

**The Reality of Digital Transformation in Developing a Proposed Artificial
Intelligence–Based Model and Its Impact on Scientific Research for
Postgraduate Students at Sirte University**

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المستخلص:

هدفت هذه الدراسة إلكشفواقع التحول الرقمي في تطوير نموذج مقترح قائم على الذكاء الاصطناعي واثره في البحث العلمي لطلاب الدراسات العليا بجامعة سرت. استخدمت الدراسة المنهج شبه التجريبي بتصميم المجموعتين الضابطة والتجريبية، حيث تكونت عينة الدراسة من (30) طالباً تم توزيعهم إلى مجموعتين: المجموعة الضابطة (15) طالباً بحثوا بالطريقة التقليدية، والمجموعة التجريبية (15) طالباً بحثوا باستخدام النموذج المقترح القائم على تقنية ChatGPT. تمثلت أدوات الدراسة في النموذج المقترح القائم على ChatGPT، واختبار مهارات البحث العلمي، وبطاقة ملاحظة لقياس الأداء العملي للطلاب، الى جانب ذلك تم استخدام المنهج الوصفي التحليلي، مع الاعتماد على استبيانات وزعت على عينة عشوائية مكونة وزعت على طلاب الدراسات العليا وبلغ عددهم 30 طالباً تم تحليل البيانات باستخدام برنامج SPSS، أظهرت نتائج الدراسة وجود فروق ذات دلالة إحصائية لصالح المجموعة التجريبية في اختبار مهارات البحث العلمي وبطاقة الملاحظة، مما يشير إلى فاعلية النموذج المقترح في تنمية مهارات البحث العلمي. كما أظهرت النتائج تحسناً ملحوظاً في قدرة الطلاب على كتابة البحث العلمي. أوصت الدراسة بضرورة التحول الرقمي و تبني النماذج القائمة على الذكاء الاصطناعي في كتابة البحث العلمي، وتدريب أعضاء هيئة التدريس القائمين على تدريس طلاب الدراسات العليا على استخدام هذه التقنيات، وتطوير البحث العلمي لتتماشى مع متطلبات العصر الرقمي.

الكلمات المفتاحية:الواقع، التحول الرقمي، الذكاء الاصطناعي، ChatGPT، مهارات البحث العلمي .

Abstract:

This study aimed to detect investigate the reality of digital transformation in developing a proposed artificial intelligence–based model and its impact on

scientific research among postgraduate students at Sirte University. The study employed a quasi-experimental approach using a control and experimental group design. The study sample consisted of (30) students who were divided into two groups: a control group (15 students) who conducted research using traditional methods, and an experimental group (15 students) who conducted research using the proposed model based on ChatGPT technology. The study instruments included the proposed ChatGPT-based model, a scientific research skills test, and an observation checklist to measure students. In addition, the descriptive-analytical method was used, relying on questionnaires distributed to a random sample of postgraduate students. The sample consisted of 30 students. The data were analyzed using the SPSS program. The results revealed statistically significant differences in favor of the experimental group in both the scientific research skills test and the observation checklist, indicating the effectiveness of the proposed model in developing scientific research skills.

The findings also showed a noticeable improvement in students' ability to write scientific research. The study recommended the necessity of digital transformation and the adoption of artificial intelligence-based models in scientific research writing, training faculty members who teach postgraduate students on using these technologies, and developing scientific research practices to keep pace with the requirements of the digital age.

Keywords: Reality, Digital Transformation, Artificial Intelligence, ChatGPT, Scientific Research Skills.

Introduction:

Humanity today is witnessing a genuine technological revolution that is accelerating at an unprecedented pace, driven by digital transformation and artificial intelligence across all aspects of life, particularly in the field of education, which is considered the fundamental pillar for building advanced societies. In this context, scientific research skills emerge as one of the core skills of the twenty-first century. Recent studies indicate that the use of artificial intelligence in scientific research among graduate students has been relatively high; however, students' awareness of the full potential

and capabilities of these technologies remains limited. (Maharreq 2024). Generative artificial intelligence technologies, foremost among them ChatGPT, represent a qualitative shift in education in general and in learning scientific research in particular. In addition, other studies have emphasized the necessity of establishing clear regulatory and ethical frameworks to govern the use of artificial intelligence in scientific research in order to preserve academic integrity and research credibility. Boudisi (2025).

Statement of the Problem:

Educational institutions face multiple challenges in the field of scientific research, particularly in teaching and writing scientific research, which is considered one of the most complex and difficult subjects for students. These challenges are not limited to the local educational environment but extend to educational institutions worldwide. At Sirte University, especially at the postgraduate level, several indicators reveal the existence of problems in scientific research writing that require innovative and effective solutions. Based on the above, the problem of the study is formulated in the following main: What is the reality of digital transformation in the effectiveness of the proposed artificial intelligence–based model in developing scientific research skills among postgraduate students at Sirte University?

From this main question, the following sub-questions arise:

1. What are the components of the proposed artificial intelligence–based model for developing scientific research skills?
2. What is the effect of applying the proposed model on improving students' scientific research writing skills?
3. What is the effect of applying the proposed model on developing students' research problem-solving skills?
4. What is the level of students' satisfaction with using the proposed model in learning scientific research writing?

Objectives of the Study:

This study seeks to achieve a set of main and subsidiary objectives that collectively aim to develop and measure the effectiveness of a proposed artificial intelligence–based model in developing scientific research skills. These objectives are as follows:

Main Objective: To investigate the reality of digital transformation in developing a proposed artificial intelligence–based model and to measure its effectiveness in developing scientific research skills among postgraduate students at Sirte University.

From this main objective, the following sub-objectives are derived:

1. To design and develop an integrated educational model that utilizes artificial intelligence technologies, specifically ChatGPT, in learning scientific research writing.
2. To measure the impact of the proposed model on improving scientific research writing skills among postgraduate students.
3. To determine the extent to which the proposed model contributes to the development of research problem-solving skills and logical thinking.
4. To explore the effect of the proposed model on students' motivation to learn scientific research writing and their level of satisfaction with the learning process.
5. To provide practical recommendations for applying artificial intelligence–based models in learning scientific research writing at universities.

Significance of the Study:

This study highlights the critical role of digital transformation and artificial intelligence tools in advancing scientific research by collection and analysis and improving the accuracy and reliability of research outcomes. It also monostearates how AL-driven technologies support informed scientific decision-making and increase researchers' productivity, Moreover, the study aligns with contributes to improving the quality of academic research within higher education institutions(UNESCO 2023).

The results of this study can assist decision-makers in educational institutions in making evidence-based decisions regarding investment in artificial intelligence technologies and the development of educational programs, as well as in designing intelligent learning environments that effectively support the learning of scientific research.

Delimitations of the Study:

1- Human Delimitations:The study is applied to postgraduate students at Sirte University. A sample consisting of (30) students was selected and distributed into two groups.

2-Spatial Delimitations:The study is confined to postgraduate students at Sirte University, which may affect the generalizability of the results to other educational institutions with different characteristics.

3-Temporal Delimitations:The study was conducted during the Fall semester of the academic year (2025–2026). The implementation period lasted four weeks, indicating that the results reflect the short-term impact of the proposed model.

4-Technical Delimitations:The study relies on ChatGPT technology as the basis of the proposed model. The results may differ if other artificial intelligence technologies or different versions of the same technology are used.

Operational Definitions of Terms:

1.Reality:Reality refers to everything related to people's lives across various fields. In this sense, it includes customs, traditions, perceptions, behaviors, livelihoods, ways of thinking, and other forms and patterns of life (Mohammed Al-Dardari, 2020).

2.Digital Transformation:Digital transformation is the process through which an institution integrates digital technologies into all areas of its operations, fundamentally changing how the institution delivers value to its stakeholders or customers (Muaytiqa Al-Gaoud, 2025).

3.Artificial Intelligence:In this study, artificial intelligence is defined as a set of technologies and algorithms that enable machines to simulate human cognitive abilities such as learning, thinking, and understanding, (Asr, 2023).

4.ChatGPT:ChatGPT is an interactive artificial intelligence model developed by OpenAI. It is based on natural language processing technology and is capable of understanding and responding to text in an intelligent and logical manner. In this study, ChatGPT is used as an educational assistant to provide explanations and support in learning and writing scientific research(www.ibm.com).

5. Scientific Research Skills: Scientific research skills are operationally defined in this study as a set of applied abilities and knowledge that students need to write successful research papers. (www.mawdoo3.com).

Previous Studies:

1. Al-Kabeer and Yassin (2023):The study conducted by Al-Kabeer and Yassin (2023) aimed to analyze the reality of using artificial intelligence tools in scientific research, with a particular focus on highlighting the most important applications that researchers and faculty members can benefit from across the various stages of the research process. The findings revealed that the use of artificial intelligence tools significantly contributes to enhancing researchers' efficiency, improving the quality of scientific output, and reducing the time and effort required to carry out different research activities, including searching for academic sources, data analysis, and information organization.

2. Badoukh and Metrouf (2024):The study by Badoukh and Metrouf (2024) sought to examine the current status of using artificial intelligence tools in scientific research within Moroccan universities, identify the level of adoption of these tools by researchers, and determine the major challenges hindering their effective use. The results indicated that the utilization of artificial intelligence tools in scientific research is still in its early stages, despite the presence of positive attitudes among researchers toward adopting such technologies. Furthermore, the findings demonstrated that artificial intelligence contributes to the development of scientific research skills, particularly in data analysis, reference management, and academic writing processes. The study recommended the integration of artificial intelligence tools into university training programs to enhance researchers' competencies and promote their effective and ethical use in scientific research.

3. Curriculum & Instruction Department (2024):ChatGPT is characterized by its ability to understand context and interact naturally with users, making it an ideal tool for use in research. It can provide detailed explanations, practical examples, problem-solving support, and interactive responses to inquiries in a useful and engaging manner.

Research Methodology:

1. Research Design: The study adopted a quasi-experimental method using a control group and an experimental group design, and the descriptive-analytical approach. The descriptive aspect was used to diagnose the reality of digital transformation and the use of artificial intelligence in scientific research, while the analytical aspect was employed to examine the effect of the proposed model on developing scientific research skills.

2. Study Population: The study population consisted of all postgraduate students at Sirte University across its various faculties, due to their direct involvement in scientific research requirements and the use of digital technologies in preparing academic theses.

3. Study Sample: The study sample was selected using a purposive sampling method, to which the proposed ChatGPT-based model was applied, and another sample was selected using simple random sampling. A questionnaire was distributed to this sample, which consisted of (30) male and female postgraduate students from different colleges at the University of Sirte, ensuring an acceptable level of academic diversity.

4. Study Instrument: The study relied on a validated questionnaire as the primary data collection instrument. The questionnaire consisted of two main sections:

1. Demographic Data: (gender, faculty, academic level, age).

2. Study Variable Dimensions:

- First dimension: Infrastructure for the use of digital transformation in the educational process.
- Second dimension: Digital transformation in the educational process.
- Third dimension: Digital transformation in the scientific research process.
- Fourth dimension: Digital transformation and digital security efficiency in the educational process.
- Fifth dimension: Senior management support.

Data Analysis, Hypothesis Testing, and Presentation of Results

Methods and Procedures:

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS). Numerical coding was applied to encode the responses of the study sample. This coding scheme was prepared as illustrated in the corresponding table(3–1).

Table (3–1) illustrates the coding of responses of the study sample members.

| Response | Disagree | Neutral | Agree |
|----------|----------|---------|-------|
| Code | 1 | 2 | 3 |

A five-point Likert scale was used, ranging from Strongly Disagree to Strongly Agree. To calculate the length of the Likert scale categories, the range was calculated ($3 - 1 = 2$) and divided by the number of scale categories, resulting in a cell length of ($2 \div 3 = 0.67$). This value was added to the minimum scale value (1) to determine the upper limit of each category. Table (3–2) illustrates the cell lengths according to this calculation.

Table (3–2): Cell Lengths of the Study Scale According to the Likert Scale and Level of Importance

| Range | Scale Category | Level of Importance |
|-----------------------------|----------------|---------------------|
| From 1.00 to less than 1.67 | Disagree | Low |
| From 1.67 to less than 2.34 | Neutral | Moderate |
| From 2.34 to 3.00 | Agree | High |

Validity and Reliability of the Study Instrument

To ensure the validity of the study questionnaire titled “The Reality of Digital Transformation in Developing a Proposed Artificial Intelligence–Based Model and Its Impact on Scientific Research among Postgraduate Students at Sirte University”, the researcher relied on the following procedures:

1. Face Validity (Expert Judgment Validity)

Face validity refers to the extent to which the study instrument measures what it is intended to measure, in terms of the relevance of the statements to the study topic and the clarity of their wording. To verify this, the questionnaire in its initial form was presented to a group of experts from local universities, who were asked to provide their opinions regarding the clarity of the items, their relevance to the corresponding dimensions, and their adequacy in covering the study variables. Their observations and suggestions contributed to improving the instrument, as necessary modifications were made, including deleting, rephrasing, or adding some items to enhance the questionnaire's validity.

2. Cronbach's Alpha Reliability Test

Reliability refers to the consistency of results obtained when the questionnaire is administered more than once to the same sample under similar conditions. Most scientific research agrees that a Cronbach's alpha coefficient greater than (0.70) indicates acceptable reliability for the questionnaire as a whole, for each dimension, or for individual items (Nunnally & Bernstein, 1994, pp. 264–265).

The results shown in Table (3–3) indicate that the study instrument has a high level of reliability, meaning it provides consistent and dependable data when applied to the study sample. Accordingly, it can be confidently used to measure the reality of digital transformation in developing a proposed artificial intelligence–based model and its impact on scientific research among postgraduate students at Sirte University.

Table (3–3): Cronbach's Alpha Coefficients for Internal Consistency of the Questionnaire Dimensions

| No. | Dimension | Items | Cronbach's Alpha |
|-----|---|-------|------------------|
| 1 | First dimension: Infrastructure for digital transformation in the educational process | 5 | 0.970 |
| 2 | Second dimension: Impact of digital transformation on | 5 | 0.984 |

| | | | |
|-------------|---|----|--------------|
| | the learning process | | |
| 3 | Third dimension: Impact of digital transformation on the scientific research process | 5 | 0.988 |
| 4 | Fourth dimension: Impact of digital transformation and digital security efficiency in the educational process | 5 | 0.980 |
| 5 | Fifth dimension: Impact of digital transformation on senior management support | 5 | 0.982 |
| Total scale | | 25 | 0.996 |

Source: Prepared by the researcher using SPSS

The results in Table (3–3) show that Cronbach’s alpha coefficients for all questionnaire dimensions ranged between (0.970) and (0.988), while the overall scale reliability reached (0.996), which exceeds the acceptable threshold of (0.70). This indicates that the questionnaire has a high level of reliability and strong internal consistency, ensuring dependable results when reapplied to the same sample. Therefore, it can be confidently relied upon to measure the reality of digital transformation in developing a proposed artificial intelligence–based model and its impact on scientific research among postgraduate students at Sirte University.

Statistical Analysis of the Demographic Variables of the Sample:

This section presents a descriptive analysis of the characteristics of the study sample according to the following variables:

Table (3–4): Descriptive Analysis of the Demographic Data of the Study Sample.

| N | | Category | Frequency | Percentage |
|---|--------|----------|-----------|------------|
| 1 | Gender | Male | 12 | 40% |

| | | | | |
|-------|----------------|------------------|----|-------|
| 2 | | Female | 18 | 60% |
| | | | 30 | 100% |
| 1 | Faculty Type | Applied Sciences | 17 | 56.7% |
| 2 | | Humanities | 13 | 43.3% |
| Total | | | 30 | 100% |
| 1 | Academic Level | Master's | 25 | 83.3% |
| 2 | | PhD | 5 | 16.7% |
| | | | 30 | 100% |
| 1 | Age | 25–30 years | 10 | 33.3% |
| 2 | | 30–40 years | 12 | 40% |
| 3 | | Over 40 years | 8 | 26.7% |
| Total | | | 30 | 100% |

The results indicate that females constituted (60%) of the sample compared to (40%) males, reflecting a higher participation of female students in postgraduate programs at Sirte University. This trend aligns with recent international reports showing increased female participation in higher education and postgraduate studies, particularly in disciplines related to scientific research.

The findings also show that (56.7%) of the sample belonged to applied science faculties, compared to (43.3%) from humanities faculties. This relatively balanced distribution provides an implicit comparative dimension, even though it was not a primary objective of the study. Furthermore, the majority of the sample were master's students (83.3%), compared to only (16.7%) doctoral students, which can be attributed to the larger number of master's students and their foundational stage in developing scientific research skills.

Regarding age, the highest proportion of participants was in the (30–40 years) category (40%), followed by the (25–30 years) category (33.3%), and then those over 40 years (26.7%). This distribution reflects a noticeable age diversity within the study sample.

Descriptive Analysis of the Study Dimensions:

The reality of digital transformation in developing a proposed artificial intelligence–based model and its impact on scientific research among postgraduate students at Sirte University was measured through five main dimensions, as follows:

First Dimension: Infrastructure for Using Digital Transformation in the Educational Process

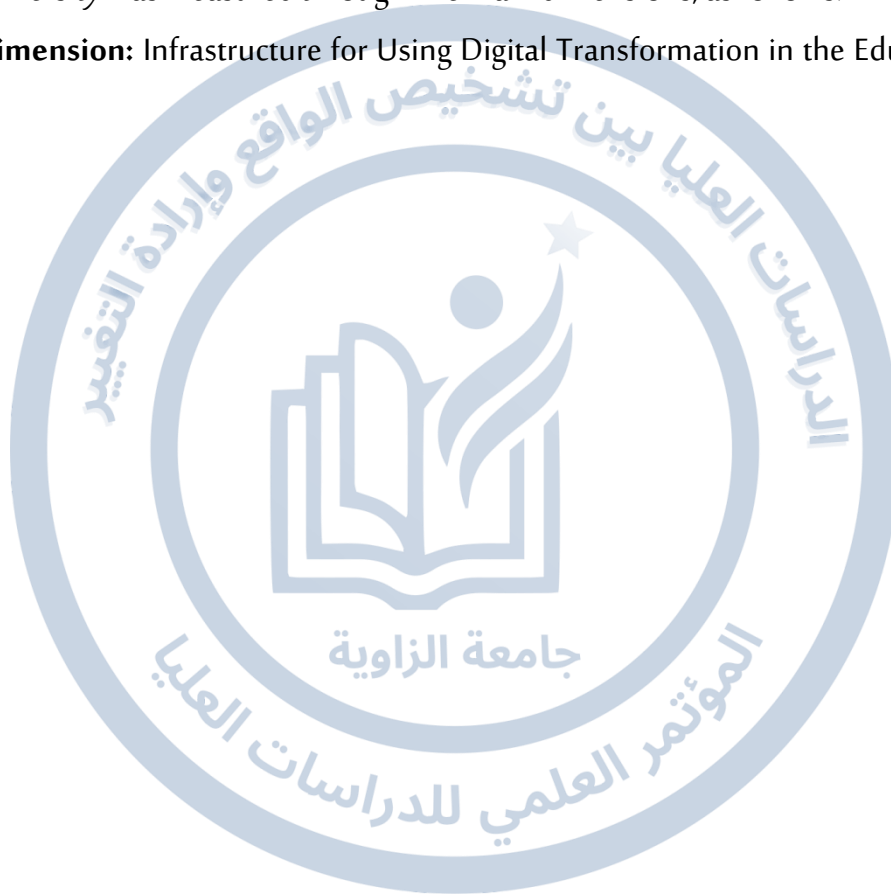


Table (3–5): Means and Standard Deviations for the First Dimension

| No | Item | Mean | Std. Deviation | Rank | Level |
|---------------|--|------|----------------|------|----------|
| 1 | The university has modern digital transformation technologies that support the educational process. | 2.10 | 0,54 | 3 | Moderate |
| 2 | The university has the ability to securely store and retain data digitally through reliable systems based on its infrastructure. | 2.18 | 0.51 | 1 | Moderate |
| 3 | The university has the capacity to expand future digital transformation usage based on its infrastructure. | 2.14 | 0.56 | 2 | Moderate |
| 4 | The university provides technical support using digital transformation technologies to immediately resolve technical problems based on its infrastructure. | 2.05 | 0.59 | 4 | Moderate |
| 5 | The university continuously develops and invests in its digital transformation infrastructure. | 2.00 | 0.61 | 5 | Moderate |
| Overall level | | 2.09 | 0.56 | - | Moderate |

This dimension aimed to examine the university's readiness in terms of infrastructure required to support digital transformation in the educational process, as it represents the fundamental pillar for implementing any artificial intelligence–based model. The results shown in Table (3–5) indicate that the overall mean score reached (2.09) with a standard deviation of (0.56), reflecting a moderate level of importance of the current infrastructure at the university.

The items of the first dimension indicate that the university's ability to retain and store data digitally through reliable systems ranked first with a mean score of (2.18). This reflects the availability of basic technological foundations that allow information to be stored securely; however, this level remains moderate and does not indicate full excellence. The university's ability to expand digitally in the future (2.14) and its possession of modern technologies to support the educational process (2.10) ranked second and third, respectively. This suggests that the university has a limited capacity to adapt to future developments in the field of digital transformation.

In contrast, the availability of immediate technical support to address technical problems (2.05) and the continuous development of digital infrastructure (2.00) ranked fourth and fifth, respectively. This reflects certain shortcomings in the speed of technical response and in ongoing infrastructure upgrading processes.

Overall, these results indicate that the university's infrastructure exists and is capable of supporting basic operations, the variation in standard deviation values across items indicates differences in learners' experiences and varying levels of interaction with the available infrastructure, which is a natural phenomenon in any diverse educational environment.

The researcher concludes that the university's infrastructure represents a solid foundation but requires further strengthening and continuous development, particularly in the areas of technical support and periodic technological updates. Enhancing these aspects would directly contribute to increasing the effectiveness of the proposed model in developing scientific research skills among postgraduate students.

Second Dimension: The Impact of Digital Transformation on the Learning Process



Table (3–6): Means and Standard Deviations for the Second Dimension

| No | Item | Mean | Std. Deviation | Rank | Level |
|---------------|--|------|----------------|------|-------|
| 1 | Digital transformation helps accelerate the learning process | 2.78 | 0,42 | 2 | High |
| 2 | Digital transformation helps design, implement, and evaluate learning experiences. | 2.85 | 0.39 | 1 | High |
| 3 | Digital transformation helps improve learning skills. | 2.74 | 0.45 | 3 | High |
| 4 | Digital transformation helps in better understanding of academic subjects. | 2.7 | 0.47 | 4 | High |
| 5 | Digital transformation helps achieve direct interaction with academic subjects. | 2.68 | 0.49 | 5 | High |
| Overall level | | 2.75 | 0.44 | - | High |

This dimension aimed to examine the impact of digital transformation on the learning process among postgraduate students, including accelerating learning, improving skills, and enhancing interaction with academic content. The results presented in Table (3–6) show that the overall mean score for this dimension reached (2.75) with a standard deviation of (0.44), indicating a high level of importance of the impact of digital transformation on the learning process from the perspective of the study sample.

The responses of the participants revealed that digital transformation in designing, implementing, and evaluating learning experiences achieved the highest mean score (2.85), reflecting students' recognition of the effective role of digital transformation in enhancing the efficiency of educational planning, implementation, and assessment. The role of digital transformation in accelerating the learning process

ranked second with a mean score of (2.78), indicating that the use of digital technologies significantly contributes to making the learning process smoother and more efficient.

Participants also indicated that digital transformation helps improve learning skills (2.74) and enhances understanding of academic subjects (2.70). In addition, it contributes to achieving direct interaction with academic content (2.68), reflecting students' awareness of the role of technology in supporting active and interactive learning rather than merely serving as a tool for information transmission.

These results can be interpreted to mean that students perceive the impact of digital transformation on educational performance and their ability to process information more quickly and in a more organized manner. Moreover, the relatively low standard deviation values (ranging from 0.39 to 0.49) indicate a reasonable level of agreement among students regarding these benefits, which strengthens the reliability and credibility of these findings.

The researcher emphasizes the importance of continuously supporting students with modern digital technologies and designing integrated learning experiences to ensure optimal utilization of digital transformation capabilities in improving the quality of learning and scientific research.

Third Dimension: The Impact of Digital Transformation on the Scientific Research Process

Table (3–7) presents the means and standard deviations for the third dimension.

| No | Item | Mean | Std. Deviation | Rank | Level |
|---------------|--|------|----------------|------|-------|
| 1 | The use of digital transformation technologies has helped improve scientific research. | 2.62 | 0,48 | 2 | High |
| 2 | Digital transformation technologies help you accomplish scientific research. | 2.65 | 0.46 | 1 | High |
| 3 | Digital transformation technologies help you achieve improvement in academic research areas in which you previously faced difficulties. | 2.58 | 0.5 | 3 | High |
| 4 | Digital transformation technologies positively affect your level of research performance compared to students who do not use them. | 2.55 | 0.52 | 4 | High |
| 5 | The use of digital transformation technologies increases your deep understanding of scientific research concepts in your academic field. | 2.53 | 0.54 | 5 | High |
| Overall level | | 2.59 | 0.5 | - | High |

This dimension aims to measure the impact of digital transformation on the ability of postgraduate students at Sirte University to perform scientific research tasks, including facilitating research completion, improving academic performance, and enhancing understanding of research concepts. The results shown in Table (3–7) indicate that the overall mean score for this dimension reached (2.59), with a standard deviation of (0.50), reflecting a high level of importance for the impact of digital transformation in supporting scientific research.

The findings of the third dimension reveal that the use of digital transformation technologies in completing scientific research ranked first, with a mean score of (2.65), while the role of these technologies in improving scientific research in general ranked second, with a mean score of (2.62). This reflects students' awareness of the effective role of digital transformation in facilitating and organizing research tasks.

Furthermore, students indicated that digital transformation technologies contribute to improving academic research areas in which they had previously faced difficulties, with a mean score of (2.58). They also reported that these technologies positively affect their level of research performance compared to students who do not use them (2.55). In addition, the use of digital transformation technologies was found to increase students' deep understanding of scientific research concepts within their academic field, with a mean score of (2.53).

This ranking suggests that students perceive digital transformation not merely as a supportive tool, but as a motivating factor for developing their research skills and overcoming academic challenges they previously encountered. Considering the standard deviation values, which ranged between (0.46) and (0.54), there is a slight variation in students' perceptions. This variation reflects differences in levels of interaction with digital transformation technologies and prior experience; however, it does not diminish the significance of the results, as all items fall within the high level of importance.

Accordingly, the researcher believes that digital transformation constitutes a pivotal element in developing students' scientific research skills, as it contributes to accelerating research completion, The researcher also emphasizes that the continuous integration of digital transformation into the scientific research environment, along with providing appropriate training and technical support, represents a fundamental strategy for enhancing research efficiency and ensuring that students benefit optimally from artificial intelligence tools.

The Fourth Dimension: The Impact of Digital Transformation and Digital Security Efficiency on the Educational Process

Table (3–8): Means and Standard Deviations for the Fourth Dimension

| No | Item | Mean | Std. Deviation | Rank | Level |
|---------------|--|------|----------------|------|----------|
| 1 | Protecting data and information using effective security systems is among the university's priorities. | 2.46 | 0,49 | 2 | High |
| 2 | The university uses advanced systems to combat cyberattacks. | 2.42 | 0.51 | 1 | High |
| 3 | Postgraduate students are trained in digital security protection methods within the educational process. | 2.38 | 0.53 | 3 | High |
| 4 | Digital security systems and software are continuously updated to ensure their effectiveness in the educational process. | 2.35 | 0.55 | 4 | High |
| 5 | Postgraduate students have sufficient awareness of digital security risks and protection methods. | 2.32 | 0.57 | 5 | Moderate |
| Overall level | | 2.39 | 0.53 | - | High |

This dimension aimed to evaluate the extent to which the university provides a digitally secure educational environment and the impact of this on the learning process and scientific research. The results presented in Table (3–8) indicate that the overall mean score for this dimension reached (2.39) with a standard deviation of (0.53), reflecting a high level of importance of the impact of digital transformation and digital security efficiency on the educational process from the perspective of the study sample.

Based on the responses of the study participants to the items of the fourth dimension, it is evident that protecting data and information using effective security systems ranked first with a mean score of (2.46), indicating that the university places clear emphasis on ensuring information confidentiality and the integrity of digital data. This was followed, in second place, by the use of advanced systems to combat cyberattacks (2.42), reflecting the university's commitment to securing its digital infrastructure against potential threats.

Students also indicated that training in digital security protection methods (2.38) and the continuous updating of security systems and software (2.35) are among the university's important practices for enhancing digital security, although their mean scores were slightly lower compared to the preceding items. In contrast, the item related to students' awareness of digital security risks and protection methods ranked fifth with a mean score of (2.32) and a moderate level of importance, suggesting the existence of a relative gap in students' cognitive and behavioral awareness, despite the efforts exerted at the level of infrastructure and technical systems.

The researcher believes that digital security efficiency represents a fundamental factor in ensuring the success of digital transformation in the educational process. It not only provides technical protection but also contributes to building students' trust in using digital tools and artificial intelligence applications. Accordingly, the researcher emphasizes the importance of enhancing students' awareness of digital security risks and preventive measures.

The Fifth Dimension:The Impact of Digital Transformation on Supporting Top Management

Table (3–9) presents the means and standard deviations for the fifth dimension.

| No | Variable | Mean | Std. Deviation | Rank | Level of Importance |
|---------------|---|------|----------------|------|---------------------|
| 1 | Top management considers digital transformation a core pillar in the development of postgraduate studies at the university. | 2.12 | 0,58 | 2 | Moderate |
| 2 | The university considers digital transformation one of its main priorities in its strategic plan. | 2.15 | 0.56 | 1 | Moderate |
| 3 | Top management encourages all postgraduate students to use digital transformation technologies. | 2.08 | 0.6 | 3 | Moderate |
| 4 | Indicators of the success of digital transformation at the university are monitored regularly. | 2.05 | 0.62 | 4 | Moderate |
| 5 | Postgraduate students face security challenges when using digital transformation technologies that reduce their sense of trust and safety during the educational process. | 1.98 | 0.64 | 5 | Moderate |
| Overall level | | 2.08 | 0.60 | - | Moderate |

Fifth Dimension: The Impact of Digital Transformation on Supporting Top Management

This dimension aims to examine the extent of top management's interest in digital transformation and its role in supporting and directing the educational and research

processes at the University of Sirte, particularly within postgraduate programs. The results presented in Table (3–9) indicate that the overall mean for this dimension reached (2.08) with a standard deviation of (0.60), reflecting a moderate level of importance of top management's role in supporting digital transformation from the students' perspective.

The findings of the fifth dimension show that including digital transformation among the university's strategic plan priorities ranked first with a mean score of (2.15), followed by considering digital transformation a core pillar in the development of postgraduate studies with a mean of (2.12). This reflects the awareness of top management regarding the importance of digital transformation at the strategic level; however, this awareness remains at a moderate level, indicating that practical implementation of such support requires further strengthening.

Students also indicated that encouragement from top management to use digital transformation technologies (2.08) and regular monitoring of digital transformation success indicators (2.05) were both at moderate levels, suggesting that institutional support exists but lacks sufficient depth and consistency. Moreover, students' evaluation revealed that security challenges encountered during the use of digital transformation technologies (1.98) may negatively affect their sense of trust and safety during the educational process. This highlights the need for greater attention to organizational and awareness-related aspects to ensure the sustainability of digital transformation.

Considering the standard deviation values (ranging between 0.56 and 0.64), there is noticeable variation in students' perceptions of top management support for digital transformation. This variation may be attributed to differences in students' experiences or unequal exposure to digital support programs.

The researcher concludes that institutional support from top management is a necessary condition for the success of digital transformation. The current moderate level reflects the presence of strategic. The researcher also emphasizes the importance of effectively addressing security challenges to enhance students' trust,

thereby ensuring the sustainable and effective integration of digital transformation into the educational and research processes.



Inferential Analysis for Hypothesis Testing:

Based on the descriptive results obtained from examining the reality of digital transformation and its impact on developing scientific research skills among postgraduate students at the University of Sirte, it became necessary to move to inferential analysis. This stage allows for testing scientific hypotheses and identifying relationships and effects among variables with greater precision. This section seeks to provide strong statistical evidence regarding the impact of digital transformation and the proposed artificial intelligence–based model on scientific research skills.

To achieve this, the independent samples t-test will be used to examine differences between two independent groups in the target variables, whether related to students' performance levels in scientific research skills or the extent of their benefit from digital transformation tools. This test is appropriate for comparing the means of two independent groups and determining whether the observed differences are statistically significant rather than due to chance.

In addition, one-way analysis of variance (ANOVA) will be employed to examine differences among more than two groups in relevant variables. This test allows for identifying statistically significant differences among multiple groups, whether related to colleges, levels of study, or different age groups. ANOVA is an effective tool for understanding within-group and between-group variance and enables the researcher to infer the impact of the independent variable on the dependent variable in a comprehensive and accurate manner.

The First Hypothesis: There are statistically significant differences in postgraduate students' perceptions of the use of artificial intelligence applications in learning scientific research writing that are attributable to the gender variable.

| Test Type | Mean (Males) | Mean (Females) | Statistical Value | Significance (p-value) | Result |
|----------------------------|--------------|----------------|-------------------|------------------------|--|
| Independent Samples t-test | 2.35 | 2,42 | t = 0.62 | 0,156 | There are no statistically significant differences |

The results of the Independent Samples t-test indicate that the mean score of male students' perceptions regarding the use of artificial intelligence applications in learning scientific research writing was (2.35), while the mean score for female students was (2.42). The calculated t-value ($t = 0.62$) with a significance level of $p = 0.156$ shows that the differences between males and females are not statistically significant.

This finding indicates that the gender variable does not have a significant effect on students' perceptions toward the use of artificial intelligence in developing scientific research skills. It reflects a relative agreement between male and female students in evaluating the usefulness and effectiveness of artificial intelligence applications. This result supports the objectivity of the proposed model.

The second hypothesis: There are statistically significant differences in graduate students' perceptions of the use of artificial intelligence applications in learning scientific research writing, attributable to the type of college (Applied Sciences / Humanities).

| Test Type | Mean (Applied Sciences) | Mean (Human Sciences) | Statistical Value | Significance | Result |
|----------------------------|-------------------------|-----------------------|-------------------|--------------|----------------------------|
| Independent Samples t-test | 2.40 | 2,36 | t = 0.48 | 0,301 | There are no statistically |

| | | | | | |
|--|--|--|--|--|-------------------------|
| | | | | | significant differences |
|--|--|--|--|--|-------------------------|

The results of the independent samples t-test showed that the mean score of perceptions among students of applied colleges was (2.40), while the mean score for students of humanities colleges was (2.36). The statistical value was $t = 0.48$ with a significance level of $p = 0.301$, indicating that the differences between the two groups are not statistically significant.

This reflects that the type of college does not have a significant effect on students' perceptions of the use of artificial intelligence applications in learning scientific research writing. It can therefore be concluded that the proposed model can be applied uniformly to students from different colleges, without the need to adapt it differently according to academic specialization.

The third hypothesis: There are statistically significant differences in graduate students' perceptions of the use of artificial intelligence applications in learning scientific research writing attributable to the stage of study (Master's / Doctoral).

| Test Type | Mean (Master's) | Mean (Doctoral) | Statistical Value | Significance (p-value) | Result |
|----------------------------|-----------------|-----------------|-------------------|------------------------|--|
| Independent Samples t-test | 2.39 | 2,50 | $t = 0.81$ | 0,411 | There are no statistically significant differences |

The results of the independent samples t-test showed that the mean score for Master's students was (2.39), while the mean score for Doctoral students was (2.50). The statistical value was $t = 0.81$ with a significance level of $p = 0.411$, indicating that the differences between the two groups are not statistically significant.

This indicates that the stage of study does not have a significant effect on students' perceptions of the use of artificial intelligence applications in learning scientific research writing. It also suggests that the proposed model demonstrates equal effectiveness among all graduate students regardless of their academic stage.



The fourth hypothesis: There are no statistically significant differences in graduate students' perceptions of the use of artificial intelligence applications in learning scientific research writing attributable to age.

| Test Type | Age Groups | Age Groups and Means | Statistical Value (ANOVA) | Significance (p-value) | Result |
|--|---------------|----------------------|---------------------------|------------------------|---|
| One-Way Analysis of Variance (One-Way ANOVA) | 25–30 years | 2.38 | f=0.12 | 0.201 | There are no statistically significant differences. |
| | 30-40 years | 2.41 | | | |
| | Over 40 years | 2.36 | | | |

The results of the One-Way Analysis of Variance (ANOVA) showed that the mean score of students' perceptions regarding the use of artificial intelligence applications in learning scientific research writing for the age group 25–30 years was (2.38), with a statistical value of $F = 0.12$ and a significance level of $p = 0.201$. These results indicate that there are no statistically significant differences among the different age groups.

This reflects that the age variable does not affect students' perceptions toward the use of artificial intelligence in developing scientific research skills. This indicates that the proposed model is effective for all age groups within the study sample.

Discussion of Results:

This study examines the impact of digital transformation on developing a proposed artificial intelligence–based model to enhance scientific research skills among graduate students at the University of Sirte. In light of the research problem, interviews with faculty members and statistical results revealed that students face clear challenges in scientific research writing, particularly in organizing research, formulating content accurately, and solving complex research problems. These challenges are exacerbated by limited support outside official lecture hours, in addition to the need to keep pace with rapid technological advancements.



First: Components of the Proposed Artificial Intelligence–Based Model

The results of the five dimensions indicate that the proposed model should be based on four main dimensions: infrastructure, digital learning, scientific research, and digital security efficiency, with support from top management. The first dimension showed that the university's infrastructure is at a moderate level, with the availability of modern technologies and secure data storage; however, it requires continuous development and effective technical support. This highlights the necessity for the model to be flexible and scalable for future expansion.

The results of the second and third dimensions confirmed that digital transformation contributes significantly to improving learning and scientific research processes by accelerating learning, enhancing interaction with content, and facilitating the completion of scientific research. This demonstrates that the core components of the model include generative artificial intelligence tools, integrated content management systems, and specialized training courses to support students in various scientific research skills.

Second: The Impact of Applying the Model on Scientific Research Writing Skills

The results of the second and third dimensions showed that digital transformation contributes significantly to improving the quality of students' scientific research. Participants indicated that artificial intelligence tools helped them better organize research, formulate clear content, and accelerate research and analysis processes.

Third: The Impact of Application on Research Problem-Solving Skills

The results of the second and third dimensions, along with infrastructure-related findings, confirm that digital transformation contributes to developing students' research problem-solving skills. Digital tools enable students to analyze information efficiently, test hypotheses, and compare results quickly and accurately.

Fourth: Level of Student Satisfaction with Using the Model

The results showed that students expressed a high level of satisfaction with the use of digital transformation in learning and scientific research, particularly in facilitating research tasks, improving learning skills, and increasing interaction with content.

However, some elements related to top management support and digital security showed moderate levels

Fifth: Answering the Main Research Question

By integrating the results of the five dimensions, it can be concluded that digital transformation has a clear and significant impact on the effectiveness of the proposed artificial intelligence–based model in developing scientific research skills among graduate students at the University of Sirte. It contributes to improving research quality, accelerating learning, developing problem-solving skills, and increasing student satisfaction. Nevertheless, some aspects still require reinforcement, particularly expanding top management support and raising students awareness of digital security to ensure a sustainable and secure educational environment.

Accordingly, the analysis confirms that the proposed model can be an effective tool for enhancing scientific research if supported by advanced infrastructure, integrated artificial intelligence tools, training programs, to improve learning and scientific research efficiency at the graduate level.

Results and Recommendations:

Results

- 1- The study showed that digital transformation and the proposed artificial intelligence–based model have a strong and clear impact on improving graduate students' scientific research skills by facilitating research writing,
- 2- Descriptive analysis results indicated that the university's infrastructure supporting digital transformation is at a moderate level, with the availability of modern technologies and secure storage systems;
- 3- The results indicated that digital transformation significantly contributes to improving the learning process by accelerating learning
- 4- The findings revealed that the university places considerable emphasis on data protection and providing cybersecurity systems, along with training students in digital security; however, students' awareness of digital risks remains moderate.

- 5- The study showed that top management support for digital transformation exists but at a moderate level, including monitoring success indicators and encouraging students to use digital technologies, which requires strengthening the strategic role of management to ensure model sustainability.
- 6- Inferential statistical tests (**t-test and ANOVA**) showed no statistically significant differences in students' perceptions of the use of artificial intelligence applications based on gender, college type, stage of study, or age group. This indicates that the proposed model can be applied uniformly to all students regardless of demographic characteristics.

Recommendations:

- 1- The researcher recommends continuous development of the university's digital infrastructure, providing modern and reliable tools
- 2- The study recommends continued use of generative artificial intelligence applications to enhance scientific research writing skills.
- 3- It is necessary to raise students' awareness of digital security risks and protection methods through specialized training programs and periodic workshops to ensure a safe digital learning environment.
- 4- Encouraging the use of interactive digital platforms to support individual and collaborative learning.
- 5- The study recommends increasing top management involvement in monitoring digital transformation implementation, developing clear strategic plans
- 6- Given the absence of demographic differences in perceptions, the researcher recommends applying the proposed model to all graduate students regardless of gender, specialization, stage of study, or age, with a focus on providing individualized support when needed.

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