These initiatives have collectively bolstered the university's capacity to convert academic research into market-ready solutions, mentor young entrepreneurs, and build lasting partnerships with global institutions. Despite these positive developments, significant barriers remain, including limited R&D funding—well below 1% of GDP—unclear pathways for IP commercialization, and insufficient industry engagement (WIPO, 2022a; MoHESR, 2021). This study aims to illuminate the evolving nature of university innovation capacity in Jordanian higher education, taking UOP as a core case study. By integrating data from institutional reports, ministry documentation, media coverage, and international organizations, the paper offers an overview of current frameworks, discusses exemplary initiatives, and identifies looming challenges and possible future directions.

Key objectives of this paper include:

1. Presenting a literature review that situates university-led innovation within global best practices and Jordan's higher education context.
2. Proposing a conceptual framework for assessing innovation infrastructure in Jordanian universities.
3. Detailing the innovation ecosystem at the University of Petra, highlighting the roles of its core centers and its participation in major collaborative projects.
4. Providing a broader analysis of innovation infrastructure across Jordanian universities, focusing on national trends, funding models, and policy interventions.
5. Outlining trends, gaps, and future challenges, offering strategic considerations for policymakers, university leaders, and stakeholders intent on deepening Jordan's innovation capacity.

Ultimately, the paper underscores that while Jordanian universities are at a pivotal phase of transformation, systemic and structural reforms are needed to ensure that nascent programs can scale sustainably and forge meaningful socio-economic impacts.

2. Literature Review

2.1 Defining Innovation Capacity and Enabling Architecture in Higher Education

In higher education, innovation infrastructure generally denotes the physical spaces, organizational units, policies, and human resources dedicated to fostering the creation and commercialization of new ideas (Etzkowitz & Leydesdorff, 2000; Cai, 2022). This encompasses research laboratories, technology transfer offices (TTOs), incubators, entrepreneurship centers, seed funding mechanisms, and conducive policy frameworks. Over the years, many universities—particularly in developed economies—have expanded these infrastructures to position themselves at the heart of regional innovation ecosystems (Alawamleh, Francis, & Alawamleh, 2023).

Innovation infrastructure in universities has assumed greater importance in the knowledge-based economy, where intangible assets (knowledge, IP, data) are crucial competitive differentiators (Nicholson & Sahay, 2009). By providing spaces for experimentation and entrepreneurial training, universities can stimulate both incremental and radical innovations that drive industrial growth and social welfare (Belitski & Desai, 2022).

2.2 Global Perspectives on University-Led Innovation

Highly cited innovation hubs such as Silicon Valley and Cambridge exemplify the role of universities in catalyzing local and national competitiveness. Key elements of these hubs include:

1. Robust Funding Environment: A mix of government grants, venture capital (VC), and corporate R&D investments.
2. Strong University–Industry Linkages: Joint research projects, embedded industry labs, and routine collaboration on talent development.
3. Supportive Policy Ecosystems: Clear IP regulations, tax incentives for R&D, and streamlined processes for establishing startups.
4. Entrepreneurial Culture: Widespread mentorship opportunities, pitch competitions, and a social acceptance—even valorization—of risk-taking (Cai, 2022).

Although Middle Eastern countries have historically lagged behind Western regions in many of these respects, certain MENA economies (e.g., the UAE, Qatar, and increasingly Jordan) are catching up through targeted reforms and large-scale foreign collaborations (GIZ & Policy Association for an Open Society, 2018).

2.3 The Jordanian Higher Education Context

Jordan has over 30 universities—public and private—serving a population characterized by high youth demographics. From a purely educational standpoint, these universities have traditionally focused on undergraduate teaching (Al-Hanakta, 2022). However, in the last ten to fifteen years, factors such as rising graduate unemployment, global accreditation pressures, and the vision of transitioning to a knowledge economy have led to greater emphasis on applied research and entrepreneurial education (Halasa, 2019).

Reports by the World Bank (2020) and the (Global Entrepreneurship Monitor, 2024) point to a vibrant entrepreneurial spirit among Jordanian youth, but also highlight systemic bottlenecks in R&D funding and knowledge transfer. While the government’s Ministry of Higher Education and Scientific Research (MoHESR) has articulated strategic priorities for fostering innovation, the actual budget allocation to R&D remains below 1% of GDP, limiting the potential impact of university-led initiatives (MoHESR, 2021). As a result, international donors—particularly the European Union, USAID, and GIZ—play a significant role in financing innovation infrastructure projects in Jordan’s universities (IREX, 2023).

2.4 University–Industry–Government Linkages in Jordan

Jordan’s innovation landscape can be viewed through the lens of the Triple Helix model, which foregrounds collaboration among university, industry, and government (Etzkowitz & Leydesdorff, 2000). However, in Jordan, a fourth actor—international donor agencies—often supplies crucial resources and capacity-building. This phenomenon is sometimes referred to as a “neo-triple helix” in developing contexts, wherein external stakeholders are indispensable catalysts for knowledge transfer (Cai, 2022).

Despite growing awareness of the need for such linkages, industry engagement remains relatively limited, especially among small and medium-sized enterprises (SMEs), which lack the capital or frameworks to embark on substantial co-development with universities (Al-Hanakta, 2022). Government incentives—like the Jordan Open Innovation Platform launched in 2021—aim to close this gap, but tangible results in technology licensing, patenting, and spin-off creation are still moderate (Jordan Times, 2021; WIPO, 2022b).

2.5 Identified Gaps in the Literature

Within the Jordanian context, existing research on university-led innovation tends to focus on broad national policies or single-point case studies. Four prominent gaps emerge:

1. Institutional Capacity: Limited examination of how universities cultivate operational, financial, and human capital for sustained innovation.
2. Case-Based Insights: A lack of in-depth case studies detailing successes, obstacles, and best practices at individual institutions.
3. Impact Assessment: Few rigorous longitudinal studies track outcomes such as startup survival, patent licensing revenues, and R&D productivity.

4. Forward-Looking Strategies: Sparse analyses project how AI, digitalization, and global shifts will influence Jordanian universities' innovation strategies.

Addressing these gaps necessitates rich, institution-level data integrated with broader policy analyses—an approach this paper employs, particularly by highlighting the University of Petra's ecosystem while keeping the national picture in view.

2.6 Digital transformation and AI in higher education (post-2023)

Recent analyses position generative AI and broader digital transformation as structural drivers of change across teaching, research workflows, academic integrity, and administration. International guidance emphasizes human-centric and ethical adoption, capacity building, and safeguards for equity, privacy, and transparency. Sector syntheses identify near-term opportunities (assessment, feedback, adaptive learning, research assistance) alongside risks (bias, data governance, and over-reliance on automation). Within the Arab region, reports point to uneven but accelerating digital adoption and the need for teacher professional development, platform choices, and quality assurance for online and blended learning. For Jordan, early institutional experiences suggest growing interest in AI-enhanced pedagogy and operations, underscoring the importance of clear policies, training, and support services.

3. Conceptual Framework

3.1 The Triple Helix and Beyond

The Triple Helix framework (Etzkowitz & Leydesdorff, 2000) posits that innovation flourishes through iterative, overlapping interactions among government, industry, and universities. In many Western contexts, this model is established through robust incentives for public-private partnerships, flexible regulatory regimes, and entrepreneurial universities. In Jordan, the model requires adaptation due to the active role of international donors and the relatively modest scale of private-sector R&D. Figure 1 conceptually represents these dimensions:

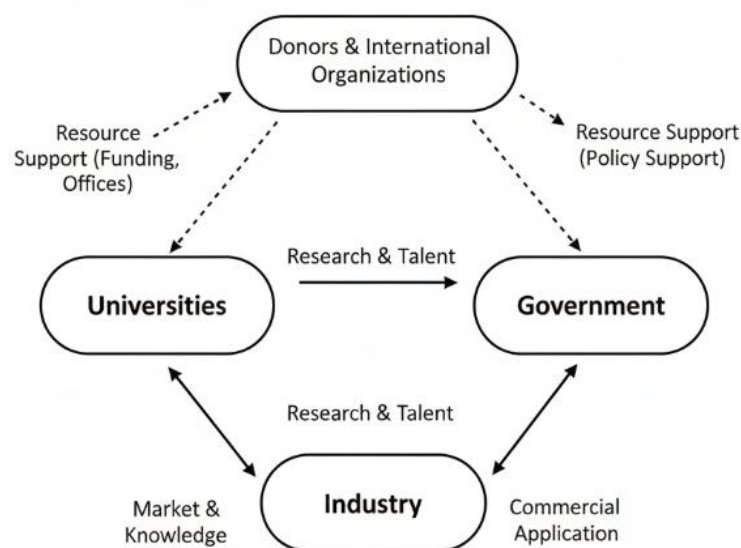


Figure 1. Triple-Helix model adapted to Jordan

Figure 1 illustrates how the three core pillars of innovation—universities, industry, and government—operate within a Jordanian context that also features significant input from donor organizations. While universities generate research and talent, donor support often bridges resource gaps, funds technology transfer offices, and facilitates training programs. Industry collaboration is gradually intensifying, but public policy—shaped by ministries—remains critical to catalyze further synergy, for instance via IP legislation and financial incentives for R&D.

3.2 Proposed Framework for Jordanian University Innovation

Building on prior scholarship (Alawamleh et al., 2019; Al-Hanakta, 2022; WIPO, 2022b), this paper proposes six core elements that collectively shape the university innovation system in Jordan:

1. Institutional Readiness: Clear strategic goals, leadership commitment, and supportive policies.
2. Physical and Organizational Infrastructure: Innovation centers, incubators, TTOs, specialized labs, and ICT/digital infrastructure.
3. Capacity-Building Programs: Entrepreneurship education, mentorship, workshops, and competitions for students and faculty.
4. Funding Mechanisms and Partnerships: Government grants, international donor projects, venture capital, industry co-financing, and philanthropic contributions.
5. IP and Commercialization Policies: Defined processes for patent filing, licensing, and revenue sharing.
6. Monitoring and Evaluation: Metrics to track startup success, patents filed, research impact, and sustainability of innovation programs.

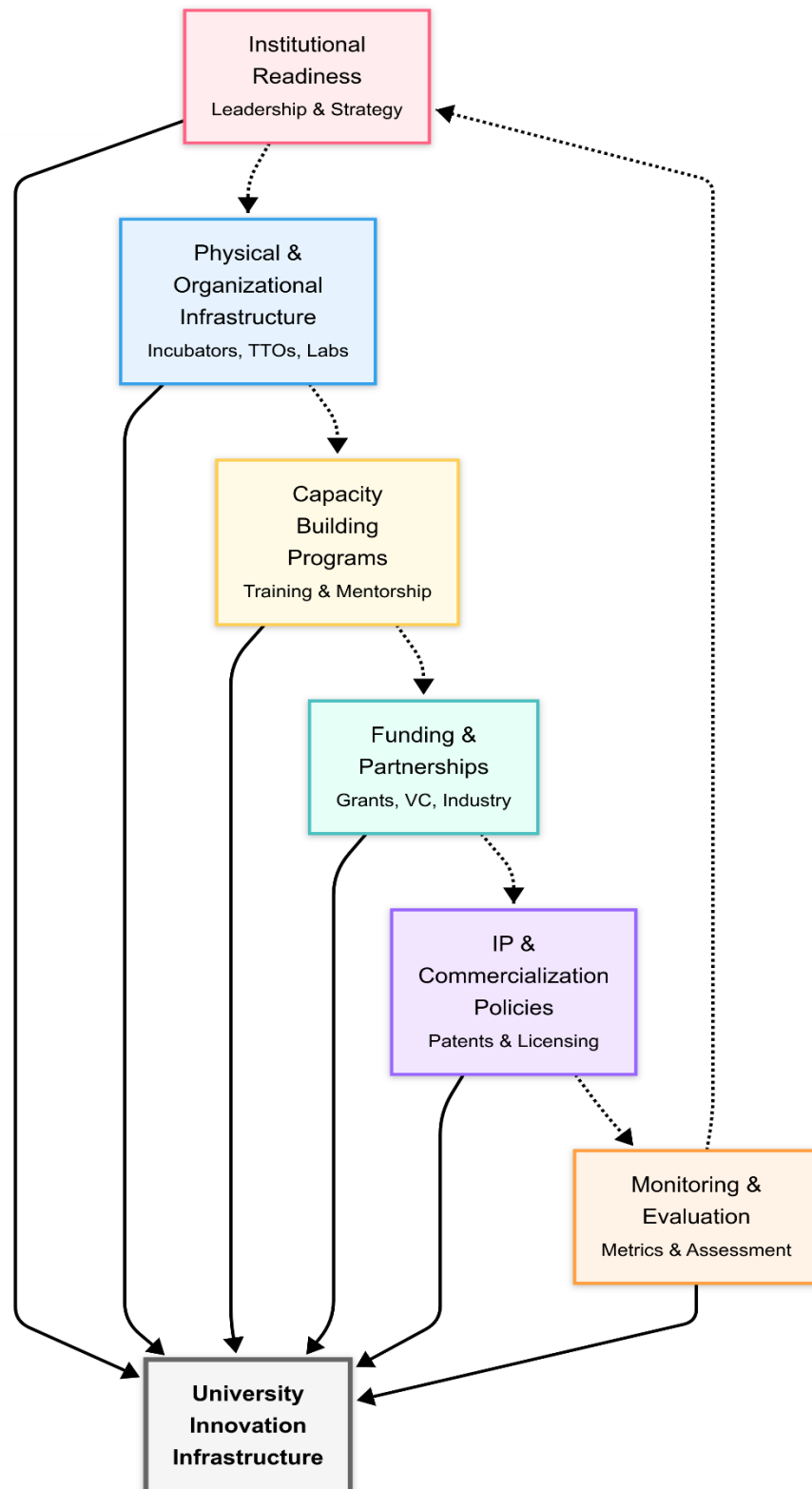


Figure 2. Six-element framework for university innovation capacity

Figure 2 elaborates how the six elements of institutional readiness, organizational infrastructure, capacity-building programs, funding partnerships, IP policies, and monitoring intersect to form a holistic ecosystem. This framework will guide our subsequent exploration of the University of Petra's initiatives, as well as our broader examination of Jordanian universities' progress and obstacles in building viable innovation ecosystems.

4. Method and Approach

4.1 Data Sources and Scope

This study synthesizes data from:

- Institutional Documents: Annual reports, strategy documents, and press releases from the University of Petra, Ministry of Higher Education (MoHESR), and other Jordanian universities.
- Scholarly Literature: Academic articles and conference proceedings on Jordanian entrepreneurship, innovation, and higher education, accessed via databases like Scopus and Google Scholar.
- International Organization Reports: Publications by WIPO, the European Commission (Erasmus+), USAID, and IREX that discuss or fund Jordanian higher education initiatives.
- Media Coverage: Articles from outlets such as *The Jordan Times* providing insights into ongoing policy debates and project launches.

The analysis emphasizes the University of Petra's innovation ecosystem within the broader context of Jordanian higher education. While data spans over a decade (2010–2024), the focus is on initiatives launched or expanded since approximately 2012, when the university established key innovation structures.

4.2 Analytical Strategy

A thematic analysis was conducted, coding documents according to the six elements in the proposed conceptual framework (Section 3.2). Particular attention was given to:

- University-Level Case Studies: Detailed descriptions of how Petra University and peer institutions organize their TTOs and incubators.
- Funding Mechanisms: Evidence of how Jordanian universities finance innovation activities, including the role of donor projects.
- Policy and IP Environment: Official statements from MoHESR, WIPO, and local regulatory bodies to gauge the maturity of IP and commercialization policies.

Where available, numerical indicators (patent counts, number of startups incubated, external grants secured) were integrated to illustrate scale and outcomes.

5. Innovation Infrastructure at the University of Petra

The University of Petra (UOP), a private university located in Amman, has emerged as an example of how an institution can incrementally build a cohesive innovative ecosystem. Key units include the Innovation & Entrepreneurship Center (IEC), Business Incubator (SIQ), and the Technology Transfer & External Funding Office (TTO/OFFER). More recently, UOP has participated in significant EU-funded and donor-led programs, further enhancing its operational capacity.

5.1 Overview of the University of Petra's Innovation Ecosystem

UOP's innovation infrastructure did not develop overnight; rather, it evolved in response to both internal strategic priorities and external opportunities presented by donor agencies. Table 1 provides a snapshot of the university's core innovation-focused entities.

Table 1. UOP's Innovation Initiatives and Achievements (2012–2024)

Initiative	Year Established	Key Functions	Notable Achievements
Innovation & Entrepreneurship Center (IEC)	2012	Mentorship, entrepreneurial training	Won local & international awards; guided several patent filings
Business Incubator (SIQ)	~2015–2016	Early-stage incubation, bootcamps, seed funds	Hosted pitch competitions; incubated multiple award-winning startups
TTO/OFFER (Tech Transfer & External)	2017 (Merged)	IP management, research grants, commercialization	Secured external funding; built industry partnerships;

Funding)				scaled IP support
Pharmaceutical Center (Lab Animal)	Studies	2019 (Expansion)	Drug discovery, preclinical testing	Received El Hassan Award for Scientific Excellence in 2021
WEFE Nexus Project Collaboration	Project	2020 (Launched)	Water, energy, food, environment solutions	Joint workshops with German partners; student prototype exchanges

WEFE: Water–Energy–Food–Ecosystems .

Table 1 outlines the university’s multifaceted approach. The IEC and Business Incubator provide a pipeline for student and faculty ventures, while the TTO/OFFER specializes in IP policies and research commercialization. Specialized centers like the Pharmaceutical Studies Center cater to domain-specific research. Cumulatively, these initiatives have garnered recognition, including national awards and international grants.

5.2 Major EU-Funded Collaborations and Projects

UOP’s innovation ecosystem is partly a product of its active involvement in large-scale donor-funded projects—particularly from the **European Union**. Over the past decade, the university has aligned its innovation strategies with three prominent EU-funded initiatives:

1. Tempus TEJ Project (2011–2016)
2. SRTD FP7 Project
3. BITTCOIN-JO Erasmus+ Project (2019–2022)
4. FREE Project – Empowering Female Academics and Sustainability

Each project contributed distinct resources and capacity-building mechanisms, ultimately reinforcing UOP’s internal structures.

5.2.1 Tempus TEJ Project (2011–2016)

The “Towards a University Enterprise Alliance in Jordan” (TEJ) initiative, financed through the EU’s Tempus program, aimed to modernize Jordanian higher education by promoting durable collaborations between universities and industry (erasmus-plus.org.jo). With about €0.88 million in funding, TEJ supported nine Jordanian universities, including UOP, to set up Research & Enterprise Offices (REOs).

UOP played a pivotal role in project quality control, establishing a REO on campus and hosting national events like the “National Innovation Fair.” This newly formed office laid the groundwork for the university’s subsequent technology transfer and entrepreneurship support. Through TEJ, UOP staff engaged in training and benchmarking visits to European partner universities, gaining practical know-how in research commercialization and partnership-building (Erasmus+ National Office – Jordan, 2016).

5.2.2 SRTD FP7 Project – Technology Transfer Office Creation

Under the EU’s Support to Research and Technological Development (SRTD) program, UOP was among five pilot universities to inaugurate Technology Transfer Offices. SRTD provided infrastructure, training, and policy guidance, enabling each university to move research “from lab to market.” For Petra, the project financed the establishment of its TTO—eventually merged into TTO/OFFER—and offered capacity-building workshops on patenting, licensing, and industrial collaboration (HCST, 2017).

A hallmark of SRTD was the European study tours for TTO officers, exposing Jordanian participants to established frameworks in Germany, the Czech Republic, and Austria. Upon returning, UOP staff updated institutional IP policies to clarify ownership of academic inventions. These steps fostered a pro-innovation culture on campus, encouraging both faculty and students to consider commercialization pathways.

5.2.3 BITTCOIN-JO Erasmus+ Project (2019–2022)

“BITTCOIN-JO” (Building Innovation Infrastructure via Technology Transfer Offices in Jordanian HEIs) is an Erasmus+ Capacity Building project launched in 2019 (BITTCOIN-JO consortium, 2019–2022). Coordinated by Yarmouk University, it aims to elevate TTO capabilities across Jordan by integrating best practices from European universities. UOP, a key partner, shared its “distributed TTO model,” wherein the Office of External Funding, the Innovation Center, and the Business Incubator collectively shepherd faculty and student innovations.

Student engagement is a central pillar of BITTCOIN-JO. UOP has trained undergraduates to assist TTO operations, boosting peer-to-peer entrepreneurship promotion (uop.edu.jo). By the project's close, UOP's TTO/OFFER was further institutionalized, with improved capacity to identify patentable ideas, provide guidance on IP filings, and foster startups. These experiences underscore how donor-led projects can catalyze long-term changes within Jordanian HEIs.

5.2.4 *FREE Project – Empowering Female Academics and Sustainability*

The FREE Project (Female Academic Role Model Empowerment, Equality and Sustainability at Universities in the Mediterranean Region) is an Erasmus+ capacity-building initiative involving institutions in Lebanon, Syria, and Jordan. FREE aims to empower female academics and promote gender equality and sustainability through training, institutional development, and collaborative research. It creates equality and sustainability centers and a regional network focused on gender issues. UOP's participation complements its innovation infrastructure by embedding inclusivity and sustainability into research and entrepreneurship.

5.3 *Innovation & Entrepreneurship Center (IEC)*

Formally launched in 2012, UOP's Innovation & Entrepreneurship Center (IEC) incubates ideas from faculty and students. Its main activities include:

- **Mentorship and Technical Training:** Seasoned entrepreneurs and faculty experts guide teams in refining business models and prototypes.
- **Innovation Competitions:** The IEC organizes contests like “Cup of Imagination,” offering initial seed funds to winning ideas.
- **Community Outreach:** Through collaboration with NGOs and local industries, IEC fosters social entrepreneurship projects, such as assistive technologies for people with disabilities.

A high-profile success story is the “Speak” project—addressing speech disorders—which grew from a student concept into a functional startup (Petra University, 2023). IEC's record of producing award-winning ventures showcases the university's effectiveness in harnessing local talent to solve pressing social issues.

5.4 *Business Incubator (SIQ)*

Established around 2015–2016, UOP's **Business Incubator**—often referred to as **SIQ**—provides specialized support for early-stage ventures. Key functions include:

- **Physical Workspace:** Dedicated offices, meeting rooms, and prototyping facilities.
- **Technical Bootcamps:** Regularly scheduled sessions on coding, design, market validation, and business modeling.
- **Networking and Investor Linkages:** SIQ connects incubatees with external mentors, angel investors, and local venture capitalists.

One notable initiative was the “Winter Entrepreneurship Competition” (2019), co-organized with SPARK, which offered a 6-week intensive program culminating in demo pitches to potential funders (Shatila, Nigam, & Mbarek, 2024). SIQ's integration with IEC ensures a seamless progression from ideation to incubation.

5.5 *Technology Transfer & External Funding Office (TTO/OFFER)*

Following impetus from SRTD and later consolidated under the BITTCOIN-JO framework, UOP's TTO/OFFER merges technology transfer functions with external funding facilitation:

1. **IP Management:** Assisting faculty and students in patent filings, drafting licensing agreements, and navigating legal processes.
2. **Research Grant Acquisition:** Identifying suitable funding calls (e.g., Erasmus+, German Academic Exchange Service (DAAD), or USAID), coordinating proposal submissions, and managing awarded projects.
3. **Cross-Unit Coordination:** Collaborating with the IEC and SIQ to ensure that research outcomes with commercial viability receive end-to-end support.

With TTO/OFFER, UOP has secured multiple external grants and participated in over 25 bilateral projects,

resulting in at least 183 student and 137 staff exchanges (Jordan Times, 2024). Notably, the office played a central role in winning the El Hassan Award for Scientific Excellence (2021) for contributions to scientific research and mentorship.

5.6 Specialized Research and Innovation Centers

UOP hosts several specialized facilities that complement the core innovation units:

- **Pharmaceutical Studies Center (Lab Animal Facility):** Focuses on drug discovery and preclinical testing, adhering to international research standards. In 2021, it won the El Hassan Award for Scientific Excellence, highlighting the center's robust research output (Petra University, 2023).
- **Proposed AI Center of Excellence:** Still in planning phases, this center aims to deepen research in artificial intelligence and foster interdisciplinary collaborations, positioning UOP as a regional hub for AI advancements.

By creating specialized labs, UOP expands its innovation scope into areas of growing regional importance, such as healthcare and AI-enabled solutions.

5.7 International Collaborations and Projects

Beyond TEJ, SRTD, and BITTCOIN-JO, the University of Petra has engaged in several additional international partnerships:

- **WEFE Nexus Project:** A collaboration with Hochschule Bonn-Rhein-Sieg (Germany) and Yarmouk University (Jordan) focusing on integrated water, energy, food, and environment solutions.
- **Huawei Smart Campus Initiative:** Preliminary discussions aim to upgrade UOP's digital infrastructure and involve students in global Information and Communication Technology (ICT) challenges.
- **Erasmus+ Mobility Agreements:** Through partnerships with European universities, UOP has facilitated short-term exchanges, staff training, and joint research proposals (European Commission, 2020).

These endeavors not only bring international expertise and funding but also expose students to diverse research environments, enhancing UOP's global profile.

6. State of University Innovation Systems in Jordan

While the University of Petra offers a compelling case study, it operates within a broader Jordanian landscape marked by policy pushes, donor involvement, and an evolving entrepreneurial culture. This section synthesizes national-level trends, highlighting both the commonalities and differences across public and private universities.

6.1 Policy Context and Government Support

Jordan's government has articulated multiple policies to stimulate university-based innovation:

- **Ministry of Higher Education Strategic Priorities (2023–2025):** Emphasizes stronger research–industry ties, simplified IP registration, and more robust R&D funding (MoHESR, 2021).
- **Economic Modernisation Vision:** Encourages universities to partner with private enterprises to foster a knowledge-based economy, with entrepreneurship embedded in curricula (GIZ & Policy Association for an Open Society, 2018).
- **National Scientific Research and Innovation Fund:** Provides grants to university-based projects, albeit with limited overall budget allocations.

Despite such policy signals, actual R&D spending remains under 1% of GDP—well below the global average, hampering the scale of potential innovation (WIPO, 2022a). Universities thus often rely heavily on donor grants and short-term collaborations.

6.2 Emergence of Innovation Centers and Business Incubators

An increasing share of Jordanian universities now houses formal innovation centers or incubators. Table 2

contrasts some of the most prominent examples, illustrating how Jordan's higher education ecosystem is responding to entrepreneurship imperatives.

Table 2. Innovation Centers at Selected Jordanian Universities—Overview and Funding Emphasis

University	Name of Center/Incubator	Year Established	Key Focus Areas	Main Funding Source
University of Petra (UOP)	IEC & SIQ Business Incubator	2012/2015–2016	General Tech, Social Ventures	Private & Donor Partnerships
Philadelphia University	Jordan Innovation Center	2006	Tech Entrepreneurship	EU & Government
University of Jordan (UJ)	UJIEC	2013	Multi-sector Innovation	University Budget
Jordan University of Science & Tech. (JUST)	JUST Incubator	2014	Biomedical & Engineering	University & Donors
Princess Sumaya University for Technology (PSUT)	PSUT Innovation Lab	2017	ICT, AI, Electronics	Private Partnerships

Note: (UJIEC): University of Jordan Innovation & Entrepreneurship Center,

Table 2 shows a common pattern of focusing on general technology and entrepreneurship, though some universities emphasize specific domains, such as biomedical engineering at JUST or ICT at PSUT. Funding models varies rely on donor grants (Philadelphia University), and others on internal budgets (UJ), while private partnerships are more prevalent at PSUT.

6.3 Funding Models and Financial Sustainability

Funding for university innovation in Jordan typically originates from:

1. Government Allocations: Limited but crucial for legitimacy.
2. International Donors: Often the largest single contributor, supporting major initiatives (Erasmus+, USAID, GIZ).
3. University Budgets: Fluctuates between private and public institutions.
4. Corporate Sponsorships: Still emerging, mostly from tech companies like Huawei or Microsoft.

Table 3. Funding Sources for University-Led Innovation in Jordan

Funding Source	Typical Contribution	Notes
Government (MoHESR, SRF)	~30–40%	Competitive grants, overall limited budget
International Donors (EU, GIZ)	~40–50%	Project-based, essential for large-scale capacity building
University Internal Budget	~10–20%	Highly variable, private vs. public sectors differ
Corporate Sponsors (e.g., Huawei)	<10%	Growing interest, not yet fully scaled

MoHESR : Government (Ministry of Higher Education and Scientific Research ; SRF :Scientific Research & Innovation Fund .

As displayed in Table 3, donor funding often eclipses government allocations, making the continuity of projects uncertain once external grants end (IREX, 2023). Sustaining newly built incubators and TTOs remains a core challenge: universities can find themselves with fully functional units but insufficient recurring funds to maintain staff, equipment, and programming.

6.4 Collaboration with International Donors and Partners

Due to modest domestic R&D investment, international donor collaborations are central to Jordan's university

innovation strategies:

- Erasmus+ Programs: Support curriculum modernization, staff exchange, and TTO capacity building.
- USAID Higher Education for Innovation & Growth: Offers coaching on industry linkages and fosters policy reforms (IREX, 2023).
- WIPO's IP Initiatives: Helped 11 Jordanian universities draft institutional IP policies (WIPO, 2022c).

Such partnerships have produced a measurable uptick in patent filings and startup activities, although from a low base. For instance, the establishment of TTOs under SRTD provided Jordanian universities with the foundational expertise needed to manage IP systematically (ibtecar.me).

6.5 Innovation Performance and Challenges

While comprehensive national statistics remain scarce, some indicators suggest incremental progress:

1. Global Innovation Index: According to WIPO's economy profiles, Jordan ranked 78th in 2022 and 71st in 2023 in the Global Innovation Index (Dutta, Lanvin, & Wunsch-Vincent, 2022; WIPO, 2022a).
2. Patent Filings: University-filed patents are on the rise, though the overall numbers remain modest relative to developed markets (Al-Hanakta, 2022).
3. Startup Ecosystem: Jordan has witnessed a surge in hackathons, pitch competitions, and incubator enrollments, reflecting increasing student interest (Rifai et al., 2023).

Despite these positive trends, enduring structural barriers hinder the scaling of innovation outcomes. Insufficient private-sector engagement, suboptimal IP legislative frameworks, and the lack of robust financial support for R&D hamper the ecosystem (Kreishan et al., 2024).

7. Trends, Gaps, and Future Challenges

7.1 Current Trends in Jordan's University Innovation Ecosystem

1. Rising Institutional Commitment: Innovation centers and entrepreneurship programs are now embedded in strategic planning across many universities (Rifai et al., 2023).
2. Increased Donor-Driven Projects: The reliance on EU, USAID, and other international organizations remains high, fueling capacity-building through TTO setup and training (Cai, 2022).
3. Sector-Specific Hubs: Emerging specialization in areas like biotechnology, AI, and agritech, tapping into Jordan's priority development goals (Al-Safadi & Danana, 2022).

7.2 Major Gaps and Limitations

1. Funding Continuity: Over-dependence on short-term donor projects raises questions about sustainability (IREX, 2023).
2. Insufficient Industry Partnerships: SMEs remain reluctant to invest in university-based research, due to limited absorptive capacity and high perceived risks (Al-Hanakta, 2022).
3. Underdeveloped IP Commercialization: While policies exist, actual licensing revenue and technology transfer deals are still nascent (WIPO, 2022b).
4. Weak Monitoring and Evaluation: Few standardized metrics track the performance of incubators or measure long-term startup survival (Kreishan et al., 2024).

Table 4. Common Barriers to Building University–Industry Innovation Capacity in Jordan

Barrier	Description	Proposed Solutions
Funding Instability	Over-dependence on donor grants	Scale up government R&D funding; incentivize private-sector co-investment
Weak IP Culture	Limited awareness of IP protection and commercial potential	Clarify IP ownership, revenue-sharing policies, and provide training
Low Industry Collaboration	SMEs unable or unwilling to fund/partner in university research	Introduce targeted tax breaks, co-financing programs, sector-based R&D

Lack of Unified Metrics	No standardized KPIs to track startup success or commercialization	funds
		Establish national frameworks for data collection and outcome monitoring

Table 4 catalogs the most pressing barriers to a robust innovation ecosystem. While some solutions, such as clarifying IP policies or introducing co-financing schemes, are gradually being implemented, the pace of reform varies across institutions and depends on broader national policy alignment (MoHESR, 2021).

7.3 Future Challenges and Opportunities

Looking ahead, Jordanian universities, including the University of Petra, confront several interconnected challenges:

1. **Scaling Innovation Centers:** Ensuring that incubators and TTOs can handle growing demand without diluting quality.
2. **Leveraging Digital Transformation:** Integrating AI, data analytics, and online collaboration platforms to speed up research commercialization and global partnerships.
3. **Deepening Industry–Academia Co-Creation:** Fostering structured collaboration with SMEs by offering incentives, risk-sharing models, and specialized problem-solving labs.
4. **Internationalizing Startups:** Encouraging Jordanian university spin-offs to explore global markets and attract foreign investors.
5. **National-Level Coordination:** Avoiding duplication of resources by promoting consortia or thematic networks across universities.

If effectively addressed, these challenges present opportunities to strengthen Jordan’s position as a regional hub for innovation-driven growth (Jarrar, 2022).

8. Discussion

The trajectory of Jordanian universities toward becoming engines of innovation reflects broader global trends, yet is shaped by the country’s unique context—most notably, constraints in public funding and the pivotal role of external donors. The University of Petra stands out for its integrated approach, combining an Innovation & Entrepreneurship Center, a Business Incubator, and a Technology Transfer & External Funding Office. Each unit serves distinct yet complementary purposes, collectively covering the innovation life cycle: ideation, incubation, and commercialization.

Participation in EU-funded projects—Tempus TEJ, SRTD, and BITTCOIN-JO—has been pivotal in building UOP’s institutional capacity. Through these projects, the university gained exposure to European best practices, implemented formal TTOs, and refined internal IP policies. Over time, Petra leveraged these experiences to create a sustainable “distributed model” for technology transfer, wherein different university departments collaborate to shepherd promising ventures from research to market entry.

Despite these successes, the challenges facing UOP are largely emblematic of the broader Jordanian landscape. Funding continuity remains precarious, as donor cycles often conclude, leaving institutions to scramble for alternative financing. Industry engagement is uneven, with larger companies more likely to partner on research, while SMEs remain hesitant or resource limited. Furthermore, IP commercialization, though aided by WIPO-led policy interventions—still yields relatively few revenue-generating patents.

Policymakers and university leaders can capitalize on existing momentum by broadening the range of public–private partnerships, especially in high-growth sectors like AI, renewable energy, and healthcare (Haddad & Zoubi, 2021). The introduction of more robust financial incentives for firms that co-invest in university research—similar to practices observed in successful innovation hubs—could encourage deeper collaboration (Alsharari & Abougamos, 2019). Simultaneously, universities need to institutionalize monitoring and evaluation systems that track the performance of incubators and TTOs in terms of real-world outcomes, including startup survival, job creation, and patent licensing revenue.

From a cultural standpoint, Jordan’s youth show strong entrepreneurial interest, as evidenced by the proliferation of hackathons and startup events (Global Entrepreneurship Monitor, 2024). Leveraging this demographic advantage effectively requires embedding entrepreneurship education across disciplines, not limiting it to business schools alone (Kreishan et al., 2024). Petra’s IEC model, which welcomes project ideas from any academic department, provides a promising template.

In summary, the University of Petra's journey underscores the synergies between institutional ambition and external collaboration. As Jordan's universities continue to expand their innovation infrastructures, sustaining these gains will hinge on policy reforms, diversified funding, stronger industry alliances, and robust performance metrics. If managed effectively, this convergence could unlock a new era of economic and social benefits—ranging from job creation to global recognition of Jordan as a hub for research and technology-based solutions.

9. Conclusion

Innovation infrastructure at Jordanian universities has progressed significantly in the last decade, propelled by shifting national policies, donor-funded projects, and proactive institutional strategies. Within this evolving landscape, the University of Petra emerges as a noteworthy case, having built a comprehensive ecosystem that includes entrepreneurship centers, a specialized incubator, and a technology transfer office. Participation in EU-funded programs—Tempus TEJ, SRTD, and BITTCOIN-JO—further elevated UOP's capacities, allowing it to adopt international best practices in research commercialization, IP management, and student-centric entrepreneurship training.

Nevertheless, the overarching challenges remain substantial. The sustainability of innovation programs is frequently tied to transient donor grants, while many SMEs in Jordan lack the resources or incentives to engage in collaborative R&D with universities. Intellectual property legislation, though improving, is not yet underpinned by strong commercialization frameworks and consistent licensing activity. Industry-academia relations continue to be ad hoc, and unified metrics for tracking innovation outcomes are only slowly materializing.

Overcoming these obstacles will require concerted efforts from **multiple stakeholders**:

- Government ministries must increase funding and enact reforms that encourage co-financing between universities and industry.
- Universities should institutionalize entrepreneurship across all faculties, expand TTO and incubator services, and strengthen their monitoring systems.
- Private sector partners need tangible incentives, structured joint projects, and formal cooperation agreements with universities. Establishing official guidelines and specific agreements facilitates knowledge transfer, aligns research with industry priorities, and addresses sector-specific need.
- International donors can transition from purely grant-making to co-development and capacity-sharing models that encourage local ownership and long-term viability.

This embedded case study thus contributes a transferable template—linking governance, incubator/TTO operations, and donor engagement—that peer Jordanian universities can adapt to advance their entrepreneurial ecosystems at scale. If properly nurtured, the convergence of youth talent, donor investments, and evolving government policies could position Jordan at the forefront of regional innovation ecosystems, generating socio-economic benefits that extend well beyond the academic sphere.

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