“The mediating role of digital innovation for the relationship between entrepreneurship and sustainable development”

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THE MEDIATING ROLE OF DIGITAL INNOVATION FOR THE RELATIONSHIP BETWEEN ENTREPRENEURSHIP AND SUSTAINABLE DEVELOPMENT

Abstract

Entrepreneurship is essential in fostering sustainable development since it deals with the social, economic, and environmental dimensions of sustainable development. This study aims to explore the influence of entrepreneurship on sustainable development and the mediation role of digital innovation in Jordanian universities. A quantitative empirical research design was adopted, collecting primary data via a survey questionnaire from a sample of 322 administrative employees selected because of their centrality in the implementation of institutional strategies and fostering entrepreneurial initiatives consistent with sustainability objectives. Data analysis was performed using Smart PLS 4 software to test the proposed relationships. The results have determined that entrepreneurship significantly influences sustainable development ($\beta = 0.48$, $p \leq 0.05$) and strongly predicts digital innovation ($\beta = 0.70$, $p \leq 0.01$). Moreover, digital innovation is positively related to sustainable development ($\beta = 0.55$, $p \leq 0.01$). Additionally, digital innovation mediates the relationship between entrepreneurship and sustainable development since the mediated effect is significant ($\beta = 0.60$, $p \leq 0.01$). These findings underline the strategic importance of digital innovation in increasing the impact of entrepreneurship on sustainability and offer lessons that university leaders and policymakers can use to integrate entrepreneurship and digital innovation into institutional strategies relevant to accomplishing sustainable development goals.

Keywords entrepreneurship, sustainable development, social, economic, environment, digital innovation, Jordanian universities

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INTRODUCTION

In recent years, universities have shown interest in achieving sustainable development, especially embracing innovative solutions to global challenges (Mondal, 2023). According to Rahman et al. (2023), entrepreneurship lies at the cornerstone of developing and improving social, economic, and environmental progress. The role of entrepreneurship is not limited to prior innovation but strives to address the continuous emergence of social issues (Shahid et al., 2023). In the digital world, digital-based innovation is emerging as a key enabler of entrepreneurship in achieving sustainable development (Ovcharuk et al., 2020). Digital tools such as prediction, automation, and relational tools have been at the forefront of creating innovative solutions for entrepreneurs in many fields and enhancing cooperation between academic and industrial communities and people (Shahid et al., 2023; Tang et al., 2023).

Specifically, there is a lack of studies that would disclose the role played by digital innovation in the strengthening of the relationship between entrepreneurship and social, economic, and environmental sustain-

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ability within the education sector (Si et al., 2023; Usman et al., 2024; Wang & Shao, 2023). This necessitates the need to evaluate the moderating impact of digital innovation on the relationship between entrepreneurship and fostering social, economic, and environmental sustainability (Tien et al., 2023; Usman et al., 2024).

1. LITERATURE REVIEW AND HYPOTHESES

In the last few decades, entrepreneurship has acquired increasing importance due to rapid technological advancement and the digital revolution (Vig, 2023). Although the concept of entrepreneurship is not new, it has been placed under the spotlight because of its developmental role in various economic, social, educational, and developmental fields (Wang & Shao, 2023; Xu et al., 2023). The change in the perception of entrepreneurship by society helps generate more income for business owners and the community in general (Febriani et al., 2024). It now acts as a way to obtain economic development as well as generate wealth from entrepreneurship that aims to seek and identify opportunities through innovation by exploring new technologies (Zhai et al., 2023).

Entrepreneurship is viewed as a catalyst for both social and economic development, striving to generate wealth and foster growth through the optimization of human resources within organizations (Felicetti et al., 2024). Recognizing its significance in creating opportunities and influencing the environment underscores its pivotal role (Gregori & Holzmann, 2020; Giedraitytė & Smaliukienė, 2024). It embraces the expanded concept of entrepreneurial thinking and culture, going beyond the notion of simply starting a business venture (Gupta et al., 2023a). It encompasses social and institutional entrepreneurship, entrepreneurial marketing, and entrepreneurial leadership (Gupta et al., 2023b). All entrepreneurial resources and the environment of Arab universities are viewed through an entrepreneurial lens, revealing the reality of students and their attitudes toward entrepreneurship (He et al., 2024). Activating their entrepreneurial practices can transform the inputs of entrepreneurial universities into human, material, and financial inputs through innovative processes to improve the output of universities, whether through students, systems, or cultures, to achieve sustainable improvement in Arab universities from a comprehensive system perspective (Johnson & Schaltegger, 2020).

Since the United Nations first proposed the idea of sustainable development, there has been a competition to implement this concept in all fields, according to its nature and economic structures (Kitsios & Kamariotou, 2023). While the foundational principles of sustainable development remain consistent and have been outlined by the United Nations, variations arise in the execution approach shaped by the unique vision, strategies, and economic context of each country (Li et al., 2023; Khawaldeh et al., 2025). Entrepreneurship is a pivotal pillar that serves as a cornerstone for advancing and nurturing societies within the framework of sustainable development (Luo et al., 2023). Achieving development rates requires emphasizing the importance of various productive formulas to uplift society and overcome its challenges while providing solutions. The progress of nations is closely tied to their degree of innovation and entrepreneurial activity (Mondal, 2023).

Owing to the importance of sustainable development, which has garnered global attention in recent decades, numerous international forums have been held for this purpose (Ovcharuk et al., 2020). The most recent was the Johannesburg Summit held in South Africa in 2002. Sustainable development has stopped being an intellectual luxury and has developed into a sine qua non to dispense justice and fairness in distributing the benefits and gains of economic development and wealth between current and future generations (Ovcharuk et al., 2020). However, with time, it came out that such ideas were just a real mirage due to the numerous problems met by small projects (Rahman et al., 2023). These problems are centered on project owners' capabilities, skills, and traits. This was a real shift toward entrepreneurship because it focused on the project owner and the project itself rather than just stressing the project (Shahid et al., 2023; Rahman et al., 2023). It is a real turning point toward entrepreneurship (Shahid et al., 2023).

Research has established a strong link between an entrepreneurial university and an entrepre-

neur (Si et al., 2023). A university can play a major role in economic development via the launch of novel projects (Su & Wu, 2024). This shift in the university's role from being a source of employment moves its focus toward generating opportunities and authentic partnership-making with stakeholders ranging from public-private sectors to graduate students (Tang et al., 2023). It also involves knowledge and technology transfer from developed Western and Eastern universities in the area of entrepreneurship (Tien et al., 2023). It is important to remember that university education is focused on creativity and invention and that the institution has competent leadership that can provide the material and ethical resources entrepreneurs need (Tolstykh et al., 2020).

An entrepreneurial university should be built according to a systems approach to achieve the expected value (Usman et al., 2024). These universities should possess the characteristics of an entrepreneurial system to sustain and balance themselves as well as identify and correct mistakes (Vig, 2023). With intensifying competition among universities, they are required to focus on sustainable competitive advantages, which pose a greater challenge for university leaders, especially in the face of global changes and technological advancements (Wang & Shao, 2023). To achieve sustainable competitive excellence and to apply the principles of sustainable development within universities, they need to secure an advanced position among other universities (Xu et al., 2023). This can be accomplished by attaining superiority and sustainability through fulfilling one of the universities' most significant roles, which contributes to sustainable development through the launch of innovative and productive projects (Yadav et al., 2023). This necessitates considering a variety of inputs and combining methods that allow institutions to support sustainable development (Luo et al., 2023).

The definitions of sustainable development have varied, but they all agree on the interaction of social, economic, environmental, and human dimensions (Gupta et al., 2023b). The objective is to achieve harmony and integration between the environment and development through an ecosystem of resources, an economic system, and a social system (Ghobakhloo et al., 2021). Sustainable development is characterized as a rational and progressive development pattern that seeks to achieve economic and social development on the one hand while preserving the environment and natural resources on the other (ElMassah & Mohieldin, 2020).

Sustainability encompasses all areas, such as sustainable food, agriculture, forests, transportation, cities, and technology (Bilan et al., 2020). Numerous terms have emerged that support sustainability, such as ecological efficiency, environmental management, entrepreneurship, social responsibility, innovation, green reduction, green innovation, and entrepreneurial environment (Azmat et al., 2023). This means that the concept has moved from a relatively marginal one to an ideal one that has formed all aspects of life, government strategies, and national and international policies. This term has changed from sustainable development to sustainability (Ashari et al., 2022). The old view of development was basically centered on issues of development in developing countries only, neglecting many aspects that play a role in the present and future of human life (Apostu & Gigauri, 2023). This is robust evidence showing that the concept has traveled from a rather marginal position to an ideal forming all facets of life, strategies of government, and policies at both a national and global level. It means that the available potential cannot only be harnessed for the present generations, but it should also be a reminder of how future generations can benefit from it (Felicetti et al., 2024).

Digital innovation is the process of improving a product, service, or process through technology. It provides practical solutions for improving operational efficiency by using technologies such as big data, data analytics, and improvement of customer experience that seeks to effectively interact between users (Zahra et al., 2023). The concept of innovation, which reflects digital technology in enhancing and improving social, economic, and environmental matters in the best possible way, became important in achieving sustainability (Zhai et al., 2023). This will enable the companies to find smart solutions that will enhance their competitive capabilities while contributing to the achievement of social, economic, and environmental sustainability (Ovcharuk et al., 2020). Digital innovations have also focused on enhancing the capabilities of entrepreneurs in developing

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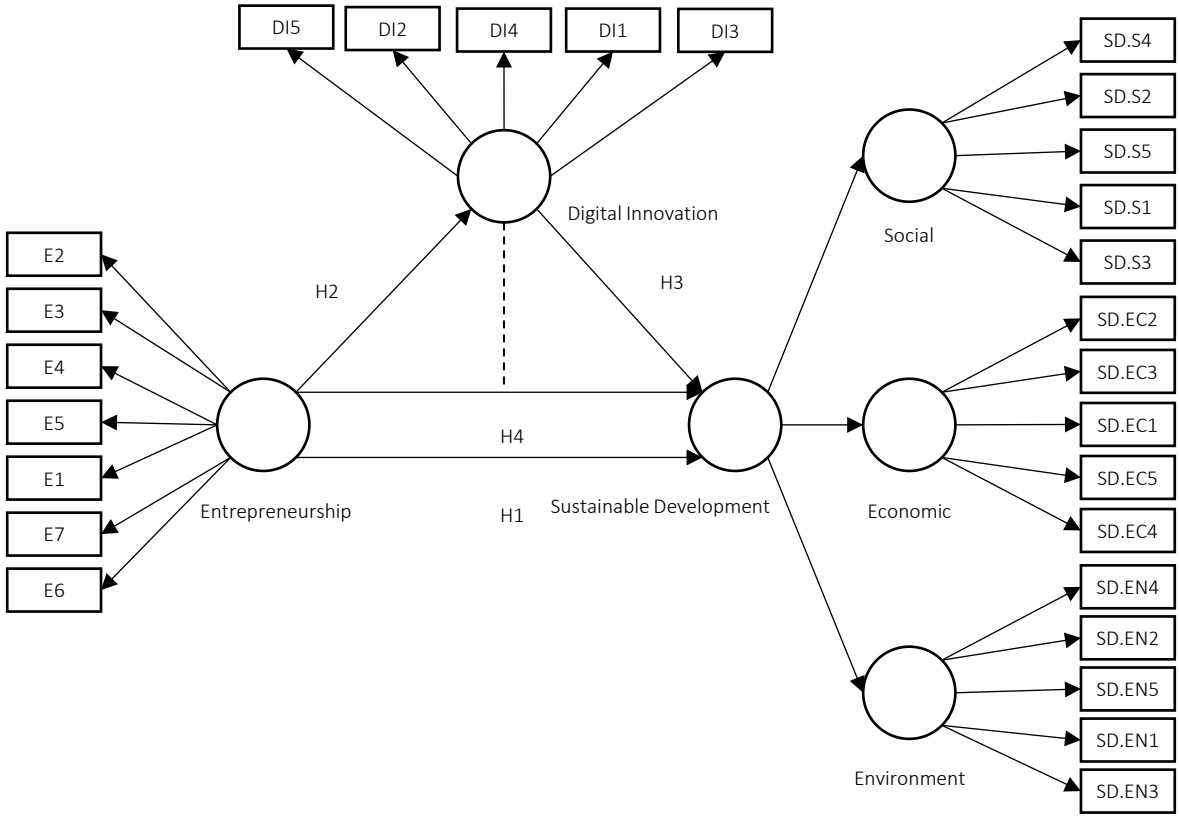

Figure 1. Conceptual research model

digital platforms that help make effective decisions to develop creativity (Khan et al., 2023).

There are challenges to entrepreneurship in relation to digital innovation involving access to up-to-date digital technologies and creating a divide between entrepreneurs across developed and developing countries (Ovcharuk et al., 2020). This diminishes the application of necessary digital tools, including automation, predictive, and relational methods, hence decreasing the entrepreneurial drive for approaching innovations within the scope of sustainable solutions (Si et al., 2023; Usman et al., 2024; Wang & Shao, 2023). In addition, the costs are high for the development of digital infrastructure, hence negatively impacting the exploitation of the necessary digital technologies and affecting different sectors (Tang et al., 2023). As a statement, it constrains the exploitation of digital innovations to a limited category of entrepreneurs driving social, economic, and environmental progress (Tolstykh et al., 2020).

Thus, the study aims to reveal the strength of the mediating role of digital innovation in improving the relationship between entrepreneurship and sustainable development of social, economic, and environmental factors within the scope of Jordanian universities (Figure 1). Therefore, the study stated the following hypotheses:

H1: Entrepreneurship significantly affects sustainable development.

H2: Entrepreneurship significantly affects digital innovation.

H3: Digital innovation significantly affects sustainable development.

H4: Entrepreneurship significantly affects sustainable development via digital innovation as a mediator.

2. METHOD

The study adopts a descriptive-analytical approach and depends on a structured questionnaire (Appendix A) as a major tool for collecting data.

A total of 322 administrative employees working in 23 Jordanian universities that are in charge of managing digital innovation and entrepreneurship initiatives, as well as sustainability programs, were surveyed through purposive sampling. The sample was carefully selected to represent public and private universities, spread according to university size and the level of commitment in terms of digital transformation, to increase the statistical power of SEM analysis. The questionnaire was administered manually to maximize accessibility and response rates. Pre-testing of the questionnaire was conducted to ensure it was clear and easily comprehensible, targeting 34 administrative employees at different universities in Jordan (Bougie & Sekaran, 2019). Table 1 shows the distribution of the study sample among the participating universities.

Table 1. Distribution of study sample across universities

Number	University	Administrative respondents
1	University of Jordan	30
2	Yarmouk University	25
3	Jordan University of Science and Technology	20
4	The Hashemite University	18
5	Al-Balqa' Applied University	18
6	Mutah University	15
7	Al-Zaytoonah University of Jordan	15
8	Al-Ahliyya Amman University	15
9	Applied Science Private University	15
10	German Jordanian University	15
11	Princess Sumaya University for Technology	14
12	Zarqa University	14
13	University of Petra	14
14	Philadelphia University	14
15	Middle East University	12
16	American University of Madaba	10
17	Amman Arab University	10
18	Jadara University	10
19	Jerash Private University	9
20	Isra University	9
21	Irbid National University	7
22	The World Islamic Sciences and Education University	7
23	Al-Hussein Bin Talal University	6

In this regard, the questionnaire was divided into four sections. The first section describes the demographic profile of the study sample. The second section consists of seven questions measuring the entrepreneurship variable (for example, "The university-wide policies support entrepreneurship within our department") (Apostu & Gigauri, 2023; Avelar et al., 2024; Johnson & Schaltegger, 2020). The third section consists of five questions measuring the digital innovation variable (for example, "The features of superior enterprise digital solutions meet the organization's requirements") (Felicetti et al., 2024; Kitsios & Kamariotou, 2023; Tang et al., 2023; Yasa et al., 2019). The fourth section consists of sustainable development variables divided into three variables, which are social (five questions), economic (five questions) and environmental aspects (five questions) (for example, "The organization follows green practices regarding waste management") (Apostu & Gigauri, 2023; Ciulli & Kolk, 2023; Johnson & Schaltegger, 2020; Luo et al., 2023; Awamleh et al., 2024).

The data were analyzed using Smart PLS 4 software to identify factor loadings, Cronbach's Alpha, AVE, weight of item loading, discriminant validity, hypotheses testing, and to assess the direct and indirect effects of the current study variables (Cheah et al., 2024). Finally, the statistical tests provided insights into the role of digital innovation as a mediator between entrepreneurship and sustainable development (Hair Jr et al., 2017).

3. RESULTS

Table 2 shows the demographic variables of the study sample consisting of (n = 322) administrative employees in various Jordanian universities, where gender is represented by a fair percentage of males (55.9%) and females (44.1%). The majority belonged to the youth category, aged 31–40 years, which shows the interest of universities in the youth category. The administrative employment category was for those who obtained Bachelor's and Master's levels. The years of experience for the great category ranged from one to 10 years.

Table 3 shows the reliability and validity scale of the items used in the study variables: entrepreneurship, digital innovation, and sustainable development (social, economic, and environmental aspects). Factor loadings showed the strength of the relationship between the items, which indicates a degree better than the permis-

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Table 2. Demographic profile

Demographic factor	Category	Frequency	Percentage (%)
Gender	Male	180	55.9
	Female	142	44.1
Age	20–30	80	24.8
	31–40	150	46.6
	41+	92	28.6
Educational Qualification	Diploma	40	12.4
	Bachelor's	100	31.1
	Master's	120	37.3
	Ph.D.	62	19.3
Years of Experience	1–5	100	31.1
	6–10	120	37.3
	11–15	62	19.3
	15+	40	12.4

sible percentage (Loadings ≥ 0.70). Cronbach's Alpha and CR also measure the reliability of the study variables, which showed the reliability of all items with degrees that exceeded the permissible value (α and CR ≥ 0.70). AVE showed convergent validity, which confirmed that the structure explains a large degree of the items, which indicates the importance of each item in the final result of the strength of the structure, which confirms discriminant validity (AVE ≥ 0.50) (Hair Jr et al., 2017). Finally, the VIF indicates no multicollinearity between the study variables, as all VIF values ≤ 5 (Bougie & Sekaran, 2019).

Table 3. Outer model results

Variable		Indicator	Factor Loadings	α	CR	AVE	VIF
Entrepreneurship		E2	0.88	0.87	0.89	0.65	1.45
		E3	0.86				
		E4	0.81				
		E5	0.77				
		E1	0.76				
		E7	0.76				
		E6	0.75				
Digital Innovation		DI5	0.85	0.88	0.89	0.68	1.60
		DI2	0.84				
		DI4	0.82				
		DI1	0.80				
		DI3	0.78				
Sustainable Development	Social	SD.S4	0.89	0.86	0.87	0.63	1.55
		SD.S2	0.87				
		SD.S5	0.86				
		SD.S1	0.81				
		SD.S3	0.80				
	Economic	SD.EC2	0.91				
		SD.EC3	0.88				
		SD.EC1	0.87				
		SD.EC5	0.82				
		SD.EC4	0.78				
	Environment	SD.EN4	0.87				
		SD.EN2	0.84				
		SD.EN5	0.81				
		SD.EN1	0.79				
		SD.EN3	0.76				

Table 4. Discriminant validity (Fornell–Larcker criterion)

Variable	Entrepreneurship	Digital Innovation	Sustainable Development
Entrepreneurship	0.81	–	–
Digital Innovation	0.64	0.83	–
Sustainable Development	0.58	0.60	0.80

Table 5. Hypotheses testing

Hypothesis	Mean	SD	Effect	Beta	T-Value	P-Value	Result
H1: Entrepreneurship → Sustainable Development	0.763	0.014	0.23	0.48	8.42	0.021	Supported
H2: Entrepreneurship → Digital Innovation	0.862	0.012	0.42	0.70	9.34	0.001	Supported
H3: Digital Innovation → Sustainable Development	0.841	0.019	0.31	0.55	7.12	0.001	Supported
H4: Mediation: Entrepreneurship → Digital Innovation → Sustainable Development	0.436	0.023	0.52	0.60	8.33	0.000	Supported

Table 4 shows no multicollinearity among the study variables, which confirms their independence. On the other hand, there is no weak correlation between the study variables ($p \leq 0.01$) (Hair Jr et al., 2017).

Table 5 and Figure 2 provide details about the direct and indirect (mediator) effects of digital innovation on the relationship between entrepreneurship and sustainable development. The arithmetic means are average for all study variables, which are good percentages (intermediate) according to the sample responses.

The effect degree for *H1:* Entrepreneurship → Sustainable Development is 0.23; *H2:* Entrepreneurship → Digital Innovation is 0.42; *H3:* Digital Innovation → Sustainable Development is 0.31; and *H4*: the indirect relationship showed 0.52. The Beta coefficient explains that whenever entrepreneurship increases by one unit, sustainable development increases by 0.48. Whenever entrepre-

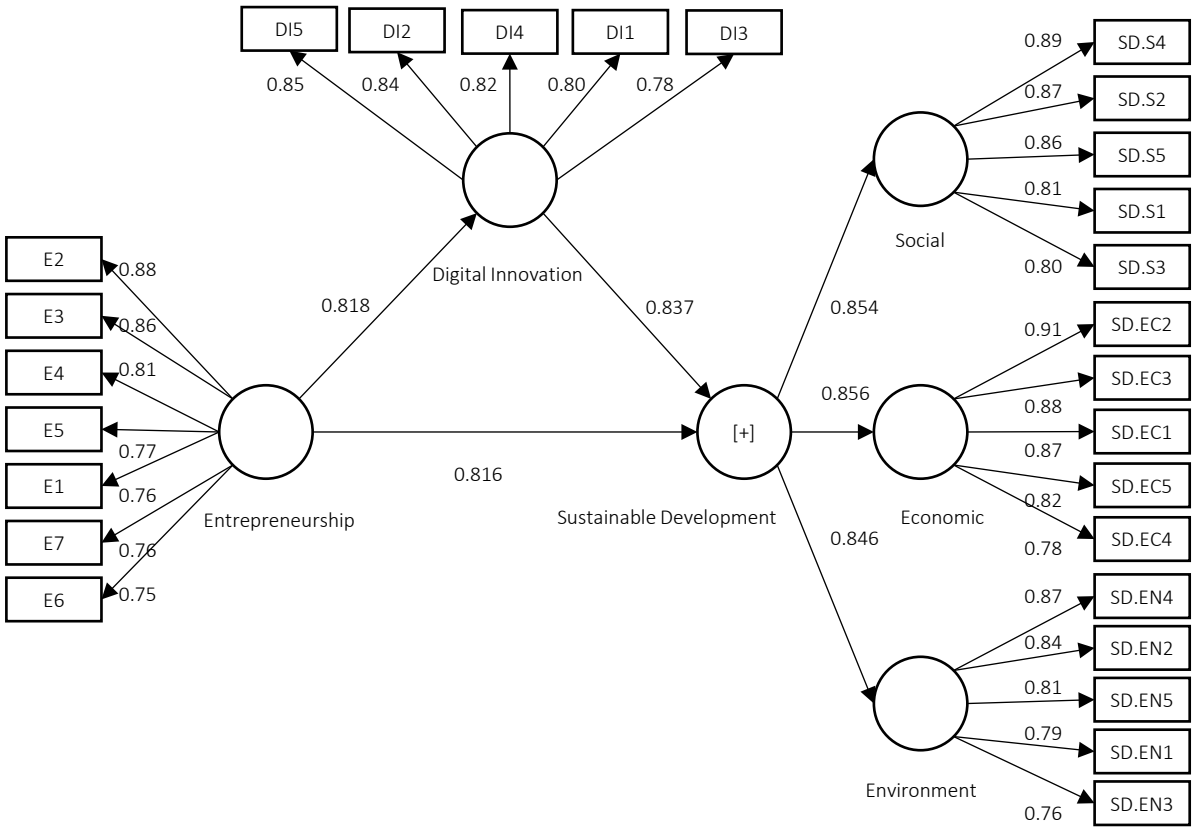

Figure 2. Structural model

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neurship increases by one unit, digital innovation increases by 0.70. Whenever digital innovation increases by one unit, sustainable development increases by 0.55. Whenever entrepreneurship with digital innovation increases, sustainable development increases by 0.60 (Hair Jr et al., 2017).

The first hypothesis showed a *T*-value of 8.42, which is significant at $p \leq 0.05$. The second hypothesis had a *T*-value of 9.34, which is significant at $p \leq 0.01$. The third hypothesis showed a *T*-value of 7.12, which is significant at $p \leq 0.01$. Finally, the fourth indirect hypothesis had a *T*-value of 8.33, which is significant at $p \leq 0.01$ (Cheah et al., 2024).

4. DISCUSSION

The study highlighted the role of entrepreneurship in promoting sustainable development in the Jordanian university sector. Digital innovation is a driving force in stimulating social, economic, and environmental development and finding technological innovations that satisfactorily contribute to the production and service sectors.

The results also confirmed that entrepreneurship has a positive impact on sustainable development in Jordanian universities. In this regard, entrepreneurial practices that involve creativity, innovation, and adventure contribute to addressing social, economic, and environmental issues. The findings also contributed to shedding light on the education sector in integrating entrepreneurial strategies in improving social responsibility services (Allal-Chérif et al., 2023; Avelar et al., 2024; Bresciani et al., 2021).

The study also confirmed that entrepreneurship positively enhances digital innovation. Universities seek to develop entrepreneurship centers, which in turn strive to access new technologies that improve operational efficiency and innovation, which emphasizes the role of digital transformation in academic institutions and improving learning outcomes (Si et al., 2023; Zahra et al., 2023; Zhai et al., 2023).

The study highlighted the role of digital innovation in developing sustainable development. This, in turn, improves the resources of educational institutions, which is evident in social, economic, and environmental initiatives and activities at the level of institutions as a whole (Luo et al., 2023). Digital tools strive to improve the sustainable development of universities, which leads to the role of cooperation in community services, and highlight the infrastructure in stressing future trends as a strategy for innovation and survival in the labor market (ElMassah & Mohieldin, 2020; Li et al., 2023; Luo et al., 2023).

The study outcomes confirmed the effective role of digital innovation in activating the relationship between entrepreneurship and sustainable development. Universities are striving to promote entrepreneurship systems technologically using digital tools to enhance sustainable development. Studies have confirmed the need for institutions to generate effective strategies to develop innovation and sustainability, enhancing competitive capabilities and improving the operating environment (Apostu & Gigauri, 2023; Bakry et al., 2024). There are also paradoxes around conventional leadership, which on a certain scale can constrain sustainable development, reduce institutional effectiveness, and constrain work (Gupta et al., 2023b). This created a prominent place for digital innovation in achieving sustainable development through improving operational processes and developing work methods (Ciulli & Kolk, 2023; ElMassah & Mohieldin, 2020; Felicetti et al., 2024; Gagulina et al., 2020).

Academically, the study seeks to refine the concept of digital innovation in enhancing the relationship between entrepreneurship and sustainable development in the educational sector (Bresciani et al., 2021). The study has equally shown the implications of integrating entrepreneurship with digital innovation, which is an effective axis in contributing to social, economic, and environmental responsibility (Gupta et al., 2023b). It also showed the prominent role played by universities in inhabiting digital teaching curricula that generate digital leadership in the social, economic, and environmental sectors (Luo et al., 2023; Mondal, 2023). This study has, in practical terms, brought about the role of universities in making sure that students are sufficiently provided with digital innovation skills (Tang et al., 2023; Shahid et al., 2023).

Universities should be supported in training future generations in the area of digital leadership facing the challenges of environmental development (Usman et al., 2024). Universities should also develop infrastructure that supports entrepreneurship projects in improving social, economic, and environmental impacts (Yadav et al., 2023; Zhai et al., 2023).

CONCLUSION

The study aimed to check the effect of digital innovation on the relationship between entrepreneurship and sustainable development in Jordanian universities. It showed that entrepreneurship enhances economic, social, and environmental progress, and digital innovation enhances institutional efficiency and creativity. Therefore, universities should prioritize entrepreneurship and digital innovation in developing sustainability. The study contributed to developing a comprehensive scope for discussing modern literature on entrepreneurship, digital innovation, and sustainable development and developing visions to improve the level of education, learning, and other sectors.

The study recommends subsequent research that contributes to expanding the scope of the current study in other sectors and cultures to discover the impact of digital innovations in enhancing the effective role of entrepreneurship and sustainability and the use of modern digital technologies such as artificial intelligence and big data in guiding entrepreneurship systems in the labor market. The study also recommends expanding qualitative research to provide comparisons of the industry and the actual experiences of entrepreneurs in generating new visions that stimulate the interaction between innovation, entrepreneurship, and sustainability in the workplace.

The study has limitations as it focuses on the educational sector and one environment and culture that cannot be generalized. The paper also included a quantitative survey of solely administrative employees. Finally, it is necessary to discover mediating influences that improve the concept of sustainability, such as government policies and cultures.

AUTHOR CONTRIBUTIONS

Conceptualization: Fawwaz Tawfiq Awamleh.
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Formal analysis: Fawwaz Tawfiq Awamleh.
Funding acquisition: Tareq Wreikat, Fawwaz Tawfiq Awamleh.
Investigation: Tareq Wreikat, Fawwaz Tawfiq Awamleh.
Methodology: Fawwaz Tawfiq Awamleh.
Project administration: Tareq Wreikat.
Resources: Tareq Wreikat, Fawwaz Tawfiq Awamleh.
Software: Tareq Wreikat.
Supervision: Fawwaz Tawfiq Awamleh.
Validation: Tareq Wreikat, Fawwaz Tawfiq Awamleh.
Writing – original draft: Tareq Wreikat, Fawwaz Tawfiq Awamleh.
Writing – review & editing: Fawwaz Tawfiq Awamleh.

REFERENCES

1. Allal-Chérif, O., Climent, J. C., & Berenguer, K. J. U. (2023). Born to be sustainable: How to combine strategic disruption, open innovation, and process digitization to create a sustainable business. *Journal of Business Research, 154,* Article 113379. https://doi.org/10.1016/j.jbusres.2022.113379
2. Apostu, S.-A., & Gigauri, I. (2023). Sustainable development and entrepreneurship in emerging countries: Are sustainable development and entrepreneurship

http://dx.doi.org/10.21511/ppm.23(1).2025.35

reciprocally reinforcing? *Journal of Entrepreneurship, Management and Innovation, 19*(1), 41-77. https://doi.org/10.7341/20231912

3. Ashari, H., Abbas, I., Abdul-Talib, A.-N., & Mohd Zamani, S. N. (2022). Entrepreneurship and sustainable development goals: A multigroup analysis of the moderating effects of entrepreneurship education on entrepreneurial intention. *Sustainability, 14*(1), Article 431. https://doi.org/10.3390/su14010431

4. Avelar, S., Borges-Tiago, T., Almeida, A., & Tiago, F. (2024). Confluence of sustainable entrepreneurship, innovation, and digitalization in SMEs. *Journal of Business Research, 170,* Article 114346. https://doi.org/10.1016/j.jbusres.2023.114346

5. Awamleh, F. T., Alarabiat, Y. A., & Bustami, A. N. (2024). Enhancing sustainable development through international performance indicators: The role of business intelligence techniques. *Challenges in Sustainability, 12*(3), 203-218. https://doi.org/10.56578/cis120304

6. Azmat, F., Lim, W. M., Moyeen, A., Voola, R., & Gupta, G. (2023). Convergence of business, innovation, and sustainability at the tipping point of the sustainable development goals. *Journal of Business Research, 167,* Article 114170. https://doi.org/10.1016/j.jbusres.2023.114170

7. Bakry, D. S., Daim, T., Dabic, M., & Yesilada, B. (2024). Evaluation of the effectiveness of innovation ecosystems in facilitating the adoption of sustainable entrepreneurship. *Journal of Small Business Management, 62*(2), 763-789. https://doi.org/10.1080/00472778.2022.2088775

8. Bilan, Y. V., Pimonenko, T. V., & Starchenko, L. V. (2020). Sustainable business models for innovation and success: Bibliometric analysis. *E3S Web of Conferences, 159,* Article 04037. https://doi.org/10.1051/e3sconf/202015904037

9. Bougie, R., & Sekaran, U. (2019). *Research methods for business: A skill-building approach* (8th ed.). John Wiley & Sons.

10. Bresciani, S., Huarng, K.-H., Malhotra, A., & Ferraris, A. (2021). Digital transformation as a springboard for product, process, and business model innovation. *Journal of Business Research, 128,* 204-210. https://doi.org/10.1016/j.jbusres.2021.02.003

11. Cheah, J.-H., Magno, F., & Cassia, F. (2024). Reviewing the SmartPLS 4 software: The latest features and enhancements. *Journal of Marketing Analytics, 12,* 97-107. https://doi.org/10.1057/s41270-023-00266-y

12. Ciulli, F., & Kolk, A. (2023). International business, digital technologies, and sustainable development: Connecting the dots. *Journal of World Business, 58*(4), Article 101445. https://doi.org/10.1016/j.jwb.2023.101445

13. ElMassah, S., & Mohieldin, M. (2020). Digital transformation and localizing sustainable development goals (SDGs). *Ecological Economics, 169,* Article 106490. https://doi.org/10.1016/j.ecolecon.2019.106490

14. Febriani, R., Nurhasanah, S., & Hakim, A. R. (2024). Relationships between demographic factors, job satisfaction, and intention to leave among women employees in Indonesia. *Problems and Perspectives in Management, 22*(1), 1-12. http://dx.doi.org/10.21511/ppm.22(1).2024.01

15. Felicetti, A. M., Corvello, V., & Ammirato, S. (2024). Digital innovation in entrepreneurial firms: A systematic literature review. *Review of Managerial Science, 18*(2), 315-362. https://doi.org/10.1007/s11846-023-00638-9

16. Gagulina, N., Samoylov, A., Novikov, A., & Yanova, E. (2020). Innovation-driven development and quality of life under conditions of digital economy. *E3S Web of Conferences, 157,* Article 04037. https://doi.org/10.1051/e3sconf/202015704037

17. Ghobakhloo, M., Iranmanesh, M., Grybauskas, A., Vilkas, M., & Petraitė, M. (2021). Industry 4.0, innovation, and sustainable development: A systematic review and roadmap to sustainable innovation. *Business Strategy and the Environment, 30*(8), 4237-4257. https://doi.org/10.1002/bse.2867

18. Giedraitytė, V., & Smaliukienė, R. (2024). Application of the creative problem-solving approach in forming public management competencies. *Problems and Perspectives in Management, 22*(1), 13-24. http://dx.doi.org/10.21511/ppm.22(1).2024.02

19. Gregori, P., & Holzmann, P. (2020). Digital sustainable entrepreneurship: A business model perspective on embedding digital technologies for social and environmental value creation. *Journal of Cleaner Production, 272,* Article 122817. https://doi.org/10.1016/j.jclepro.2020.122817

20. Gupta, B. B., Gaurav, A., & Panigrahi, P. K. (2023a). Analysis of the development of sustainable entrepreneurship practices through knowledge and smart innovative based education system. *International Entrepreneurship and Management Journal, 19*(2), 923-940. https://doi.org/10.1007/s11365-023-00853-6

21. Gupta, B. B., Gaurav, A., Panigrahi, P. K., & Arya, V. (2023b). Analysis of artificial intelligence-based technologies and approaches on sustainable entrepreneurship. *Technological Forecasting and Social Change, 186,* Article 122152. https://doi.org/10.1016/j.techfore.2022.122152

22. Hair Jr, J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: Updated guidelines on which method to use. *International Journal of Multivariate Data Analysis, 1*(2), 107-123. https://doi.org/10.1504/IJMDA.2017.087624

23. He, Q., Ribeiro-Navarrete, S., & Botella-Carrubi, D. (2024). A matter of motivation: The impact of enterprise digital transformation on green innovation. *Review of Managerial Science, 18*(5), 1489-1518. https://doi.org/10.1007/s11846-023-00665-6

24. Johnson, M. P., & Schaltegger, S. (2020). Entrepreneurship for sustainable development: A review and multilevel causal mechanism framework. *Entrepreneurship Theory and Practice, 44*(6), 1141-1173. https://doi.org/10.1177/1042258719885368

25. Khan, I. S., Ahmad, M. O., & Majava, J. (2023). Industry 4.0 innovations and their implications: An evaluation from sustainable

development perspective. *Journal of Cleaner Production, 405,* Article 137006. https://doi.org/10.1016/j.jclepro.2023.137006

26. Khawaldeh, K., Awamleh, F. T., Al-Shibly, M. S., & Al-Kharabsheh, A. (2025). Data-driven strategic planning: The mediating role of the Blockchain-based supply chain in enhancing digital logistics performance. *International Journal of Innovative Research and Scientific Studies, 8*(1), 2680-2687. https://doi.org/10.53894/ijirss.v8i1.5041
27. Kitsios, F., & Kamariotou, M. (2023). Digital innovation and entrepreneurship transformation through open data hackathons: Design strategies for successful start-up settings. *International Journal of Information Management, 69,* Article 102472. https://doi.org/10.1016/j.ijinfomgt.2022.102472
28. Li, X., Zhang, L., & Cao, J. (2023). Research on the mechanism of sustainable business model innovation driven by the digital platform ecosystem. *Journal of Engineering and Technology Management, 68,* Article 101738. https://doi.org/10.1016/j.jengtecman.2023.101738
29. Luo, S., Yimamu, N., Li, Y., Wu, H., Irfan, M., & Hao, Y. (2023). Digitalization and sustainable development: How could digital economy development improve green innovation in China? *Business Strategy and the Environment, 32*(4), 1847-1871. https://doi.org/10.1002/bse.3223
30. Mondal, S. (2023). The nexus between green entrepreneurship and sustainable development: An econometric study. *Global Business Review*. https://doi.org/10.1177/09721509231157009
31. Ovcharuk, O., Ivaniuk, I., Soroko, N., Gritsenchuk, O., & Kravchyna, O. (2020). The use of digital learning tools in the teachers' professional activities to ensure sustainable development and democratization of education in European countries. *E3S Web of Conferences, 166,* Article 10019. https://doi.org/10.1051/e3sconf/202016610019
32. Rahman, M. M., Hasan, M. J., Deb, B. C., Rahman, M. S., & Kabir, A. S. (2023). The effect of social media entrepreneurship on sustainable development: Evidence from online clothing shops in Bangladesh. *Heliyon, 9*(9), Article e19397. https://doi.org/10.1016/j.heliyon.2023.e19397
33. Shahid, M. S., Hossain, M., Shahid, S., & Anwar, T. (2023). Frugal innovation as a source of sustainable entrepreneurship to tackle social and environmental challenges. *Journal of Cleaner Production, 406,* Article 137050. https://doi.org/10.1016/j.jclepro.2023.137050
34. Si, S., Hall, J., Suddaby, R., Ahlstrom, D., & Wei, J. (2023). Technology, entrepreneurship, innovation and social change in digital economics. *Technovation, 119,* Article 102484. https://doi.org/10.1016/j.technovation.2022.102484
35. Su, Y., & Wu, J. (2024). Digital transformation and enterprise sustainable development. *Finance Research Letters, 60,* Article 104902. https://doi.org/10.1016/j.frl.2023.104902
36. Tang, H., Yao, Q., Boadu, F., & Xie, Y. (2023). Distributed innovation, digital entrepreneurial opportunity, IT-enabled capabilities, and enterprises' digital innovation performance: A moderated mediating model. *European Journal of Innovation Management, 26*(4), 1106-1128. https://doi.org/10.1108/EJIM-08-2021-0431
37. Tien, N. H., Tien, N. V., Mai, N. P., & Duc, L. D. M. (2023). Green entrepreneurship: a game changer in Vietnam business landscape. *International journal of entrepreneurship and small business, 48*(4), 408-431. https://doi.org/10.1504/IJESB.2023.130829
38. Tolstykh, T., Gamidullaeva, L., & Shmeleva, N. (2020). Elaboration of a mechanism for sustainable enterprise development in innovation ecosystems. *Journal of Open Innovation: Technology, Market, and Complexity, 6*(4). https://doi.org/10.3390/joitmc6040095
39. Usman, F. O., Kess-Momoh, A. J., Ibeh, C. V., Elufioye, A. E., Ilojianya, V. I., & Oyeyemi, O. P. (2024). Entrepreneurial innovations and trends: A global review: Examining emerging trends, challenges, and opportunities in the field of entrepreneurship, with a focus on how technology and globalization are shaping new business ventures. *International Journal of Science and Research Archive*, *11*(1), 552-569. https://doi.org/10.30574/ijsra.2024.11.1.0079
40. Vig, S. (2023). Sustainable development through sustainable entrepreneurship and innovation: A single-case approach. *Social Responsibility Journal, 19*(7), 1196-1217. https://doi.org/10.1108/SRJ-02-2022-0093
41. Wang, L., & Shao, J. (2023). Digital economy, entrepreneurship and energy efficiency. *Energy, 269,* Article 126801. https://doi.org/10.1016/j.energy.2023.126801
42. Xu, J., Yu, Y., Zhang, M., & Zhang, J. Z. (2023). Impacts of digital transformation on eco-innovation and sustainable performance: Evidence from Chinese manufacturing companies. *Journal of Cleaner Production, 393,* Article 136278. https://doi.org/10.1016/j.jclepro.2023.136278
43. Yadav, S., Samadhiya, A., Kumar, A., Majumdar, A., Garza-Reyes, J. A., & Luthra, S. (2023). Achieving the sustainable development goals through net zero emissions: Innovation-driven strategies for transitioning from incremental to radical lean, green and digital technologies. *Resources, Conservation and Recycling, 197,* Article 107094. https://doi.org/10.1016/j.resconrec.2023.107094
44. Yasa, N. N. K., Ekawati, N. W., & Rahmayanti, P. L. D. (2019). The role of digital innovation in mediating digital capability on business performance. *European Journal of Management and Marketing Studies, 4*(2). Retrieved from https://oapub.org/soc/index.php/EJMMS/article/view/636
45. Zahra, S. A., Liu, W., & Si, S. (2023). How digital technology promotes entrepreneurship in ecosystems. *Technovation, 119,* Article 102457. https://doi.org/10.1016/j.technovation.2022.102457
46. Zhai, Y., Yang, K., Chen, L., Lin, H., Yu, M., & Jin, R. (2023). Digital entrepreneurship: Global maps and trends of research. *Journal of Business & Industrial Marketing, 38*(3), 637-655. https://doi.org/10.1108/JBIM-05-2021-0244

http://dx.doi.org/10.21511/ppm.23(1).2025.35

APPENDIX A

Table A1. Survey questionnaire

Variable		Indicator	References
Entrepreneurship		**E1:** The university-wide policies support entrepreneurship within our department	Apostu and Gigauri (2023), Avelar et al. (2024), Johnson and Schaltegger (2020)
		E2: Feedback in policy development encourages entrepreneurial initiatives at all levels	
		E3: This university is much more responsive than others to innovative ideas brought forward with an entrepreneurial spirit	
		E4: The department enjoys considerable freedom in adopting entrepreneurial approaches to faculty evaluation	
		E5: University policies facilitate integrating entrepreneurship into the department's goals	
		E6: The faculties feel encouraged to pursue opportunities with an entrepreneurial perspective within the department	
		E7: University policies contribute to developing entrepreneurial success and innovative initiatives within the department	
Digital Innovation		**DI1:** The features of superior enterprise digital solutions meet the organization's requirements	Felicetti et al. (2024), Kitsios and Kamariotou (2023), Tang et al. (2023), Yasa et al. (2019)
		DI2: The nature of superior enterprise digital solutions is innovative and user-friendly	
		DI3: Different digital solutions are implemented to meet different types of organizational requirements	
		DI4: The different product platforms offered by enterprise digital solutions vary significantly in terms of their functionality	
		DI5: Each new version of a product has numerous improvements over previous versions	
Sustainable Development	Social	**SDS1:** It is a social equity and inclusion-promoting organization	Apostu and Gigauri (2023), Ciulli and Kolk (2023), Johnson and Schaltegger (2020), Luo et al. (2023), Awamleh et al. (2024)
		SDS2: The organization focuses on the care of its employees and communities	
		SDS3: The organization promotes social responsibility through its activities	
		SDS4: The organization believes in education and community development programs	
		SDS5: The organization engages in initiatives that improve the quality of life for marginalized groups	
	Economic	**SDEC1:** The organization ensures long-term financial stability and growth	
		SDEC2: The organization prioritizes cost-effective and efficient resource use	
		SDEC3: It supports the economic development of its locality through job creation	
		SDEC4: The organization invests in innovation to maintain its competitive advantage	
		SDEC5: The organization follows strategies for sustainable economic growth without the exploitation of resources	
	Environment	**SDEN1:**The organization works in an active way to minimize environmental damage	
		SDEN2: The organization follows green practices regarding waste management	
		SDEN3: It makes use of renewable energy sources that reduce carbon footprint	
		SDEN4: The organization encourages the conservation of natural resources in its operations	
		SDEN5: The company follows environmental legislation and works toward continuous improvement	