Digital Transformation and Strategic Planning and Their Impact on Metaverse Technology to Promote Entrepreneurship: A Study on Technology Companies in the City of Misurata

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Abstract

This study aimed at analyzing the relationship between digital transformation and strategic planning under metaverse technology to promote entrepreneurship. A descriptive analytical approach was used for 138 questionnaires, distributed to administrators in technology companies in the city of Misurata. The formulated hypotheses were analyzed and tested using the Smart.pls4 program. The results revealed that companies recognize the importance of digital transformation and strategic planning in promoting entrepreneurship in light of metaverse technology. They also need to improve their technological maturity level and training on metaverse technology. Digital transformation directly and indirectly impacts entrepreneurship through strategic planning and metaverse technology. On this basis, a number of recommendations in the following areas were suggested: investing in digital transformation and strategic planning, preparing for the future by investing in metaverse technology, taking advantage of the opportunities provided by this technology to support companies in investing in digital transformation, providing training and support to users of metaverse technology, and developing policies and laws that support the growth of entrepreneurship. The study further suggested conducting more studies on the relationship between digital transformation and entrepreneurship under metaverse technology, and the impact of metaverse technology on entrepreneurship on various sectors.

Keywords: Digital Transformation, Strategic Planning, Entrepreneurship, Metaverse, Technology Companies.

1. Introduction

In our fast-paced digital world, digital entrepreneurship has become an urgent necessity for the success of companies in various fields. Digital transformation and strategic planning are among the most important factors that can help companies achieve success in the world of digital entrepreneurship.

Metaverse technology is a new concept of a three-dimensional virtual world (3D) that connects digital and real experiences. The metaverse is an integrated virtual environment that users can interact with, create, and enjoy. It can include a variety of experiences (Smith, 2022).

Metaverse technology can provide new opportunities for digital entrepreneurship; for example, it can be used to create new customer experiences, deliver innovative products and services, create new virtual communities, and foster collaboration between companies (Strickland, 2022). This study aims to analyze the role of digital transformation and strategic planning in promoting entrepreneurship in the tech community of Misurata, with the metaverse technology emerging as a new opportunity for digital entrepreneurship (Smith, 2022; Strickland, 2022). The following are some specific examples of how metaverse technology can be used in digital entrepreneurship:

Education: The metaverse can be used to create an interactive and immersive virtual learning environment improving the contribution of the students' environment in learning new skills more effectively and efficiently.

Entertainment: The metaverse can be used to create new and immersive games and entertainment experiences, allowing users to enjoy their time in new, more engaging ways.

Social Media: The metaverse can be used to create new virtual communities and foster interpersonal collaboration, activating the role of communities and people in communicating more effectively and conveniently.

Research Problem

An exploratory study on a sample of Misurata's tech revealed the problems they face in the field of metaverse technology for entrepreneurship. The survey concluded that there is a knowledge gap in understanding the role of digital transformation and strategic planning in the field of metaverse technology to promote entrepreneurship from which the research questions has been revolved.

Research Questions

This study seeks to answer the following questions:

1. What is the relationship between digital transformation and entrepreneurship in the companies under study?

2. What is the relationship between digital transformation and strategic planning in entrepreneurship under metaverse technology?

3. What is the role of metaverse technology in promoting entrepreneurship?

Research Objectives

This study aims to achieve the following objectives:

1. Understand the relationship between digital transformation and entrepreneurship for technology companies.

2. Identify the role of metaverse technology in promoting entrepreneurship.

3. Analyze the impact of digital transformation on strategic planning in entrepreneurship using metaverse technology.

4. Identify the challenges and opportunities related to the application of digital transformation and metaverse technology in corporate entrepreneurship.

5. Provide recommendations and strategies to promote entrepreneurship using digital transformation, strategic planning and metaverse technology.

Significance of the Study

Theoretical Significance

This study contributes to understanding the role of digital transformation and strategic planning in metaverse technology to promote entrepreneurship in the technology companies under study.

The study adds to theoretical knowledge about the relationship between digital transformation and strategic planning in promoting entrepreneurship under metaverse technology. Bienasz (2022) suggests that four innovations that give rise to the metaverse include virtual experiences, decentralized virtual worlds, blockchain-based digital assets, and AI-based virtual assistants. These innovations could create new pathways to entrepreneurship and business development in the metaverse. According to Boldureanu et al. (2020), entrepreneurial education through successful entrepreneurial models in higher education institutions helps prepare a new generation of entrepreneurs to navigate the opportunities offered by the metaverse. It highlights the importance of educational initiatives in promoting the entrepreneurial ideas and skills of the metaverse.

The study opens new horizons for research in the field of entrepreneurship in metaverse technology, which is currently considered the latest technology.

Practical Significance

The study equips entrepreneurs with strategies to leverage digital transformation and metaverse technology to boost their businesses.

The study assists government agencies and supporters of entrepreneurs in developing policies and programs to support metaverse entrepreneurship.

The digital entrepreneurial ecosystem includes a variety of actors, such as entrepreneurs, investors, government, universities, and supporting institutions (Purbasari et al., 2021). These multiple actors play critical roles in promoting the growth of digital platforms-based SMEs (MSMEs) (Purbasari et al., 2021). Effective interaction and coordination between these diverse entities is crucial in supporting and thriving the digital entrepreneurial ecosystem.

Importance to the Study Population

1. The study contributes to promoting entrepreneurship in Misurata in line with modern technology.

2. It contributes to the development of entrepreneurship culture and metaverse culture in technology companies in the city of Misurata.

3. It further assists in the development of a local digital transformation strategy to promote entrepreneurship in the city.

4. It helps develop training and support programs for entrepreneurs in Misurata to benefit from digital transformation.

Limitations of the Study

The limits of the study are as follows:

1. Time limits: The study was completed for the time period from 2023 to 2024.

2. Geographical boundaries: The study restricted its focus to the technology companies in the city of Misrata.

3. Methodological limits: Questionnaires were the only data collection method.

Study Hypotheses

Based on the theoretical framework, the following hypotheses were developed:

H1: There is a statistically significant relationship between digital transformation and entrepreneurship.

H2: There is a statistically significant relationship between strategic planning and entrepreneurship.

H3: There is a statistically significant relationship between digital transformation, strategic planning, and entrepreneurship.

H4: There is a statistically significant relationship between digital transformation, strategic planning, and entrepreneurship in the presence of metaverse technology.

Analysis and Construction of Study Hypotheses

The hypotheses of the study were based on previous studies that dealt with the relationship between digital transformation, strategic planning, entrepreneurship, and metaverse technology. The following discussion provides aspects that support hypothesis building:

Technology and Innovation: Digital transformation fosters innovations and digital solutions that address local and global needs, while enabling investment in ICT and strengthening digital infrastructure to promote innovation and develop startups.

Improving Global Market Access: Digital transformation can support companies in accessing global markets and expanding their operations, using digital technology and online marketing. Libyan companies can strengthen their global presence and achieve a competitive advantage.

Improving Process Efficiency and Cost Savings: Digital transformation can help improve process efficiency and achieve cost savings for Libyan companies through smart applications and digital technology.

Relying on Metaverse Technology: Companies can identify growth opportunities, improve operations, better guide strategies, and develop new products and services that meet market and customer needs more effectively. Boldureanu et al (2020) emphasize the importance of entrepreneurship education through pioneering models in higher education institutions. It demonstrates the provision of entrepreneurial programs and activities within universities that help develop students' entrepreneurial skills and traits. This enhances their ability to launch their own projects in the future that already provide metaverse technology to digital entrepreneurs (Susanti, 2023). It is constantly updated according to the needs of digital entrepreneurs. The update will provide a sense of comfort for creators to do business in the metaverse environment, hoping that the government will introduce new laws protecting digital entrepreneurs.

A survey distributed to company managers on this study shows that there are a number of key challenges facing companies in the local market. The most prominent of these challenges include:

1. Regulatory and legislative complexities hinder business operations.

2. Lack of supporting infrastructure, such as transportation and communications, affect the efficiency of corporate operations.

3. Qualified and adequately trained human resources are difficult to obtain.

On the other hand, the most promising areas for growth and expansion noted by the managers include:

1. There are opportunities in emerging new sectors such as technology and digital services.

2. Benefit from stimulus programs and government support encourage such investments.

Study Variables

Independent and Intermediate Variables

Digital Transformation: This is measured through digital infrastructure, digital operations, digital data, and digital culture.

Strategic Planning (future vision): This is measured through vision, strategy, implementation, and monitoring.

Metaverse Technology: This is measured through technological maturity, social acceptance, continuous training, and technological investment.

Dependent Variable

Entrepreneurship: This can be measured through the indicators of innovation, growth, profitability, and competition.

Research Model

The study model was developed based on the studies presented in the following figure (1):

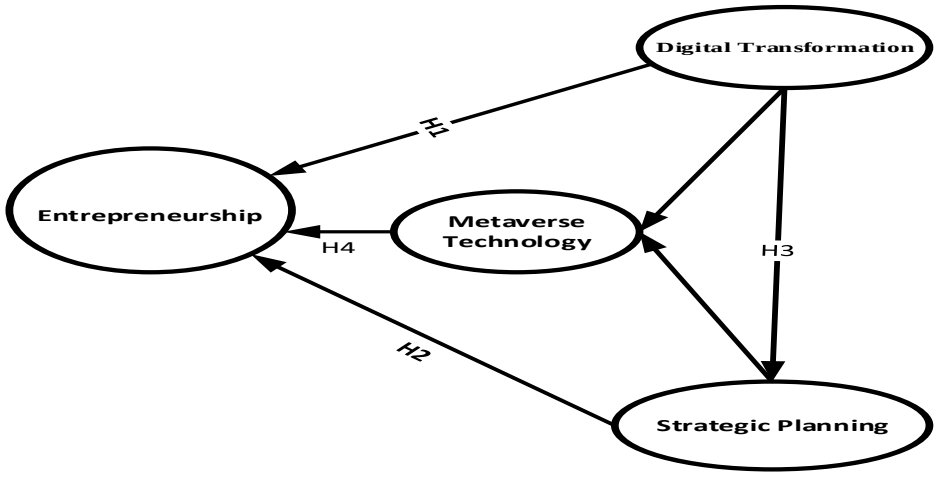

Figure (1) Study model

Previous Studies

The previous studies section is one of the most important parts of scientific research, as it provides a theoretical framework for the study. Khalifa and Zuraikat (2021) emphasized the importance of investing in ICT and strengthening digital infrastructure in Libya to stimulate innovation and develop startups.

Through reviewing relevant literature, understanding the area of interest, and staying up to date with the latest developments in the field of study.

Moreover, through reviewing relevant literature, understanding the area of interest, and staying up to date with the latest developments in the field of study, this research is following on the trends and turns in:

1. Digital Transformation and Entrepreneurship: Digital transformation refers to the process of transforming traditional business into digital businesses. This transformation includes changing the processes, systems, products and services used by companies.

1. Metaverse technology is a three-dimensional virtual environment that users can interact with using virtual reality and augmented reality devices. It has the potential to change many aspects of life. Based on the above previous studies that discussed the relationship between digital transformation, strategic planning, metaverse technology, and entrepreneurship, a summary can be presented in the following table:

Table (1) Previous Studies

Author's Name	Year	Study Title	Objectives of the study	Study variables	Results of the study
Westerman, G., Bonnet, D., & McAfee, A.	2014	Leading Digital: Turning Technology into Business Transformation	Explore how companies can achieve digital transformation and transform technology into a transformation in management and strategic work	Digital transformation, decision-making, adoption of technological innovations	Successful companies in digital transformation are characterized by the ability to make quick decisions and adopt technological innovations
Brynjolfsson, E., & McAfee, A.	2014	The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies	Explore the impact of advanced technology on the economy and labor market	Digital transformation, labor, economic development	Digital transformation is leading to dramatic changes in labor and economic development, and requires adapting businesses and individuals to these changes to thrive
Rayna, T., & Striukova, L.	2016	Effectuation and Digital Entrepreneurship: Towards a Theory of Digital Bricolage	Focusing on the relationship of influence and digital entrepreneurship It presents the idea of digital aggregation as a model for innovation and digital work	Impact, digital entrepreneurship, digital aggregation	Using and innovatively pooling available resources can effectively support digital entrepreneurship
Venkatraman, N.	2017	Digital Innovation Strategy: A Framework for Diagnosis and Anticipation	Provide a framework for discovering, diagnosing, and anticipating digital innovation strategies	Digital innovation strategies, future digital and technological transformations	Companies with the ability to diagnose future digital and technological transformations can adopt effective strategies for digital innovation and competitive edge
Teece, D. J.	2018	Business Models and Dynamic Capabilities	Research into the relationship between business models and the dynamic capabilities of companies	Business models, dynamic capabilities, performance	Companies that adopt flexible business models and are able to adapt to digital transformation perform better and are more resilient to technological changes
Chesbrough, H.	2020	Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers	Focus on the importance of developing and renewing digital business models to keep pace with digital transformation	Digital business models, innovation, competitive advantage	Companies that rely on innovative digital business models achieve competitive advantage and take advantage of growth and innovation opportunities
Osterwalder, A., & Pigneur, Y.	2022	Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers	Explore the process of developing innovative business models that are documented in the Business Model Generation book	Transforming ideas into business models, digital project success, entrepreneurship	Transforming ideas into clear and robust business models can successfully drive a digital project and foster entrepreneurship
Smith, H.	2022	The metaverse: A new frontier for business and technology	Analysis of the role of metaverse technology in entrepreneurship	Metaverse, entrepreneurship	Metaverse technology has the potential to be a powerful driver of innovation and entrepreneurship. Metaverse technology can provide new opportunities for startups to innovate in a variety of fields such as gaming, education, entertainment, e-commerce, and social commerce.

Author's Name	Year	Study Title	Objectives of the study	Study variables	Results of the study
Strickland, J.	2022	The metaverse: The future of business and society	Analysis of the impact of metaverse technology on the economy and society	Metaverse technology - economy - society	Metaverse technology has the potential to change the way we live, work, and communicate. It also has the potential to create new opportunities for innovation and entrepreneurship.
Anissa Lia Susanti, Ismail Yusuf, Nizza Nadya Rachmani	2023	Use of Metaverse for the Development of Digital Entrepreneurship in Nusameta	Analysis of the use of metaverse technology to develop digital entrepreneurship at Nusameta	Providing metaverse for digital entrepreneurs Updating the metaverse according to the needs of entrepreneurs in providing laws to protect digital entrepreneurs	- Nusameta Provides Metaverse for Digital Entrepreneurs - The metaverse is constantly updated according to the needs of entrepreneurs - Nusameta hopes to provide laws to protect digital entrepreneurs

Prepared by the researcher from the review of previous relevant studies, in which the studies are arranged chronologically from the oldest to the newest

2. Theoretical Framework of the Study

According to the previous studies and a thorough review of theories related to the variables of the study, there are some models on which the study relied, namely:

1.2 Comprehensive Digital Transformation Model: This model is used to describe and analyze the digital transformation process of organizations and countries. It includes multiple factors such as IT infrastructure, strategic directions, cultural transformation, and organizational transformation (Westerman, & McAfee, 2014).

2.2 Digital Capability Model: This model focuses on the capabilities necessary for organizations to achieve digital transformation, including the ability to adopt new technology, analyze data, develop digital innovations, and improve customer experience (Brynjolfsson, & McAfee, 2014).

3.2 Continuous Innovation Model: This model indicates the importance of adopting continuous innovation and experimentation in achieving digital transformation. This includes the ability to generate new ideas, test them quickly, and adopt successful experiences continuously (Chesbrough, 2020).

4.2 Alternative Technology Model: This model focuses on the use of alternative technology in achieving digital transformation and includes looking at innovative technologies such as artificial intelligence, metaverse, cloud computing, the Internet, and machine learning (Brynjolfsson, & McAfee, 2016).

5.2 Strategic Collaboration Model: This model indicates the importance of cooperation and partnerships in achieving digital transformation. It includes cooperation with startups, larger institutions, government, and academic agencies as well as enhanced strategic cooperation to

facilitate knowledge and resources exchange, thereby driving digital transformation (Westerman, & McAfee, 2014).

6.2 Data-driven Business Model: This model emphasizes the importance of using data as a tool to achieve digital transformation, including data collection and analysis, applying data-driven conclusions in decision-making, investing in data infrastructure, and strengthening capabilities in graphical analysis to promote digital transformation (Mayer-Schönberger, & Cukier, 2013). Among the benefits of digital transformation are improving the efficiency of operations, reducing costs, improving customer experience, and expanding market reach. Companies can transform traditional business models into models that are more adapted to the digital age, such as e-commerce, metaverse technology, and smart operation (Dholakia, & Kshetri, 2020).

3. Practical Framework of Study

1.3 Description of the Study Design

The study was designed to suit the target sample - administrators of technology companies in the city of Misurata - represented by the following companies:

1. Al Lama Information Technology Company
2. Atheel Company for Modern Technology and Communications
3. Al-Hadatha Company for Technology, Information Systems, and Consulting
4. Ibdaa Company for Information Technology
5. Enjaz Information Technology Company

2.3 Description of the Tools Used in Data Collection

1.2.3 Data collection: A questionnaire was designed to collect data on digital transformation, strategic planning, metaverse technology, and entrepreneurship in technology companies in the city of Misurata.

2.2.3 Data Analysis: Data were analyzed using SmartPLS 4 software to test the research hypotheses.

Study Sample

Administrators of technology companies in the city of Misurata were selected by the comprehensive survey method. However, out of 215 surveyed employees, only 138 questionnaires were valid for analysis.

3.2.3 Data Collection Tools: The questionnaire was designed and used as a data collection tool on digital transformation, strategic planning, metaverse technology, and entrepreneurship in technology companies in Misurata. It was distributed electronically to administrators of technology companies.

Questionnaire Design: The questionnaire included 40 items distributed over the following three variables:

10 items for digital transformation, 10 paragraphs for strategic planning, 12 paragraphs for metaverse technology, and 8 paragraphs for entrepreneurship.

3.3 Statistical Analysis of the Study: A statistical analysis method (smart. Pls) was adopted to investigate the relationship between digital transformation, strategic planning, metaverse technology, and entrepreneurship in technology companies in the city of Misurata

1.3.3 Description of the Study Sample: 138 questionnaires were obtained from administrators of technology companies in Misurata. The following table (2) shows a general description and a comprehensive survey of administrators in these companies:

Table (2) Demographic factors of the study sample

Demographic factors of the study sample		Frequency	Percentages
Gender	male	83	60.2%
	female	55	39.8%
Age	From 20 to 29 years	41	29.7%
	From 30 to 39 years	52	37.7%
	From 40 to 49 years	35	25.4%
	From 50 years and above	10	7.2%
Academic qualification	Bachelor	69	50.0%
	Master	49	35.5%
	Doctor	20	14.5%
Experience	Less than 5 years	22	15.9%
	From 5 years to less than 10 years	46	33.3%
	From 10 years to less than 15 years	35	25.4%
	15 years and above	35	25.4%
Demographic data of the study sample		138	100.0

As illustrated in the above table, it is found that 60.2% of the study participants are males, and the majority (65.1%) are between the ages of 20 and 39 years. In addition, half (50.0%) of the participants hold a bachelor's degree, and the majority (59.7%) have less than 10 years of experience.

2.3.3 Description of Statistical Methods Used in the Study

Statistical Analysis to Test Hypotheses: (smart. pls) is a statistical method that aims at interpreting the correlation coefficients that have statistical significance between various variables. That is, this analysis simplifies the correlations between the various variables. It also describes the relationship between the variables and their interpretation. In addition, factor analysis is a statistical approach to data analysis for multiple axes that are associated with one or more factors.

Validity and Stability of the Resolution

Honesty: (Validity) The validity of the questionnaire is related to the extent to which it measures what it is actually supposed to measure. This means does the questionnaire ask the correct questions to accurately obtain the required information. There are different types of honesty, two of which are relevant to this study and were relied upon:

Content validity: It measures the compatibility between the paragraphs of the questionnaire and the concept to be measured using the SMART program. PLS4.

Arbitrator's Validity: This measures the extent to which experts agree that the paragraphs of the questionnaire are appropriate to measure the structure in question.

Questionnaire Stability (Reliability): The stability of the questionnaire is related to the extent to which it measures the variables in a consistent and constant manner. There are different ways to measure the stability of the questionnaire such as Cronbach alpha stability coefficient which is considered one of the most common ways to measure the stability of the questionnaire, and depends on the variation of the questionnaire paragraphs (Field, 2023). Through the analysis of variables, it was found that the value of Cronbach alpha for the study is 0.94, indicating that the questionnaire has stability and can be relied upon to test the hypotheses.

The following diagram (2) illustrates the statements of the axes to which they belong

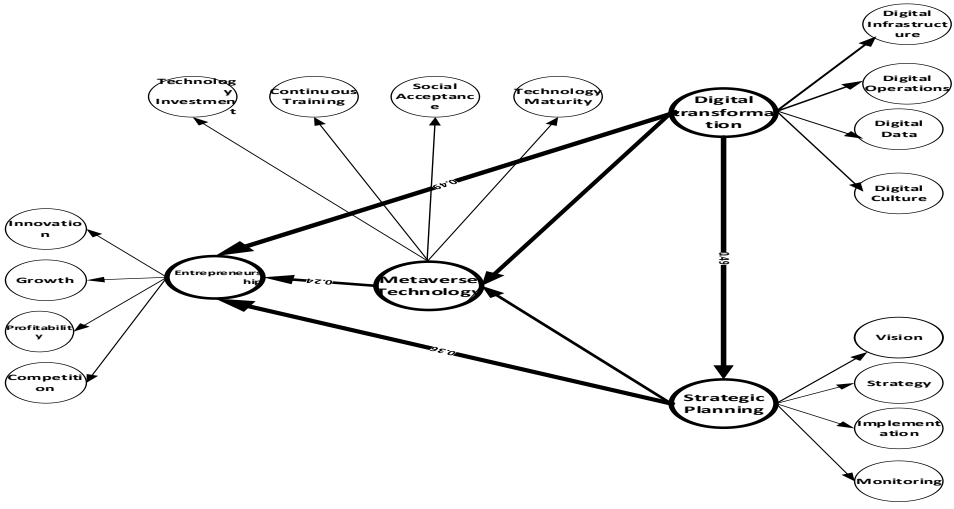

Figure (2) Studying the phrases of the axes to which they belong

In view of the questionnaire items, some statements that did not reach the required value of 0.70 were excluded from the statistical analysis using smart.pls. Then, the statement that represent the axis that can be relied upon were extracted, so that the questions (phrases) are close and similar to the axis to which they belong. As for the axes of the variables, all were within the required range.

1- Reliability of the individual element (0.70>) Factor loadings.

2. Composite reliability (0.70>). Composite reliability

3- Average variation extracted (50.0 >). Average Variance Extracted

Statistical Analysis to Find out the Divergence and Dissonance of Different Questions from each other: Discriminate validity consists of two tests; namely Cross Loading and Variable Correlation - Root square of AV any process of checking whether the variables are overlapping with each other. The variables must be different from each other through empirical criteria.

4.3 Analysis of digital transformation variables, strategic planning and metaverse

Table(3) Analysis of the paragraphs of the questionnaire variables

Variables		Paragraphs	Arithmetic mean	Standard deviation	General direction
Digital Transformation	Infrastructure	An integrated IT system is available.	4.3	0.6	Degree
		There is a significant investment in information technology.	4.3	0.6	Degree
		There is a strong digital infrastructure for digital transformation.	4.3	0.6	Degree
	Operations	We have digital business processes.	4.2	0.7	Degree
		We use digital technology to improve our operations.	4.2	0.7	Degree
		We have a digital strategy for business operations.	4.2	0.7	Degree
	Data	We collect and use digital data to make decisions.	4.1	0.8	Degree
		We have a digital data culture in our company.	2	0.9	Disagree
		We have an efficient data management system.	4.1	0.8	Degree
	Digital Culture	We have a positive digital culture.	2.6	0.9	Disagree
		We support digital innovation.	2.2	0.9	Disagree
		We recognize the importance of digital transformation.	1.8	0.9	Disagree
Strategic Planning	Vision	We have a clear vision for the future of entrepreneurship in our company.	4.4	0.5	Degree
		We believe in the importance of entrepreneurship in our company.	4.3	0.6	Degree
		We support innovation and entrepreneurship in our company.	4.3	0.6	Degree
	Strategy	We have a clear strategy to promote entrepreneurship .	4.3	0.6	Degree
		We have a specific action plan for the implementation of the strategy.	4.3	0.6	Degree
		We monitor and evaluate the entrepreneurial performance of our company.	4.2	0.7	Degree
	Implementation	We have sufficient resources to implement the strategy.	4.2	0.7	Degree
		We train employees on entrepreneurship.	4.2	0.7	Degree
		We create a supportive environment for entrepreneurship.	4.2	0.7	Degree
	Monitoring	We have an effective monitoring system for entrepreneurial performance.	4.1	0.8	Degree
		We conduct periodic evaluation of entrepreneurial performance.	4.1	0.8	Degree
		We take corrective action to improve entrepreneurial performance.	4.1	0.8	Degree
Metaverse Technology	Technological maturity	We are well aware of the possibilities of metaverse technology.	3.9	0.6	Degree
		We are able to use the metaverse technology efficiently.	2.3	0.4	Disagree
		We are able to develop new ideas on how to use the metaverse technique.	2.4	0.5	Disagree
	Social acceptance	There is a willingness to accept the metaverse technique.	3.6	0.9	Degree
		The metaverse can contribute to social and economic development.	3.7	0.9	Degree
		The metaverse can help solve some social problems.	3.9	0.8	Degree
	Training	Libyan companies provide adequate training on metaverse technology.	1.6	1.1	Disagree

Variables		Paragraphs	Arithmetic mean	Standard deviation	General direction
		We would like to get metaverse training.	3.9	0.6	Degree
		We see training for the metaverse as financially expensive.	3.8	0.8	Degree
	Investing through the metaverse	We have the opportunity to successfully invest in metaverse technology.	4.1	0.8	Degree
		Investing in metaverse technology is an investment of time.	3.9	0.7	Degree
		We see that there are high profits from investing in metaverse technology.	3.8	0.8	Degree

Based on the arithmetic mean and standard deviation of the paragraphs of the questionnaire variables in the table above, the following can be concluded:

Digital Transformation Variable

Infrastructure: The tech companies in Misurata have a strong digital infrastructure, with the three infrastructure-related paragraphs receiving an arithmetic average of 4.3, which is above the minimum approval (3.5).

Digital operations: The tech companies in Misurata have good digital business operations, with the three paragraphs related to operations having an arithmetic average of 4.2, which is above the minimum approval threshold.

Digital data: The tech companies in Misurata have a weak data culture, with the paragraph "We have a digital data culture" scoring an arithmetic average of 2, which is below the minimum approval threshold.

Digital literacy: The tech companies in Misurata have a weak digital culture and support for innovation, with the three paragraphs related to digital culture having an arithmetic average of 2.6, 2.2, and 1.8, respectively, all below the minimum approval threshold.

Variable Strategic Planning

Vision: The tech companies in Misurata have a clear vision for the future of entrepreneurship, with vision-related paragraphs having an arithmetic average of 4.4, 4.3, and 4.3, which is higher than the minimum approval threshold.

Strategy: The tech companies in Misurata have a clear strategy promoting entrepreneurship, with the three paragraphs related to the strategy receiving an arithmetic average of 4.3, which is above the minimum approval threshold.

Implementation: The tech companies in Misurata have the potential to implement the strategy, with the three implementation-related paragraphs receiving an arithmetic average of 4.2, which is above the minimum approval threshold.

Monitoring: The tech companies in Misurata have an effective system for monitoring entrepreneurship performance, with the three monitoring paragraphs receiving an arithmetic average of 4.1, which is above the minimum approval threshold.

Variable Metaverse Technology

Technological maturity: As illustrated in the table, it is found that the participants are well aware of the potential of the metaverse technology with an average of 3.9, which indicates a high level of agreement. However, they do not agree about their ability to use the metaverse technology efficiently and develop new ideas on how to use it, as they were evaluated with averages of 2.3 and 2.4, respectively.

Social acceptance: Participants believe that the Libyan society is ready to accept metaverse technology with an average of 3.6, indicating a moderate level of agreement. They also believe that metaverse technology can contribute to social and economic development with an average of 3.7. They further believe it can help solve some social problems scoring an average of 3.9.

Training: Participants do not agree that Libyan companies provide adequate training on metaverse technology scoring an average of 1.6, indicating a weak agreement on this aspect. However, they express their desire to obtain training opportunities on metaverse technology with an average of 3.9. They further believe that training can be financially profitable with an average of 3.8.

Investing through the metaverse: Participants believe that Libyan companies have an opportunity to successfully invest in metaverse technology with an average score of 4.1. They also believe that investing in it as an investment of time; this statement realized an average score of 3.9.

5.3 Variable paragraph analysis: Entrepreneurship

Table (4) Analysis of Entrepreneurship Paragraphs

Variables		Paragraphs	Arithmetic mean	Standard deviation	General direction
Entrepreneurship performance	Innovation	We have a proven track record of innovation.	4.2	0.7	Degree
		We launch new products and services on a regular basis.	4.2	0.7	Degree
		We apply new technologies in our business.	4.2	0.7	Degree
	Growth	We grow in the market continuously.	4.1	0.8	Degree
		We achieve an increase in sales and profits.	4.1	0.8	Degree
		We are expanding into new markets.	4.1	0.8	Degree
	Profitability	We have good profit margins.	2.3	0.9	Disagree
		We make enough profits to cover costs.	2.4	0.9	Disagree
		We invest in future growth.	2.4	0.9	Disagree
	Competition	We are competitive with other companies.	4.4	0.5	Degree
		We have a competitive advantage.	4.4	0.5	Degree
		We grow higher than other companies in the market.	4.4	0.5	Degree

From the table, it is found that the axes of the entrepreneurial variable are as follows:

Innovation: From the answers, the three paragraphs related to innovation received an arithmetic average of 4.2, which is above the minimum approval threshold.

Growth: The three paragraphs related to growth received an arithmetic average of 4.1, which is above the minimum approval threshold.

Profitability: The three paragraphs on profitability had an arithmetic average of 2.3, 2.4 and 4 respectively, all below the minimum approval threshold.

Competition: The three paragraphs related to competition had an arithmetic average of 4.4 each, which is higher than the minimum approval threshold.

6.3 Statistical results of the analysis of the impact of digital transformation, strategic planning, and metaverse technology on entrepreneurship

Table (5) Analysis of the components of digital transformation, strategic planning, metaverse technology, and entrepreneurship

Variables	Dimensions of variables	loading	AVE	CR	influence
Digital Transformation	Infrastructure	0.6	0.5	0.6	Weak
	Operations	0.7	0.5	0.7	strong
	Data	0.8	0.5	0.8	Strong
	Cultural	0.9	0.5	0.9	Strong
Strategic Planning	Vision	0.8	0.5	0.8	Strong
	Strategy	0.7	0.5	0.7	Strong
	Implementation	0.6	0.5	0.6	Weak
	Monitoring	0.8	0.5	0.8	Strong
Metaverse Technology	Technological maturity	0.6	0.5	0.6	Weak
	Social acceptance	0.6	0.5	0.6	Weak
	Training	0.6	0.5	0.6	Weak
	Investment	0.6	0.5	0.6	Weak
Entrepreneurship	Innovation	0.7	0.5	0.7	Strong
	Growth	0.8	0.5	0.8	Strong
	Profitability	0.8	0.5	0.8	Strong
	Competition	0.8	0.5	0.8	Strong

Prepared by the researcher from the data outputs of the 4smart.pls program

The above table (5) indicates the following:

Digital transformation: Data reveal that infrastructure has little impact, while operations, data, and culture have a strong impact on digital transformation.

Strategic planning: It is noted that vision, strategy, and monitoring are significant dimensions strongly affecting strategic planning, while the impact of implementation is weak.

Metaverse technology: We find that technological maturity, social acceptance, training and investment are all weak dimensions that weakly affect metaverse technology.

Entrepreneurship: Innovation, growth, profitability and competition are all powerful dimensions that strongly affect entrepreneurship.

7.3 Results of regression analysis of the impact of digital transformation dimensions and strategic planning on entrepreneurship performance

Table (6) The strength of the correlation of independent variables with entrepreneurial performance

Independent variable	R	R2
Infrastructure	0.60	0.36
Operations	0.70	0.49
Data	0.80	0.64
Cultural	0.90	0.81
Vision	0.80	0.64
Strategy	0.70	0.49
Implementation	-0.60	0.36
Monitoring	0.80	0.64
Innovation	0.70	0.49
Growth	0.80	0.64
Profitability	0.80	0.64
Competition	0.80	0.64

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Based on the results of the above table (6), the following conclusions can be drawn:

All dimensions of digital transformation have a positive impact on entrepreneurship performance, as the values of the correlation coefficient (R) range between 0.60 and 0.90. Furthermore, all dimensions of strategic planning have a positive impact on entrepreneurship, where the values of the correlation coefficient (R) range between 0.70 and 0.80. Innovation, growth, profitability, and competition are the indicators of entrepreneurship performance that are positively affected by the dimensions of digital transformation and strategic planning.

8.3 The impact of digital transformation and strategic planning on entrepreneurship

Table (7) Results of the relationship between variables

Result	R2	R	Independent variable
positive	0.49	0.70	Digital Transformation
positive	0.36	0.60	Strategic Planning
positive	0.49	0.70	Entrepreneurship Performance

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Table (7) above illustrates the results of the regression analysis of the impact of digital transformation and strategic planning on entrepreneurship.

The correlation coefficient refers to the strength of the relationship between the independent variable and the dependent variable, where the correlation coefficient ranges from 0 to 1. The closer the correlation coefficient is to 1, the stronger the relationship between the two variables.

The coefficient of determination (R2) refers to the amount of variation in the dependent variable that can be explained by the independent variable, where the coefficient of determination ranges

between 0 and 1. The closer the coefficient of determination is to 1, the greater the amount of variance in the dependent variable that can be explained by the independent variable. Based on the obtained results in table (7), it can be concluded that:

The most significant impact is digital transformation, followed by strategic planning.

9.3 Calculation of the size of the effect between variables

To test hypotheses and calculate the size of the effect, refer to the following table:

Table (8) Size of the effect between variables

The Relationship between the Studied Variables	SSO	SSE	Q2	Predictability
Digital Transformation and Strategic Planning	0.70	0.30	0.49	Strong
Digital Transformation and Entrepreneurship	0.70	0.30	0.49	Strong
Strategic Planning and Entrepreneurship	0.49	0.51	0.24	medium

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Digital transformation and strategic planning: There is a strong correlation between the two variables, with an impact size of 0.70, indicating that 49% of the variation in strategic planning can be explained by digital transformation.

Digital transformation and entrepreneurship: There is also a strong correlation between the two variables, with the impact size reaching 0.70, implying that 49% of the variation in entrepreneurship can be explained by digital transformation.

Strategic planning and entrepreneurship: There is an average relationship between the two variables, where the impact size was 0.49, indicating that 24% of the variation in entrepreneurship is explained by strategic planning.

10.3 Study of the intermediate variable

Table 9 Calculation of the effect of the median variable in the study

	IV- -> Mediator	Mediator --> DV	Automatic calculation	Standard deviation	Automatic calculation	Bootstrapped Confidence Interval	
	Path a	Path b	Indirect Effect	SE	t-value	95% LL	95% UL
M1	0.36	0.81	0.63	0.1	6.300	0.434	0.826
M2	0.4	0.5	0.49	0.1	4.900	0.294	0.686

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M1: Variable Intermediate Strategic Planning

M2: Intermediate variable metaverse technology

The table shows the results of the intermediate effects analysis conducted on the following variables:

Grade 1: Independent Variable (IV) Digital Transformation, Intermediate Variable (M1) Strategic Planning, and Dependent Variable (DV) Entrepreneurship

Grade 2: Independent Variable (IV) Digital Transformation and Strategic Planning, Intermediate Variable (M2), Metaverse Technology, and Dependent Variable (DV) Entrepreneurship

The impact strength the two intermediate variables (M1 and M2) on the dependent variable (DV) can be compared. The impact strength is estimated based on the Indirect Effect value and the SE value (Standard Error).

In the first row: The indirect effect value of M1 on the DV is 0.63 and the SE value is 0.1.

In the second row: The indirect effect value of M2 on the DV is 0.49 and the SE value is 0.1.

Based on these values, it can be said that the intermediate variable (M1), strategic planning, has a stronger impact on the dependent variable (DV), entrepreneurship, compared to the intermediate variable (M2), metaverse technology. The strength of the impact was measured based on the value of the indirect effect, where the greater value indicates the strongest impact.

4. Results

1.4 Results of the statistical analysis of the study:

Through the analysis of the paragraphs of the questionnaire and axes of the variables, the following results were reached:

1. Companies recognize the importance of digital transformation, entrepreneurship, and metaverse. However, they need to improve their technological maturity and metaverse training.

2. There is a direct impact of digital transformation in entrepreneurship of 0.3 which indicates a statistically significant relationship between digital transformation and entrepreneurship.

3. The direct impact of strategic planning on entrepreneurship is 0.2, which means that there is a statistically significant relationship between strategic planning and entrepreneurship.

4. Through strategic planning, the indirect impact of digital transformation on entrepreneurship is 0.63. This indicates a statistically significant relationship between digital transformation, strategic planning, and entrepreneurship.

5. Digital transformation and strategic planning have a positive impact on entrepreneurship.

6. The indirect impact of digital transformation on entrepreneurship through metaverse technology is 0.49, indicating a statistically significant relationship between digital transformation, strategic planning, and entrepreneurship in the presence of metaverse technology.

7. Digital transformation and strategic planning have a positive impact on entrepreneurship with metaverse technology.

2.4 Interpretation of Results

An interpretation of the findings mentioned in the statistical analysis can be developed. Findings indicate a statistically significant relationship between digital transformation, entrepreneurship, and strategic planning. In addition, they reveal a positive impact of digital transformation and strategic planning on entrepreneurship performance.

The findings also highlight the importance of companies being aware of the significance of digital transformation, metaverse, and entrepreneurship, but they need to improve their technological maturity and metaverse training.

As for the indirect impact of digital transformation on entrepreneurship through strategic planning and metaverse technology, the study indicates a statistically significant relationship between these variables, suggesting that digital transformation can positively impact entrepreneurship by improving strategic planning and the use of metaverse technology.

3.4 Discussion of the results in relation to the previous studies:

4.3.1 Differences between the Study and Previous Studies and the Recent Addition to the Study

Timeframe: The current study focuses on digital transformation, entrepreneurship, strategic planning, and the presence of metaverse technology in technology companies in Misurata, while previous studies focus on digital transformation and entrepreneurship in general.

Geographic region: The current study focuses on technology companies in the city of Misurata, while previous studies focus on companies from other countries.

Study population and sample: The current study elected data from administrators in technology companies, while previous studies rely on samples of companies from different countries.

Methodology: The current study adopts a descriptive analytical approach, while previous studies use a variety of research approaches.

Adding the study and then studying the metamorphosis technique, which is one of the modern scientific additions to entrepreneurship.

4.3.2 Similarities between the study and previous studies

The Westerman and McAfee (2014) study agrees with the current study in that digital transformation requires companies to be flexible and able to adapt to technological changes.

Brynjolfsson and McAfee (2014) study agree with the current study in that digital transformation creates new opportunities for entrepreneurship, but also requires companies to be able to adapt to these changes. Furthermore, the Chesbrough (2020) study agrees with this study in that digital transformation requires companies to develop new and flexible business models that can keep pace with technological changes.

Teece (2018) study is in lines with the current study in that digital transformation requires companies to be able to develop flexible business models capable of adapting to change. Osterwalder and Pigneur (2022) study agrees with the current study in that digital transformation requires companies to be able to develop clear and actionable business models.

Rayna and Striukova (2016) study is in accordance with the current study in that digital transformation can create new opportunities for innovation and entrepreneurship by repooling available resources.

The results of the current study are consistent with the that of the previous studies (Smith, 2022; Strickland, 2022). In fact, metaverse technology has the potential to be a powerful driver of innovation and entrepreneurship by providing new opportunities for startups to innovate.

3.3.4 Discussion on the Research Questions in Relation to the Findings of the Study

The research results offer reasonable answers to the study questions. These are outlined as follows:

First question: What is the relationship between digital transformation and entrepreneurship?

The results obtained indicate a positive relationship between digital transformation and entrepreneurship in the companies under study. The study found that companies recognize the importance of digital transformation and entrepreneurship, and that digital transformation has a direct impact on entrepreneurship.

Second question: What is the relationship between digital transformation and strategic planning in entrepreneurship under metaverse technology?

The results obtained indicate a positive relationship between digital transformation and strategic planning in entrepreneurship under metaverse technology. It concluded that digital transformation can help companies develop strategic planning capabilities, which are crucial for succeeding in the metaverse technology environment. Moreover, the study found that there is an indirect impact of digital transformation on entrepreneurship through strategic planning.

Third question: What is the role of metaverse technology in promoting entrepreneurship in the companies under study?

The results obtained indicate that metaverse technology has the potential to be a powerful driver for promoting entrepreneurship, as it was found that it can provide new opportunities for companies to innovate. Moreover, it was found that there is an indirect impact of digital transformation on entrepreneurship through metaverse technology.

5. Recommendations

Based on the findings and conclusions the following recommendations are offered:

Improving the level of technological maturity:

Guide companies to modernize their systems and IT architecture to support digital transformation and entrepreneurship.

Provide training and workshops for employees to learn and acquire the technical skills required for metaverse technology and digital transformation.

Enhancing Strategic Planning:

Encourage companies to develop robust and appropriate strategic plans focused on digital transformation and entrepreneurship.

Enhance communication and interaction between the company's people to enhance strategic planning and achieve entrepreneurial goals.

Use the metaverse technique effectively:

Direct companies to adopt and use metaverse technology as a strategic tool in data analysis and strategic decision-making.

Provide the required support and training for employees to understand and use metaverse technology effectively in an entrepreneurial context.

Enhancing the interaction between digital transformation and strategic planning:

Encourage companies to closely link digital transformation and strategic planning to make the most of their relationship.

Guiding companies to implement entrepreneurship strategies based on interconnected digital transformation and strategic planning.

Leveraging digital transformation and strategic planning in improving entrepreneurship performance:

Encourage companies to use digital transformation and strategic planning as tools to improve performance and achieve success in entrepreneurship.

Provide support and resources for companies to effectively implement digital transformation strategies and strategic planning.

6. Future recommendations

Driving digital transformation:

Develop integrated strategies for digital transformation in companies.

Invest in IT and digital transformation to drive efficiency and innovation.

Develop a culture open to change and innovation and foster continuous learning.

Skills Development and Education:

Direct investment in education and training to develop digital and technological skills.

Promote lifelong learning and provide opportunities for continuing education and professional development.

Strengthening cooperation and partnerships:

Encourage cooperation between the public and private sectors to exchange knowledge and experiences.

Foster cross-sectoral partnerships to promote digital transformation and innovation.

Investment Guidance:

Direct investment in R&D and innovation in priority areas.

Support startups, innovate and foster an innovative business environment.

7. Conclusion

The current study represents a starting point for future studies on digital transformation and entrepreneurship in light of strategic planning and metaverse technology. It concludes that the trend towards digital transformation and entrepreneurship is increasingly important in the modern world. Hence, it is crucial for Libyan companies to be attentive to global developments and leverage digital transformation opportunities to strengthen and develop their economy.

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