

National Conference Digital Entrepreneurship and Digital Innovation: Opportunities and Challenges

The Fourth Theme: Pillars of Advancing Startups in Light of Modern Digital Transformations

Incubators as Catalysts for Digital Transformation and Sustainable Entrepreneurship: An Analytical Study of International and Arab Experiences.

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Abstract

This paper aims to analyze the pivotal role digital business incubators play in enhancing the sustainability of start-ups in light of the global digital transformation. This paper uses a comparative analytical study of international and Arab experiences, highlighting that digital incubators are no longer merely spaces for supporting entrepreneurship, but have become integrated innovation systems that contribute to achieving sustainable development by integrating technology, green finance, and social innovation. It demonstrates that the relationship between digital transformation and sustainability is complementary, with the former serving as a means to enhance efficiency and reduce environmental impact, while the latter provides the ethical framework for guiding innovation toward social responsibility. The study also proposes a conceptual model linking digital incubators and sustainable entrepreneurship across the axes of digital infrastructure, sustainable management, green innovation, and community empowerment. It recommends the need to instill a culture of sustainable innovation in universities, activate digital governance, and establish Arab cooperation networks to enhance the effectiveness of digital incubators in achieving a sustainable and balanced digital economy.

Keywords: Digital transformation - Business incubators - Sustainable entrepreneurship - Innovation - Startups - Sustainable development.

المخلص:

تهدف هذه المداخلة إلى تحليل الدور المحوري الذي تؤديه حاضنات الأعمال الرقمية في تعزيز استدامة المؤسسات الناشئة في ظل التحول الرقمي العالمي، من خلال دراسة تحليلية مقارنة لتجارب دولية وعربية أبرزت أن الحاضنات الرقمية لم تعد مجرد فضاءات لدعم ريادة الأعمال، بل أصبحت منظومات ابتكار متكاملة تسهم في تحقيق التنمية المستدامة عبر دمج التكنولوجيا والتمويل الأخضر والابتكار الاجتماعي. وتبين أن العلاقة بين التحول الرقمي والاستدامة علاقة تكاملية، حيث يعد الأول وسيلة لتعزيز الكفاءة وتقليل الأثر البيئي، بينما توفر الثانية الإطار الأخلاقي لتوجيه الابتكار نحو المسؤولية المجتمعية. كما تقترح الدراسة نموذجاً مفاهيمي يربط بين الحاضنات الرقمية وريادة الأعمال المستدامة عبر محاور

البنية الرقمية والإدارة المستدامة والابتكار الأخضر والتمكين المجتمعي، وتوصي بضرورة ترسيخ ثقافة الابتكار المستدام في الجامعات، وتفعيل الحوكمة الرقمية، وإنشاء شبكات تعاون عربية لتعزيز فعالية الحاضنات الرقمية في تحقيق اقتصاد رقمي مستدام ومتوازن.

الكلمات المفتاحية:

تحول رقمي – حاضنات اعمال – ريادة اعمال مستدامة – ابتكار – مؤسسات ناشئة – تنمية مستدامة

I. Introduction

The contemporary world is witnessing profound transformations affecting all aspects of economic and social life, due to the rapid development of digital technologies and the emergence of new types of entrepreneurship. Digital start-ups have become one of the most prominent pillars of modern economies, characterized by their ability to rapidly innovate, create added value, and generate job opportunities. However, these enterprises face complex challenges related to financing, governance, growth management, and market access, making them vulnerable to failure in their early stages without a supportive and stimulating environment.

In this context, business incubators have emerged as a strategic tool that seeks to enable entrepreneurs to transform their ideas into sustainable projects by providing support services, technical guidance, legal advice, and connections to financing networks. With the rise of digital transformation, digital incubators are adopting innovative approaches based on leveraging modern technologies such as artificial intelligence, cloud computing, and big data to enhance the efficiency of emerging projects and direct them toward economic, social, and environmental sustainability.

The importance of this topic lies in its intersection with three pivotal issues in the contemporary economy: digital transformation, entrepreneurship, and sustainability. Incubators today are no longer merely spaces for incubating projects, but rather comprehensive innovation systems that contribute to building a competitive digital economy based on knowledge and creativity.

1. The Problem of the Study

The central problem of this intervention is the following question:

How do business incubators contribute to promoting digital transformation and sustainable entrepreneurship, and what are the nature of international and Arab practices and experiences that can be leveraged to build an effective incubation model to support the sustainability of digital startups?

This main question leads to a set of sub-questions:

- What role do incubators play in enabling startups to achieve digital transformation?
- How do incubators contribute to achieving the three dimensions of sustainability (economic, social, and environmental) within entrepreneurial ecosystems?
- What are the similarities and differences between international and Arab experiences in the field of sustainable digital incubation?
- What is the proposed conceptual model for activating the role of incubators in supporting the sustainability of digital entrepreneurial institutions?

2. Study Objectives

This paper aims to achieve a number of academic and applied objectives, most notably:

- Analyzing the interactive relationship between incubators and digital transformation in the context of entrepreneurship.
- Exploring the role of incubators in enhancing the sustainability of startups through technical and organizational support.
- Monitoring and analyzing successful international and Arab experiences in the field of sustainable digital incubators.
- Proposing an applied conceptual model that illustrates how incubators can contribute to achieving a balance between digital innovation and institutional sustainability.

3. Significance of the Study

The importance of this study stems from its highlighting of a modern topic in the digital economy and entrepreneurship. Business incubators have become a pivotal link in innovation systems, especially in light of the radical transformations brought about by the Fourth Industrial Revolution. The study also gains its importance from its practical dimension, through analyzing real-life experiences and comparing their results with what can be applied in emerging Arab environments.

4. Study Methodology

This intervention relied on a comparative analytical approach, which aims to study the phenomenon by analyzing its theoretical components and comparing them with international and Arab field experiences. A case study approach was also used to analyze some leading models in the field of sustainable digital incubators, such as the experiences of the European Union, Singapore, the United Arab Emirates, and Tunisia.

II: Theoretical Framework – Business Incubators and Digital Transformation

1. The Concept of Business Incubators

Business incubators are institutions or support spaces dedicated to incubating entrepreneurial projects in their early stages, by creating an appropriate environment for developing ideas and transforming them into competitive enterprises. According to the definition of the Organization for Economic Co-operation and Development (OECD, 2022), an incubator represents "an institutional support environment that combines infrastructure, advisory services, and communication networks with the aim of enabling entrepreneurs to build innovative and sustainable projects."

Incubators differ from business accelerators in that they focus on long-term support during the founding phase, while accelerators typically focus on the subsequent growth phase. Modern incubators are also distinguished by their focus on digital innovation, as they increasingly rely on artificial intelligence tools and predictive analytics to support decision-making in entrepreneurial projects (Mian et al., 2021).

2. Digital Transformation in the Entrepreneurship Ecosystem

Digital transformation refers to the process of radically changing the way organizations operate by employing modern digital technologies to improve performance, innovation, and create new value (Verhoef et al., 2021).

In the entrepreneurial context, digital transformation is a crucial factor in enabling startups to achieve greater flexibility in dealing with markets, expand digital services, and develop innovative solutions that respond to rapidly changing global demand.

Recent studies have shown that digital startups operating within digital incubation ecosystems achieve success rates twice as high as traditional projects, due to the digital training platforms, data analysis systems, and smart e-marketing channels these incubators provide (European Commission, 2023).

Therefore, it can be argued that digital transformation is no longer just a technological option; it has become a strategic framework guiding sustainable entrepreneurship.

3. The Roles of Business Incubators in Light of the Digital Transformation

In light of the Fourth Industrial Revolution, incubators are no longer limited to providing spaces or consulting. They have become key players in digital innovation ecosystems, playing a number of complementary roles:

- **Enabling Role:**

By providing access to modern technology and digital platforms, startups can develop smart products and services based on big data and artificial intelligence.

- **Formative and Cognitive Role:**

Through digital training programs and courses in design thinking and digital entrepreneurship, these courses enhance entrepreneurs' competencies and their ability to adapt to digital transformations (Marques & Ferreira, 2022).

- **Networking Role:**

Linking entrepreneurs to funding and investment networks (Venture Capital Networks) and major technology companies, increasing opportunities for partnerships and sustainable growth.

- **Guiding and Governance Role:**

Incubators provide a strategic framework for digital governance and monitoring compliance with ethical and environmental standards in innovation.

- **Environmental and sustainability role:**

By encouraging projects with positive social and environmental impact, such as startups in the fields of clean energy, smart cities, and sustainable tourism (UNCTAD, 2024).

4. Types of incubators in the digital environment

Digital incubators can be classified according to their functions or the nature of the services they provide, as follows:

Type	Distinctive Characteristics	Main Objectives
University Incubators	Affiliated with academic institutions; integrate scientific research with entrepreneurship	Support student innovation and transform research into marketable products
Government Incubators	Funded by the state and managed by official institutions	Stimulate the digital economy and create job opportunities for youth
Private Incubators	Owned by companies or individual investors	Achieve investment returns and develop technological projects
Virtual Incubators	Operate entirely through digital environments (online platforms)	Support remote projects using digital tools and interactive platforms
Green and Sustainable Incubators	Focus on environmental and social innovation	Encourage green entrepreneurship and achieve sustainable development goals

Source: Prepared by the researcher based on Marques & Ferreira (2022); Mian et al. (2021); OECD (2022); UNCTAD (2024).

5. The Relationship Between Incubators and Digital Transformation

Recent literature demonstrates that the relationship between incubators and digital transformation is a mutually complementary one:

- Digital transformation provides incubators with new tools to improve operational performance and collect and analyze data on incubated projects.
- Incubators represent a key platform for experimenting and applying digital technology in a real-world setting through startups (Nambisan et al., 2023).

This interaction creates a digital entrepreneurial ecosystem that enables interaction between incubators, universities, investors, government, and society to achieve sustainable economic growth.

III: The Relationship Between Incubators and Sustainable Entrepreneurship – Towards an Integrative Approach

1. Sustainable Entrepreneurship: Concept and Dimensions

Sustainable entrepreneurship is defined as the process of creating and developing new enterprises that balance economic, social, and environmental objectives, seeking to generate added value without harming natural resources or ignoring social responsibility (Schaltegger & Wagner, 2019).

This type of entrepreneurship represents a strategic direction in light of global environmental and economic challenges, especially with the emergence of the circular economy concept and the transition to more efficient and sustainable production and consumption models.

The dimensions of sustainable entrepreneurship are manifested in three main axes:

1. The economic dimension: relates to job creation and achieving smart and innovative growth.
2. The social dimension: focuses on promoting social welfare, integration, and empowering marginalized groups.
3. The environmental dimension: relates to protecting natural resources and encouraging environmental innovation and clean technology.

Thus, sustainable entrepreneurship is a cornerstone in building a future economy based on responsibility, creativity, and green digital transformation.

2. Incubators as a Mechanism for Achieving Sustainable Entrepreneurship

Business incubators play a pivotal role in achieving sustainability by guiding entrepreneurial projects toward balanced economic and environmental goals. Recent studies (Yun et al., 2023; Lamine & Fayolle, 2021) have identified a set of mechanisms that make incubators an effective catalyst for sustainable entrepreneurship:

1. Stimulating responsible innovation:

Incubators create an environment that encourages the adoption of technological solutions that take ethical and social standards into account, known as responsible innovation.

2. Enhancing resource efficiency:

By integrating circular economy principles into startup strategies, such as recycling and the use of renewable energy in operational processes.

3. Disseminating a culture of corporate sustainability:

Through training workshops and management guidance that instill in entrepreneurs environmental and social awareness as a fundamental component of the organization's strategic vision.

4. Facilitating access to green finance:

Incubators play a mediating role between entrepreneurial projects and financing institutions that support sustainable innovation, such as green investment funds and international organizations.

5. Empowering the local community:

By supporting projects with direct social impact, especially those focused on creating job opportunities for youth and women in digital fields (Moussa & Schumpeter, 2022).

3. Integration of digital transformation and sustainability within incubators

The world is currently witnessing a growing intersection between digital transformation and sustainability within incubators, which has given rise to the concept of Sustainable Digital Incubators (SDIs), which rely on technology to guide projects toward sustainable and innovative solutions (Nambisan et al., 2023).

This integration is evident at several levels:

- Technical level: Through the use of artificial intelligence to analyze project performance and determine their environmental and social impact.
- Organizational level: Through digital platforms used to monitor sustainability plans and assess incubated projects' compliance with environmental and social performance indicators (ESG metrics).
- Strategic level: By adopting an integrated vision that balances profitability and sustainability, incubators work to transform entrepreneurial ideas into circular business models based on green innovation.

A study published by the World Bank (2023) shows that startups incubated by sustainable digital platforms in Europe and Asia achieved a 35% growth in survival

rates during the first three years of their establishment, compared to other non-incubated companies.

4. Indicators for Measuring Incubators' Contribution to Sustainability

To measure the effectiveness of incubators in supporting sustainable entrepreneurship, a set of quantitative and qualitative indicators developed by international institutions can be adopted, such as:

Indicator	Developing Organization	Description	Performance Interpretation
Green Entrepreneurship Index	Global Green Growth Institute (2022)	Measures the level of adoption of environmental innovations within incubators and incubated projects	A higher score indicates strong integration of sustainability principles
Responsible Innovation Index	European Innovation Council (2023)	Assesses the extent to which projects adhere to ethical and social responsibility standards	A high score reflects strategic awareness of entrepreneurial responsibility
Digital Efficiency Score	OECD (2022)	Measures the efficiency of digital technology use within incubation systems	A higher score indicates a transition toward a fully digital incubation model
Startup Survival & Growth Rate	World Bank (2023)	Tracks the continuity and growth rate of incubated enterprises	A higher rate reflects the success of the incubation ecosystem in achieving sustainability

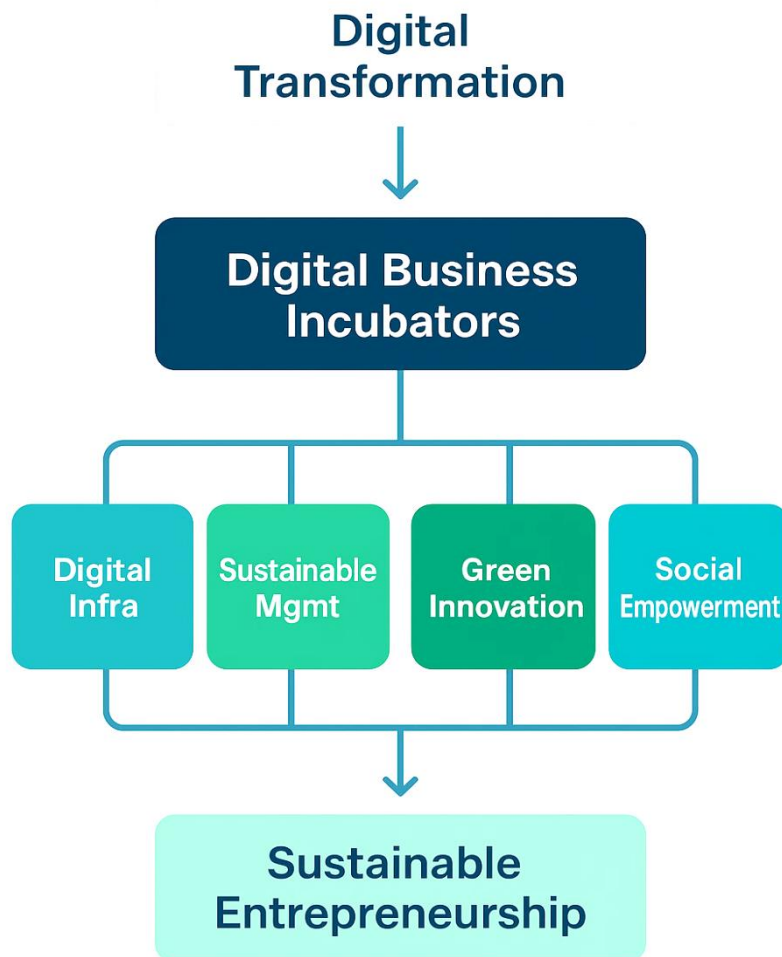
Source: Prepared by the researcher based on OECD (2022); World Bank (2023); European Innovation Council (2023); Global Green Growth Institute (2022).

5. The Transformation Model for Sustainable Incubators

The relationship between digital transformation, incubators, and sustainable entrepreneurship can be summarized in a four-pronged, integrated model:

1. Digital Infrastructure: Empowering the incubator with analytical tools and artificial intelligence.
2. Sustainable Management: Integrating the Sustainable Development Goals into incubation policies.

3. Green Innovation: Directing projects toward clean technology and renewable energy solutions.
4. Community Empowerment: Enhancing social impact through the inclusion of youth and women.



(Prepared by the researchers based on Marques & Ferreira, 2022; Mian et al., 2021; OECD, 2022; UNCTAD, 2024).

IV: Analysis of International and Arab Experiences in Digital Incubators and Sustainable Entrepreneurship

1. International Experiences

1-1: The European Experience – Climate-KIC (European Union)

The Climate-KIC initiative is one of the most prominent European models that combines technological innovation and environmental sustainability. It was founded

in 2010 with support from the European Institute of Innovation and Technology (EIT) to encourage startups to provide solutions to climate and energy problems.

The incubator relies on an open innovation model that brings together startups, universities, investors, and local authorities. Its programs have resulted in the funding of more than 1,500 startup projects in the fields of clean energy, waste management, and smart agriculture.

A European Commission report (2023) indicates that the incubator contributed to a 22% reduction in carbon emissions in the projects it incubated between 2016 and 2022, making it a model for green entrepreneurship support policies.

1-2: The Asian Experience – Shenzhen Hi-Tech Incubator in China

China's experience with the Shenzhen Hi-Tech Incubator represents a pioneering model for integrating digital transformation and green manufacturing.

Founded in 1996, the incubator now houses more than 400 technology startups focused on solar energy, artificial intelligence, and industrial robotics.

What distinguishes it is its adoption of a "government-incubator" policy, whereby the state provides direct financial and technical support amounting to up to 70% of research and development expenditures, in addition to tax incentives and logistical facilities (Chen et al., 2023).

It has been able to create a sustainable business environment that has produced more than 200 green patents annually and contributed to a 15% increase in industrial energy efficiency over a decade.

1-3: The American Experience – Techstars Sustainability Accelerator

Techstars Sustainability Accelerator is one of the most prominent incubators in the United States. It was founded in 2018 in partnership with The Nature Conservancy.

It aims to support startups that offer digital solutions in the fields of water management, clean energy, and smart agriculture.

According to the Techstars Report (2023), more than 60% of incubated companies were able to achieve sustainable economic growth within three years of incubation, thanks to intensive mentorship programs and technical support.

The American experience also features a combination of crowdfunding and green investing, making it a balanced model that combines financial innovation and environmental sustainability.

2. Arab Experiences

2-1: The United Arab Emirates – Hub71 and Masdar City

The UAE embodies an integrated model that combines digital transformation and sustainability within the entrepreneurial ecosystem.

In the capital, Abu Dhabi, Hub71 is a digital incubation platform that brings together global entrepreneurs and investors, providing a smart digital environment based on artificial intelligence and blockchain technologies.

Masdar City is the region's first eco-friendly smart city, featuring technology incubators focused on clean energy and sustainable buildings.

These two experiences have contributed to the creation of more than 1,000 green digital jobs and supported dozens of startups that combine digital innovation with positive environmental impact (UAE Ministry of Economy, 2024).

2-2: Tunisia - Flat6Labs Tunis

Flat6Labs Tunis is one of the most successful incubators in North Africa, representing a model of public-private partnership.

The incubator supports startups in the fields of financial technology, digital education, and alternative energy.

It also focuses on empowering youth and women through training programs on innovation and sustainable entrepreneurship skills.

According to the African Development Bank (2024) report, the incubator has supported more than 120 digital projects over five years, 35% of which have a clear environmental focus.

2-3: Egypt – The Cairo ICT Incubator and GrEEK Campus Experience

Egypt is a growing regional hub for digital entrepreneurship, thanks to technology incubators such as GrEEK Campus, an open work environment that brings together startups, investors, and programmers.

The Egyptian Ministry of Communications and Information Technology also launched the Cairo ICT Incubator initiative to finance digital innovations with social and environmental dimensions.

These incubators have contributed to enhancing sustainable employment opportunities and integrating the informal economy into the formal digital economy, enhancing social and economic sustainability (Egypt ICT Ministry, 2023).

3. Analytical Comparison of Experiences

Comparative Element	European Union	China	United States	UAE	Tunisia	Egypt
Type of Incubator	Environmental – Green	Industrial – Technological	Digital – Environmental	Digital – Sustainable	Digital – Social	Digital – Economic

Role of the State	Legislative and financial support	Direct and comprehensive support	Market environment stimulation	Strategic funding and investment	Youth and entrepreneurship support	Digital infrastructure support
Environmental Impact	22% reduction in emissions	+15% energy efficiency	Digital environmental solutions	Clean energy projects	Green social economy	Digital awareness
Social Dimension	Engagement of the academic community	Employment of technical talents	Comprehensive mentoring and training	Youth empowerment	Women's inclusion	Integration of the informal economy
Sustainability Level	Very high	High	High	High	Moderate	Moderate

Source: Prepared by the researcher based on OECD (2022); UNCTAD (2024); World Bank (2023); Techstars (2023); UAE Ministry of Economy (2024).

V: General Analytical Comparison and the Proposed Model

1. General Analytical Comparison between International and Arab Experiences

By reviewing and analyzing previous experiences, it becomes clear that digital incubators represent one of the most important tools for supporting sustainable entrepreneurship in both the international and Arab contexts. However, there are fundamental differences in the philosophy of implementation, funding mechanisms, and level of institutional maturity.

1-1: At the structural level

European, American, and Chinese experiences demonstrate that digital incubators have become integrated economic systems directly linked to universities, large companies, and research institutions.

In Arab countries, however, most incubators are still in the institutional growth phase and face challenges related to sustainable funding and weak networking with scientific research systems (OECD, 2022).

1-2: At the level of governance and sustainability

Incubators in Europe and the United States are managed through a participatory governance model that brings together the state, the private sector, and the academic community, ensuring sustainable funding and program continuity (Marques & Ferreira, 2022).

In the Arab context, incubators tend to rely heavily on direct government support, with a clear absence of long-term independent governance mechanisms (UNCTAD, 2024).

1-3: At the level of social innovation

Arab experiences—particularly in Tunisia and Morocco—have demonstrated remarkable progress in integrating the social dimension and youth entrepreneurship

within the incubator system, through programs to empower women and support new entrepreneurs in vulnerable areas.

In contrast, Western experiences focus more on the environmental and technological dimension through the development of green products and low-emission digital solutions (World Bank, 2023).

1-4: At the level of economic impact

Digital incubators in developed countries have achieved high success rates in transforming incubated projects into established companies that survive beyond the start-up phase. The survival rate of projects after incubation exceeds 70% in Europe and the United States (Techstars, 2023).

The Arab rate, however, ranges between 40% and 55% due to limited access to venture funding and weak partnerships between universities and the industrial sector (UAE Ministry of Economy, 2024).

2. Analytical Comparison Conclusions

From the previous comparison, a set of general conclusions can be drawn:

- Digital transformation is an essential element in the success of incubators, as it represents the main driver for improving the productive and environmental efficiency of startups.
- Sustainability is not an automatic outcome of digital transformation; rather, it requires a strategic vision, integrated policies, and a corporate culture based on ethical innovation and social responsibility.
- The institutional maturity of incubators is linked to their ability to build partnerships between the three sectors: government, university, and the private sector.
- Arab incubators possess strong components (youth diversity, technological opportunities, government support), but they need to adopt Western governance experiences and adapt them to their local specificities.
- Green and social innovation represent the future direction of developing digital incubators towards comprehensive sustainability.

3. The Proposed Conceptual Model for Activating the Relationship between Digital Incubators and Sustainable Entrepreneurship

3-1 Description of the Proposed Model

The researcher proposes an integrative conceptual model that explains the mechanism for transforming digital transformation within incubators into sustainable entrepreneurship across three interactive levels:

- **Structural Level:**

The digital incubator operates as an organizational platform containing the technological infrastructure (digital cloud, Internet of Things, artificial intelligence) and providing startups with a flexible and smart work environment.

- **Interactive Level:**

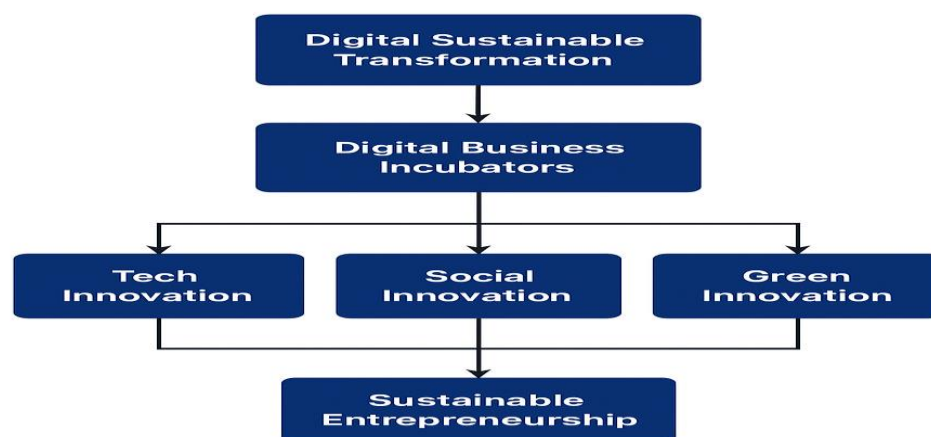
This interaction combines technical and social innovation through support programs, funding, training, and university partnerships, transforming ideas into viable, profitable, and sustainable projects.

- **Transformational Level:**

This interaction results in entrepreneurial projects with a balanced economic, environmental, and social impact, contributing to achieving the 2030 Sustainable Development Goals, such as green employment, reducing emissions, and promoting social inclusion.

3-2 Illustration of the proposed model

Figure (2): The proposed conceptual model for activating the role of digital incubators in sustainable entrepreneurship



(Prepared by the researcher based on Marques & Ferreira, 2022; Nambisan et al., 2023; UNCTAD, 2024).

4. Implications of the Model

This model highlights that achieving sustainable entrepreneurship does not depend on the availability of technology, but rather on its deployment within an integrated incubator system that combines digital knowledge, social innovation, and environmental awareness.

The model also emphasizes that digital transformation becomes sustainable only when it translates into added economic, social, and environmental value for society.

VI: General Conclusion and Recommendations

1. Conclusion

The study demonstrated that digital business incubators have become one of the most important strategic pillars for achieving sustainable entrepreneurship in light of global digital transformations. A comparative analysis of international and Arab experiences demonstrated that the success of these incubators does not depend solely on the availability of technology or funding, but rather requires a participatory governance framework and an integrated development vision that combines digital transformation, social innovation, and environmental awareness.

The study revealed that the relationship between digital transformation and sustainability is reciprocal and complementary. Digital transformation enhances the efficiency of production processes and reduces the environmental impact of emerging enterprises, while sustainability principles ensure that this transformation is directed toward a more responsible and socially just path.

The results also confirmed that digital incubators can transform from mere technical support platforms into sustainable innovation ecosystems that empower entrepreneurs to design projects with a positive economic and social impact, contributing to the achievement of the goals of the 2030 Agenda for Sustainable Development.

On the other hand, the study revealed significant disparities between international and Arab experiences in the areas of governance, financing, and applied research. While European and Asian incubators have reached institutional maturity, their Arab counterparts are still in the experimental and establishment phase, calling for the development of more flexible national policies and linking them to government and strategic digital transformation.

Accordingly, achieving sustainable entrepreneurship in the Arab world will only be achieved by bridging the gap between digital innovation and comprehensive development by enhancing the role of incubators as key drivers of economic, environmental, and social development.

2. Recommendations

Based on the results of the analysis, a set of practical recommendations can be proposed that contribute to improving the performance of digital incubators and supporting the sustainability of startups:

2-1: At the institutional level

- Restructuring incubators within a unified national vision that integrates the digital and environmental dimensions into the innovation support system.

- Strengthening partnerships between universities and incubators to facilitate the transfer of technology and applied knowledge to entrepreneurial projects.
- Establishing national evaluation indicators to measure the environmental and social performance of incubated startups.

2-2: At the economic level

- Activating green and digital finance as mechanisms to finance entrepreneurial projects with environmental and social impact.
- Launching national innovation funds to support startups in the fields of the circular economy, clean energy, and industrial digital transformation.
- Stimulating private investment in digital incubators through clear tax and legislative incentives.

2-3: At the environmental and social level

- Mainstreaming a culture of green and social innovation in university curricula and entrepreneurship programs.
- Supporting women's and youth projects in the field of sustainable technology through specialized incubators.
- Employing artificial intelligence and data analysis to track the environmental and social impact of incubated projects and improve sustainability policies.

2-4: At the regional and international levels

- Enhancing Arab and international cooperation to exchange expertise on sustainable digital incubator policies.
- Establishing joint Arab networks for digital incubators to facilitate the transfer of knowledge and successful experiences.
- Leveraging global experiences in green digital transformation (such as the Spanish and Japanese experiences) to design local application models.

3. Future Research Prospects

This study opens new horizons for academic research on the relationship between digital transformation and sustainable entrepreneurship. In the future, it is possible to:

- Conduct quantitative studies to measure the impact of digital transformation on economic and social sustainability indicators for start-ups.
- Analyze the role of artificial intelligence and big data in improving the effectiveness of digital incubators.
- Develop Smart PLS models to explain the causal relationships between incubators and sustainable innovation in Arab contexts.

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