

UTAUT Model Analysis of Mandatory Digital Transformation Adoption in the Agricultural Bank of Egypt: Moderating Effects of Age and Education.

تحليل نموذج UTAUT لتبني التحوّل الرقمي الإلزامي في البنك الزراعي المصري: التأثيرات المُعدّلة للعمر والتعليم

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Abstract

Aligned with Egypt's Vision 2030 for digital transformation in the public sector, this study investigates the determinants of employees' adoption of digital transformation technologies in the Agricultural Bank of Egypt (ABE) using the Unified Theory of Acceptance and Use of Technology (UTAUT) model. The research explores both direct and indirect effects of performance expectancy, effort expectancy, social influence, and facilitating conditions on adoption, while examining the moderating roles of age and education. A quantitative approach was applied using data collected from 563 employees through a structured questionnaire, and the proposed model was analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings reveal that performance expectancy and social influence significantly and positively affect behavioral intention and actual adoption, whereas effort expectancy was found to be non-significant. Facilitating conditions emerged as a strong determinant of actual adoption. Furthermore, age and education significantly moderate several relationships: age strengthens the influence of social and effort expectancy, while higher education reduces the effect of effort expectancy but enhances the role of social influence. The study contributes theoretically by extending the UTAUT model to a mandatory use, public banking context. Practically, by providing actionable insights to enhance employee readiness, digital training, and engagement strategies in line with Egypt's demographic diversity and national digital transformation goals.

Keywords: UTAUT Model, Digital Transformation Adoption, Behavioral Intention, Age, Education, Agricultural Bank of Egypt, Mandatory Adoption

المخلص

تماشياً مع رؤية مصر ٢٠٣٠ للتحويل الرقمي في القطاع العام، تهدف هذه الدراسة إلى استكشاف العوامل المحددة لتبني الموظفين لتقنيات التحويل الرقمي في البنك الزراعي المصري (ABE) باستخدام نموذج النظرية الموحدة لقبول واستخدام التكنولوجيا (UTAUT). تبحث الدراسة في كل من التأثيرات المباشرة وغير المباشرة لتوقعات الأداء، وتوقعات الجهد، والتأثير الاجتماعي، وظروف التيسير على التبني، مع دراسة الأدوار التعديلية لكل من العمر والمستوى التعليمي.

اعتمد البحث على منهج كمي باستخدام بيانات تم جمعها من 563 موظفاً عبر استبيان منظم، وتم تحليل النموذج المقترح باستخدام نمذجة المعادلات البنائية بطريقة المربعات الصغرى الجزئية (PLS-SEM). أظهرت النتائج أن توقعات الأداء والتأثير الاجتماعي يؤثران بشكل إيجابي ومعنوي في كل من النية السلوكية والتبني الفعلي، بينما لم يكن لتوقعات الجهد تأثير معنوي. كما تبين أن ظروف التيسير تُعدّ محدداً قوياً للتبني الفعلي. علاوة على ذلك، تبين أن العمر والتعليم يؤثران بشكل معدل على عدة علاقات؛ إذ يعزز العمر تأثير كلٍ من التوقعات الاجتماعية وتوقعات الجهد، بينما يقلل المستوى التعليمي المرتفع من تأثير توقعات الجهد ويعزز دور التأثير الاجتماعي. تسهم الدراسة نظرياً في توسيع تطبيق نموذج UTAUT في سياق الاستخدام الإلزامي بالمؤسسات المصرفية الحكومية، بينما تقدم عملياً رؤية قابلة للتنفيذ لتعزيز جاهزية الموظفين، وتحسين برامج التدريب الرقمي واستراتيجيات المشاركة بما يتماشى مع التنوع الديموغرافي في مصر وأهداف التحويل الرقمي الوطنية.

الكلمات المفتاحية: نموذج UTAUT، تبني التحويل الرقمي، النية السلوكية، العمر، التعليم، البنك الزراعي المصري، الاستخدام الإلزامي.

1- Introduction

Digital transformation in the government sector aims to simplify operations, enhance service quality, and promote institutional transparency and accountability. In Egypt, it is a central pillar of Vision 2030, championed by the Ministry of Communications and Information Technology (MCIT) through its Digital Egypt initiative, which seeks to establish a robust digital ecosystem and strengthen government-to-government (G2G) infrastructure. To support this transformation, the Digital Transformation Academy has trained tens of thousands of public sector employees in the adoption of digital tools.

At the global level, Information and Communication Technology (ICT) is widely recognized as a key driver of societal development. As nations increasingly integrate technologies connected to the Internet and the World Wide Web (WWW), e-government initiatives have emerged to enhance efficiency, reduce operational costs, and improve service delivery for various stakeholders, including citizens, businesses, public employees, and governmental entities (Moussa & Tarek, 2023).

Despite these technical advancements and capacity-building programs, the actual usage of digital systems in the daily routines of government employees remains inconsistent and under-examined. While systems may be formally adopted, their effective use is not guaranteed, especially in large, bureaucratic institutions such as government banks. This suggests that technical readiness alone is not enough, but human factors such as perceived usefulness, ease of use and organizational support play a critical role in shaping technology adoption. (Venkatesh et al., 2012).

This study employs the Unified Theory of Acceptance and Use of Technology (UTAUT) to investigate how employees adopt a recently introduced digital system at the Agricultural Bank of Egypt (ABE), in a mandatory usage environment. Specifically, it investigates how performance expectancy, effort expectancy, social influence, and facilitating conditions influence actual usage, while also analyzing the moderating role of employees' age and education level. By including demographic moderators, the study offers a clearer understanding of how individual differences influence the adoption of digital transformation in public sector institutions.

The Agricultural Bank of Egypt was chosen as the case for this study due to its unique position among government banks. Unlike other state-owned commercial banks, ABE serves as the largest developmental bank in Egypt with a mandate to support the agricultural and rural economy. With more than 1,200 branches nationwide, it represents one of the broadest institutional networks in the country, reaching rural areas and Upper Egypt (Food Business Africa, 2024). Moreover, the bank is currently undergoing a comprehensive restructuring and digital transformation program, which includes the modernization of its core banking system and digital services (Egypt Today, 2020; FirstBank, 2025). This transitional phase provides a timely and relevant setting to investigate employees' technology adoption, thereby addressing the gap between formal system implementation and actual usage in public sector institutions.

2- Literature Review

This section reviews key literature on digital transformation and technology adoption. It outlines Egypt's national digital initiatives and their challenges, presents major technology acceptance theories relevant to understanding adoption behavior, and examines previous studies on digital transformation in various contexts. The review also identifies research gaps, particularly regarding employees' adoption of digital technologies at the Agriculture Bank of Egypt.

2.1 Digital Transformation in Egypt

In support of Egypt's Vision 2030 and the national digital transformation agenda, the Egyptian government has launched comprehensive initiatives to modernize the information and communications technology (ICT) sector. The Ministry of Communications and Information Technology (MCIT) is leading the Digital Egypt Initiative, which focuses on three pillars: digital transformation, digital skills, and digital innovation (MCIT Yearbook, 2024).

Digital transformation efforts include the creation of unified electronic platforms to enable citizens to access services in agriculture, utilities, real estate, and the judiciary. Port Said was chosen as a pilot governorate, where more than 150 services are now available digitally, with plans for nationwide expansion. The move to the New Administrative Capital has also been designed as a "paperless government," integrating modern technologies to achieve transparent and efficient governance.

In parallel with these efforts, digital skills development programs were launched to ensure sustainability. Thousands of employees across Egypt's governorates have received certifications in digital competencies, while initiatives such as Digital Egypt Generations and Youth Enablement for Freelancing have targeted young Egyptians.

Digital innovation initiatives, including InnovEgypt and Heya Raeda, further support entrepreneurship and women's participation in the digital economy.

Despite these achievements, challenges remain. Studies by Kamal (2021) and Elbatanouny et al. (2023) highlight barriers such as low trust in government systems, resistance from aging, high costs of the internet and apps, privacy concerns, cultural preferences for personalized services, and inefficient infrastructure. These barriers emphasize the importance of examining adoption not only at the citizen level but also among employees in government institutions.

2.2 Technology Acceptance Frameworks

Several theoretical models have been developed to explain individuals' intention and behavior toward adopting technology. The Theory of Reasoned Action (TRA), proposed by Fishbein and Ajzen (1975) and cited in Venkatesh et al. (2003), suggests that behavioral intention is determined by an individual's attitude toward the behavior and subjective norms. Building on this foundation, Davis (1989) introduced the Technology Acceptance Model (TAM), which focuses on Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) as the key determinants of behavioral intention (as cited in Venkatesh et al., 2003).

Later, Ajzen's Theory of Planned Behavior (TPB) (1991) extended this framework by adding Perceived Behavioral Control (PBC) to capture the influence of external constraints on behavior.

Other scholars have suggested complementary models. The Theory of Interpersonal Behavior (TIB) developed by Triandis (1980), as cited in Alshammari and Rosli (2020), incorporated habit, affect, and facilitating conditions as major determinants of technology use. Similarly, Rogers' (2003) Diffusion of Innovation (DOI) theory, as cited in Alalwan et al. (2017), emphasized five innovation attributes, namely comparative advantage, compatibility, complexity, trialability, and observability, which influence adoption. Additional contributions included the Motivational Model (MM), the Model of PC Utilization (MPCU), and Social Cognitive Theory (SCT).

The Motivational Model (MM) developed by Davis et al. (1992) and cited in Venkatesh et al. (2003), Nyimbili and Chalwe (2023), and Baharudin and Khodari (2022), distinguishes between intrinsic motivation (e.g., enjoyment, personal satisfaction) and extrinsic motivation (e.g., rewards, performance outcomes), both of which influence technology usage behavior. Likewise, Thompson et al. (1991) proposed the Model of PC Utilization (MPCU), emphasizing contextual factors such as job-technology fit and long-term consequences as key determinants of system use (Venkatesh et al., 2003). The Social Cognitive Theory (SCT), developed by Bandura (1986) and cited in Venkatesh et al. (2003), highlights the role of self-efficacy, outcome expectations, and technology-related anxiety in shaping user behavior, highlighting the interaction between personal capabilities and environmental conditions.

Recognizing overlaps and limitations among previous models, Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT) model, which integrates eight prior models. The UTAUT model identifies four core dimensions of technology adoption: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions, which are taken into account based on gender, age, experience, and voluntary use. This integrative model is particularly relevant in mandatory use contexts, such as government digital transformation initiatives.

Therefore, the Unified Theory of Acceptance and Use of Technology (UTAUT) serves as the theoretical foundation for this study, which assesses employees' adoption of digital transformation technologies within the Agricultural Bank of Egypt.

Given the mandatory nature of the digital system deployed at ABE and the variation in employees' engagement based on demographic factors such as age and education, the UTAUT model offers a robust and contextually appropriate framework for analyzing both behavioral intention and actual usage.

The following section reviews empirical studies that have applied similar models to examine digital transformation adoption across different contexts, highlighting the research gap addressed in the present study.

2.3 Previous Empirical Studies on Digital Transformation Adoption in Different Contexts

Several studies have investigated digital transformation from the perspective of external users. Haridy et al. (2025) examined Egyptian citizens' attitudes toward e-government platforms using an extended UTAUT model that incorporated trust as an additional construct. The findings showed that performance expectancy and effort expectancy influenced adoption, while trust had no significant effect on adoption. Similarly, Tariq et al. (2024) extended UTAUT with trust and risk to explain FinTech adoption in Pakistan's digital banking sector, emphasizing the mediating role of behavioral intention but focusing on customers rather than employees. Shaikh and Amin (2024) added consumer innovativeness to UTAUT, showing that performance expectancy, effort expectancy, and innovativeness significantly shape FinTech adoption intentions in Pakistan, while social influence and facilitating conditions had no effect. Nepal and Nepal (2023) applied UTAUT to digital banking in Nepal and found that performance expectancy, effort expectancy, and facilitating conditions significantly influenced behavioral intention, while social influence was not significant. Behavioral intention mediated the relationship between these factors and usage, but the study focused only on customers, excluded additional constructs, and was cross-sectional. Malekpour et al. (2023) examined customer preferences for digital transformation in emerging markets, particularly in the retail sector. The study also emphasized customer attitudes and ignored employee perspectives. Khamis (2023) used TAM to assess citizens' adoption of e-government services in Egypt, finding usefulness and ease of use as critical drivers, while institutional trust remained a barrier. Elbatanouny et al. (2023) qualitatively studied mobile government (m-government) adoption in Egypt, identifying trust, ease of use, and infrastructure readiness as key drivers, but again focusing on citizens. ElKhashin and Saleeb (2020) similarly applied TAM to citizens' adoption of e-government portals in developing countries, concluding that usefulness, ease of use, and trust in system design affect adoption. In the higher education context, Haron et al. (2021) applied the UTAUT model to understand students' adoption of MOOCs in Malaysian public universities. Their survey-based SEM analysis showed that performance expectancy, effort expectancy, and social influence significantly influence behavioral intention, while facilitating conditions affect actual usage. However, the study focused only on students, overlooking instructors and institutional factors, and did not include additional constructs such as trust or innovativeness.

Some research has also considered employees' adoption of digital technologies, though in limited contexts. Mahmoud and Abdel Aziz (2024) investigated hospitality employees in Egypt using the UTAUT model. The results confirmed the significance of all four dimensions and highlighted educational level as a moderator factor, but the study was limited to the tourism sector. Kim et al. (2024) applied the UTAUT model to investigate the adoption and usage of generative AI systems in small enterprises in South Korea. The study found that effort expectancy and social influence significantly influenced employees' behavioral intention, while performance expectancy and facilitating conditions showed no significant impact. Behavioral intention was identified as a strong predictor of actual usage, with social influence also exerting an indirect effect through intention. The study also highlighted the moderating role of age and work experience. The findings also showed that

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younger employees were more influenced by effort expectancy, while older and more experienced employees were more influenced by social influence.

Edo et al. (2023) combined TAM and UTAUT to study the extent to which healthcare workers adopt digital health technologies in Nigeria. The results confirmed the significance of the two dimensions of performance and effort expectations. Abdelmonem and Radwan (2023) studied employees at Agricultural Bank of Egypt branches in New Valley, focusing on organizational mindfulness. The findings emphasized the positive impacts of digital readiness and leadership on organizational mindfulness. Some studies have analyzed digital transformation from an organizational or economic perspective, rather than at the employee level. In their study of Chinese companies, Yan et al. (2024) found that corporate digitization has a negative effect on shadow banking practices, suggesting that greater digital adoption curbs dependence on informal financial channels. While important, the focus was on economic outcomes rather than employee adoption. Elgamal and Al-Aassy (2024) examined digital transformation and organizational performance in the Egyptian banking sector, particularly at ABE, highlighting customer-centric benefits such as efficiency and competitiveness, without assessing employee adoption. Moussa and Tarek (2023) provided a review of Egypt's digital transformation strategy under Vision 2030, stressing government leadership and infrastructure development. However, they identified gaps in evaluating employee readiness and adoption. Attuquayefio and Addo (2014) applied UTAUT to students in Ghana, showing that effort expectancy predicted behavioral intention, and facilitating conditions influenced actual use.

2.4 Research Gap

Although digital transformation in Egypt has attracted growing research attention, the majority of studies have focused on citizens' adoption of digital services, while government employees, particularly within public banks, have given limited attention to the internal adoption of digital systems. Existing employee research has largely addressed the private sector or examined organizational outcomes without applying frameworks such as UTAUT or considering demographic factors. Internationally, the UTAUT model has been widely applied in private or customer-oriented contexts, but not in public institutions. Moreover, most studies emphasize behavioral intention rather than actual system usage, ignoring the influence of demographic factors such as age and education. Therefore, studies are needed to examine the actual use and application of the UTAUT model in government banking services, taking into account employee demographics.

In light of Egypt's nationwide drive toward digital transformation and the recent implementation of advanced systems such as Finacle in public banking institutions like the Agricultural Bank of Egypt (ABE), addressing these research gaps has become both timely and essential. This includes:

- Investigating actual system usage rather than just behavioral intention,
- Exploring the role of UTAUT constructs within a public sector context (ABE),
- Assessing the impact of demographic moderators like age and education, and
- Focusing specifically on government employees as internal users, rather than external service recipients.

3- Problem Statement

Despite Egypt's substantial investments in digital infrastructure and national initiatives aligned with Vision 2030, the level of government employees' adoption and actual use of digital technologies remains limited and insufficiently studied. This issue is particularly evident in the Agricultural Bank of Egypt, where the Finacle system was recently implemented as part of its modernization plan, yet the extent to which employees integrate it into their daily tasks is still unclear. Moreover, most previous studies have focused on citizens' adoption of digital services, while employee-level adoption in public banking institutions has been overlooked. Existing research has emphasized behavioral intention rather than actual usage, and has paid little attention to demographic factors such as age and educational level. Accordingly, this study addresses the following research question:

What are the most significant determinants affecting the adoption and actual utilization of digital transformation technologies by employees at the Agricultural Bank of Egypt, and how do age and educational level moderate these relationships?

4- Study Objectives

This study aims to examine the actual adoption of digital transformation technologies among employees at the Agricultural Bank of Egypt, using the Unified Theory of Acceptance and Use of Technology (UTAUT) model. The specific objectives of the study are:

- Examine the impact of key UTAUT model constructs, performance expectancy, effort expectancy, social influence, and facilitating conditions, on behavioral intention to use and actual use of digital technologies in a government banking context.
- Explore the moderating effect of age and education level on the relationship between UTAUT dimensions and employees' adoption behavior.
- Assess the current level of digital technology adoption among employees at the Agricultural Bank of Egypt.
- Identify the barriers and practical factors that affect the use of technology within government institutions.
- Provide actionable recommendations for enhancing employee engagement and accelerating digital transformation initiatives in the Egyptian government sector.

5- Study Significance

This study is significant at both theoretical and practical levels, as well as in policy implications. Theoretically, it enriches the literature on technology adoption by applying the UTAUT model within the context of governmental banking in Egypt, a developing country where this area has been underexplored. It further extends previous research by examining the mediating role of behavioral intention and by incorporating demographic moderators such as age and education, thereby offering deeper insights into employee adoption of digital transformation. Practically, the study provides decision-makers at the Agricultural Bank of Egypt with evidence-based guidance on the determinants of

employees' acceptance and actual use of new digital systems, thereby reducing resistance to change and enhancing the effectiveness of transformation initiatives. At the policy level, the study supports Egypt's Vision 2030 by generating actionable insights that can inform national strategies for digitalization in public sector institutions.

6- Study Variables

The following part represents the independent, dependent, mediating, and moderating variables of the study:

6.1 Independent Variable (UTAUT Model Dimensions)

This study adopts the Unified Theory of Acceptance and Use of Technology (UTAUT) model as the primary independent variable. UTAUT is recognized as one of the most comprehensive and integrative frameworks for examining technology acceptance, building upon earlier theoretical models to provide a consolidated view of the drivers of adoption. The model highlights both psychological and contextual factors that influence individuals' behavioral intentions and actual system usage. Its four core constructs, Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions, collectively explain why and how individuals adopt digital transformation technologies. These dimensions will be explained in detail as follows:

Performance Expectancy (PE): This dimension reflects the extent to which individuals believe that using digital technologies will enhance their efficiency, productivity, or access to services (Attuquayefio & Addo, 2014). In the Egyptian context, empirical studies have consistently emphasized its significance. Mahmoud and Abdelaziz (2024) found that performance expectancy comparable to perceived usefulness in TAM significantly shaped employees' adoption of digital transformation technologies in the hospitality sector. Similarly, Haridy et al. (2025) confirmed its role in influencing citizens' acceptance of e-government platforms. These findings suggest that employees are more inclined to adopt technologies when they perceive clear, tangible benefits to their work performance and career outcomes.

Effort expectancy (EE): Defined as the degree to which a technology is perceived as user-friendly and easy to operate (Venkatesh et al., 2003), effort expectancy closely parallels perceived ease of use in TAM. When systems require minimal cognitive or physical effort, employees are more willing to engage with them (ElKhesheh & Saleeb, 2020). Haridy et al. (2025) further stressed that in e-government contexts, effort expectancy also encompasses institutional responsibility to provide simple, accessible, and well-supported systems. Thus, this construct captures not only usability but also the institutional facilitation of ease of access, both of which enhance technology adoption.

Social influence (SI): Refers to the extent to which individuals believe that important others, such as colleagues or supervisors, expect them to use a technology (Venkatesh et al., 2003). Social influence is conceptually aligned with subjective norms in TRA and TPB, image in diffusion of innovation theory, and social factors in MPCU. Studies (e.g., Mahmoud & Abdelaziz, 2024; Venkatesh et al., 2012; Elbatanouny et al., 2023) show that

social influence is stronger in mandatory or formal environments, where management and peer expectations significantly affect both intention and actual technology use.

Facilitating conditions (FC): This construct refers to employees' perceptions of the resources, infrastructure, and technical support available to enable effective system usage (Venkatesh et al., 2003). It overlaps with concepts of behavioral control and organizational readiness, making it a key predictor of actual usage. Mahmoud and Abdelaziz (2024) underscored the critical role of infrastructure and organizational support in digital transformation, while Venkatesh et al. (2012) observed that facilitating conditions often matter more during initial adoption stages than in long-term use. Elbatanouny et al. (2023) identified additional enabling factors such as language accessibility, interface design, storage capacity, and functionality that directly influence the adoption of m-government services. In developing country contexts, where infrastructure and user support can vary widely, facilitating conditions remain a key factor in employees' ability to consistently adopt digital systems.

6.2 Dependent Variable: (Adoption of Digital Transformation Technologies (ADTT))

In the context of the Unified Theory of Acceptance and Use of Technology (UTAUT), **ADTT**, also referred to as actual use of the information systems, represents the observable and measurable extent to which individuals adopt and engage with a given technology in their daily tasks or organizational settings. It reflects the real-life execution of system usage, as opposed to merely the intention or willingness to use the technology. According to Venkatesh et al. (2012), ADTT is directly influenced by behavioral intention. ADTT is a key outcome variable in technology acceptance research, indicating the successful translation of intent into tangible system engagement (Attuquayefio & Addo, 2014).

6.3 Mediating Variable: (Behavioral Intention (BI))

Behavioral intention (BI) is a central construct in the UTAUT model and serves as a strong predictor of actual technology usage. Venkatesh et al. (2003) define BI as the extent to which an individual is aware of making plans to perform or refrain from a particular behavior, in this case, dealing with digital technologies. BI is primarily shaped by performance expectancy, effort expectancy, and social influence, making it a key mediator that directs the influence of these factors on actual use behavior. Employee willingness and readiness to use digital systems play a crucial role in the success of digital transformation initiatives (Attuquayefio & Addo, 2014). As highlighted by Elrashidy et al. (2024), enhancing behavioral intention is essential for ensuring not only initial adoption but also the sustainable and effective use of digital technologies within organizations.

6.4 Moderating Variables

The study examines two moderating variables, Age and Education Level, which influence the strength of relationships between UTAUT constructs and behavioral intention or adoption of digital transformation technologies.

- **Age**

Age is a key moderator in technology adoption research, significantly shaping the relationships between UTAUT constructs and behavior intention, and thus actual technology use. Studies (e.g., Kim et al., 2024; Attuquayefio & Addo, 2014; Venkatesh et al., 2012; Morris & Venkatesh, 2000) highlight that the effect of these constructs varies across age groups; for instance, social influence becomes more influential with older individuals, and effort expectancy is more relevant for younger users. Elrashidy et al. (2024) and Elbatanouny et al. (2023) noted demographic differences in digital payment and service adoption, emphasizing the need to account for age diversity in digital transformation research.

- **Education level**

Education level significantly influences digital technology adoption. Studies in Egypt (Mahmoud & Abdelaziz, 2024; ElKheshin & Saleeb, 2020) show that higher education enhances employees' acceptance of digital transformation, as it strengthens performance expectancy, effort expectancy, and social influence. Users with a high level of education tend to view digital systems as useful and easy to use, while those with limited education levels often report lower perceived usefulness and ease of use.

7- The Conceptual Model

The conceptual model of this study based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model, which highlights four key determinants of technology adoption: performance expectancy, effort expectancy, social influence, and facilitating conditions. Within this framework, performance expectancy, effort expectancy, and social influence are proposed to influence employees' behavioral intention to adopt digital transformation technologies, while both behavioral intention and facilitating conditions are expected to determine actual usage. To enhance the explanatory power of the model and account for individual differences, age and education level were introduced as moderating variables, affecting the strength of the relationships between the independent constructs and behavioral intention.

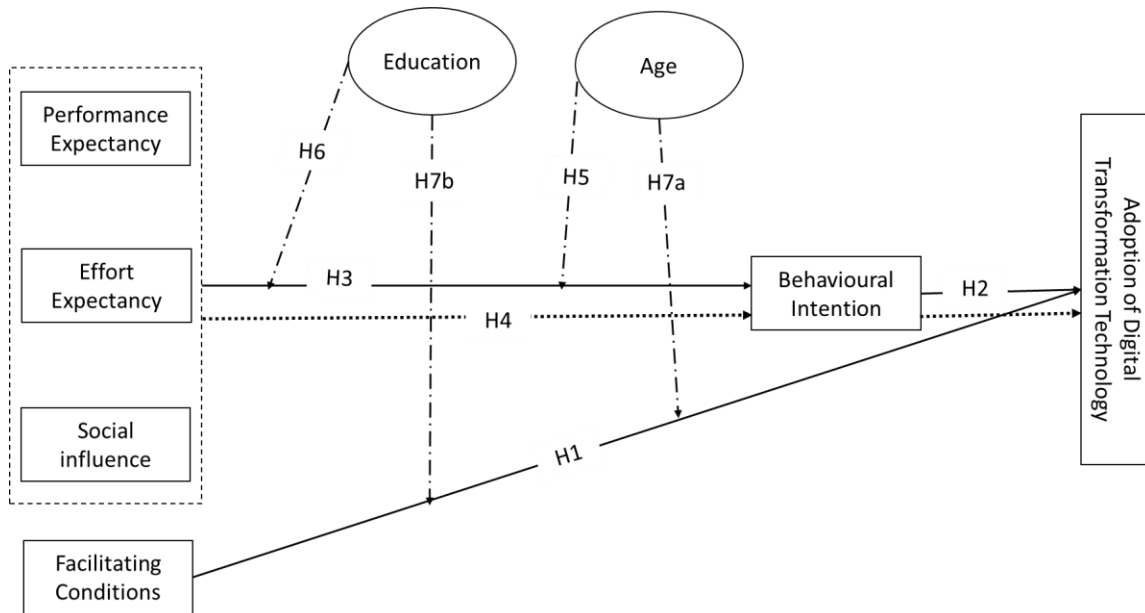


Figure 1: Conceptual framework

Source: Developed by the author based on the UTAUT model (Venkatesh et al., 2003)

From the proposed model in Figure 1 and previous studies, the study extracts the following hypotheses:

- (H1): Facilitating conditions have a significantly positive effect on the adoption of digital transformation technologies.
- (H2): Behavioral Intention to Use has a significantly positive effect on the adoption of digital transformation technologies.
- (H3): UTAUT Factors (Performance Expectancy, Effort Expectancy, Social Influence) have a significantly positive effect on the Behavioral Intention
- (H4): Behavioral Intention mediates the relationship between UTAUT factors (Performance Expectancy, Effort Expectancy, Social Influence) and employee adoption of digital transformation
- (H5): Age moderates the relationship between the dimensions of the UTAUT model (performance expectancy, effort expectancy, and social influence) and the behavioral intention to use digital technologies, indirectly affecting employees' adoption of digital transformation technologies.
- (H6): Educational level moderates the relationship between the dimensions of the UTAUT model (performance expectancy, effort expectancy, and social influence) and the behavioral intention to use digital technologies, indirectly affecting employees' adoption of digital transformation technologies.
- (H7): Both Age and Educational level moderate the relationship between the facilitating conditions and the employees' adoption of digital transformation technologies.

- (H7a): Age moderates significantly the relationship between the facilitating conditions and the employees' adoption of digital transformation technologies.
- (H7b): Education moderates significantly the relationship between the facilitating conditions and the employees' adoption of digital transformation technologies.

8- Research Methodology

This section outlines the methodological approach adopted in the present study. It describes the research design, context, population and sampling procedures, data collection instrument, and analytical techniques used. The aim is to ensure methodological clarity and transparency in examining the factors influencing employees' adoption of digital transformation technologies at the Agricultural Bank of Egypt (ABE).

8.1 Research Design

This study adopted a quantitative, cross-sectional survey design to investigate employees' acceptance of digital transformation technologies within the Agricultural Bank of Egypt (ABE). The Unified Theory of Acceptance and Use of Technology (UTAUT) served as the theoretical framework, and data were collected through a structured questionnaire.

8.2 Research Context

The study was conducted at the Agricultural Bank of Egypt (ABE), a government institution that plays a central role in supporting Egypt's agricultural and rural development. In addition to providing financing for crops, agricultural activities, and related projects such as natural gas and biogas loans, ABE also offers a wide range of agricultural and rural banking services tailored to meet the specific needs of farmers and rural populations (Agricultural Bank of Egypt, n.d.)^{*}.

The bank's origins date back to the economic crisis of the early 20th century, when it was established under Decree Law No. 50 of 1930 and the Royal Decree of 1931 as the Egyptian Agricultural Credit Bank, to protect farmers from exploitation by foreign lenders. It initially operated with a capital of one million Egyptian pounds.

In 1976, under Law No. 117, the bank was renamed the Development and Agricultural Credit Bank, expanding its mandate to include a broader range of services for rural development. Later, Law No. 84 of 2016 restructured the institution as a public sector joint stock company under the name Agricultural Bank of Egypt, fully owned by the Egyptian state and regulated by the Central Bank of Egypt.

Today, ABE is one of the largest agricultural banks in the Arab world and the Middle East, with a national network of about 1200 district branches and village banks across all governorates. It also manages more than 4 million square meters of storage space, including 2 million square meters dedicated to collecting local wheat from farmers.

The bank's vision is to drive economic development by promoting financial inclusion and offering integrated banking and agricultural services. Its mission aligns with national efforts

^{*} <https://abe.com.eg/>

to achieve food security and support rural livelihoods. Currently, ABE is undergoing a comprehensive restructuring and modernization process, which includes upgrading its branches and enhancing staff capabilities. With approximately 17,000 employees, the bank serves between 3 and 4 million clients in all branches (Fouad et al., 2022).

According to an informal discussion with an employee in the Information Technology Department who was responsible for training staff on the newly implemented digital systems within the bank, contextual insights were gathered regarding the implementation and internal support for digital transformation. This observation was included solely to describe the institutional environment and provide contextual understanding; since the present study adopts a purely quantitative design, these insights were not analyzed as qualitative data nor considered part of a mixed-methods approach.

The Agricultural Bank of Egypt utilizes two major systems that reflect its digital transformation efforts: the Document Management System (DMS) and the Finacle Core Banking System. These systems were introduced to streamline internal operations, enhance efficiency, and improve service delivery across various departments.

The DMS involves the use of specialized software and digital tools to store, manage, and track electronic documents and scanned images of paper-based records. At the Agricultural Bank of Egypt, the DMS plays a crucial role in improving internal processes. It is used to link customer loan files to their accounts, store and track audit documents and financial reports, and digitize new customer files during the account opening process.

Before adopting the Finacle Core Banking System, the bank relied on the Arabank system as its primary platform for managing daily banking operations. However, due to limitations in security, integration, and support for digital functions, the bank transitioned to Finacle as part of a broader digital transformation strategy. In April 2024, the Finacle Core Banking System was officially launched at ABE. According to its functionality in the Egyptian banking sector, the system enables the bank to offer a wider range of banking services.

8.3 Population and Sample

The study was conducted at the Agricultural Bank of Egypt's headquarters in Dokki, Cairo, which employs approximately 2,000 staff members. However, the relevant study population was restricted to employees who actively use the newly implemented Finacle Core Banking System. The study included a sample of 563 employees, whose valid responses represent an appropriate percentage of the target population. This sample size is sufficient for applying Partial Least Squares Structural Equation Modeling (PLS-SEM) in line with established statistical standards. PLS-SEM is appropriate for medium-sized samples, provided the data quality is adequate. Additionally, the sample was diverse in terms of demographic characteristics, including age and educational level. This diversity supports one of the main objectives of the study, which is to examine the moderating role of these variables in the relationship between the dimensions of the UTAUT model and the adoption of digital transformation technologies.

Due to the system being new, it was reported that most employees had access to the system. Approximately 1600 employees had access to the new system at the main office branch.

From the headquarters, a sampling frame was obtained with the individuals using this system. Accordingly, a simple random sampling technique was utilized. A total of 563 valid responses were received, representing the study sample. Therefore, this sample exceeded the minimum required of 311 responses to ensure a 95% confidence level and a 5% margin of error according to the Cochran equation (1963), as shown below:

$$n = \frac{Z^2 * P * (1 - P)}{e^2} = \frac{1.96^2 * 0.5 * 0.5}{0.05^2} = 384.16 \approx 385$$

$$n' = \frac{n}{1 + \frac{Z^2 * P * (1 - P)}{e^2 N}} = \frac{385}{1 + \frac{1.96^2 * 0.5 * 0.5}{0.05^2 * 1600}} = 310.46 \approx 311$$

Thus, the sample size was sufficient for further analysis.

8.4 Research Instrument

To examine employees' acceptance of digital transformation technologies, a structured questionnaire was developed in Arabic via Google Forms, based on the UTAUT model. The questionnaire consisted of two sections: the first collected demographic data, while the second included 22 items measured on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Out of the 22 items, 15 were drawn from established measurement scales used in earlier studies (Venkatesh et al., 2003; Attuquayefio & Addo, 2014; Mahmoud & Abdelaziz, 2024; Kim et al., 2024), reflecting four core dimensions: performance expectancy (4 items), effort expectancy (4 items), social influence (4 items), and facilitating conditions (3 items). Behavioral intention was measured using three items adapted from Venkatesh et al. (2012), Kim et al. (2024), Haridy, and Gaber (2024), while actual system use was assessed with four items based on Abbad (2021) and Kim et al. (2024). All of these items were mandatory to ensure full survey completion and reduce the risk of data loss.

8.5 Data Collection Procedure

Data was collected through a structured questionnaire developed in Arabic using Google Forms. The survey link was distributed electronically to employees at the Agricultural Bank of Egypt's headquarters. Participation was voluntary, and confidentiality and anonymity of participants were ensured.

8.6 Data Analysis Methods

This study employs Partial Least Squares Structural Equation Modeling (PLS-SEM) to test its hypothesized relationships. Furthermore, PLS-SEM is well-suited for this study as it is less demanding regarding sample size distribution and data normality assumptions, allowing for a focus on the theoretical relevance and quality of the model.

9- Research Results

Table 1: Demographic representation of the study

Variables	Categories	Frequency	Percentage
Gender	Female	410	72.8
	Male	153	27.2
Age	Less than 25 years old	24	4.3
	25-35 years old	450	79.9
	More than 35 years old	89	15.8
Education	Bachelor	438	77.8
	Masters	106	18.8
	PhDs	19	3.4
Experience	Less than 5 years	406	72.1
	5-10 years	68	12.1
	10-15 years	18	3.2
	More than 15 years	71	12.6
Position	Employee	474	84.2
	Head of Department	18	3.2
	Manager	71	12.6

Source: Calculations based on 563 respondents using SPSS 26

Table 1 shows that around 72.8% of the sample are females (410). This shows that the bank is female-dominated. The majority were aged 25-35 years old (450), representing 79.9% of the sample. Around 15.8% of the sample presented those aged more than 35 years old (89). As the minimum education level required to work in a bank was having bachelor's degree, it is not surprising that around 77.8% have their Bachelor's degree (438), while 18.8% have their master's degree (106), followed by only 3.4% having their PhD (19). It seems the majority had less than 5 years of experience (406). This percentage was followed by having more than 15 years of experience (71) for 12.6% of the sample. Only 3.2% of the sample had years of experience between 10 and 15 years (18). Regarding the position, the sample included 84.2%, 12.6% and 3.2% representing employees (474), managers (71), and heads of departments (18), respectively.

Table2: Reliability and Validity Analysis of the variables

Variables	Items	Loadings	VIF	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Adoption of Digital Transformation Technology	ADTT1	0.751	1.932	0.835	0.891	0.674
	ADTT2	0.879	3.075			
	ADTT3	0.923	3.317			
	ADTT4	0.711	1.422			
Behavioral Intention	BIU1	0.803	1.61	0.71	0.827	0.618
	BIU2	0.89	1.409			
	BIU3	0.646	1.313			
Effort Expectancy	EE1	0.814	2.244	0.865	0.909	0.715
	EE2	0.882	2.536			
	EE3	0.759	1.995			
	EE4	0.918	3.15			
Facilitating Conditions	FC1	0.794	1.552	0.71	0.838	0.634
	FC2	0.833	1.665			
	FC3	0.759	1.236			
Performance Expectancy	PE1	0.704	2.15	0.836	0.89	0.672
	PE2	0.89	3.138			
	PE3	0.848	2.179			
	PE4	0.825	2.382			
Social Influence	SI2	0.852	1.784	0.781	0.873	0.696
	SI3	0.861	1.944			
	SI4	0.787	1.425			

Source: Calculations based on 563 respondents using Smart PLS 3

Upon evaluating the reliability and validity analysis, as shown in Table 2, the variables in the study exceeded the threshold of the Cronbach alpha of 0.7 (Cheung et al., 2023). This indicated a high level of internal consistency and reliability. In addition, all dimensions demonstrated a composite reliability above 0.7 and an average variance extracted (AVE) above 0.5 (Nasution et al., 2020). The variables are confirmed to be valid. Considering the Variance Inflation Factors (VIFs) are below five, it can be inferred that multicollinearity does not pose a problem in the model (Nasution et al., 2020). Furthermore, all item loadings surpassed 0.6, showing the significance and importance of the statements (Cheung et al., 2023).

Table 3: Fornell-Larcker Criterion for Discriminant Validity Analysis

Variables	Adoption of Digital Transformation Technology	Behavioral Intention	Effort Expectancy	Facilitating Conditions	Performance Expectancy	Social Influence
Adoption of Digital Transformation Technology	0.821					
Behavioral Intention	0.59	0.786				
Effort Expectancy	0.599	0.756	0.845			
Facilitating Conditions	0.619	0.598	0.686	0.796		
Performance Expectancy	0.587	0.761	0.775	0.467	0.82	
Social Influence	0.68	0.632	0.739	0.79	0.697	0.834

Source: Calculations based on 563 respondents using Smart PLS 3

The Fornell-Larcker Criterion in Table 3 assesses discriminant validity, which confirms that the constructs in the model are distinct from one another. This is verified by comparing the square root of the AVE for each construct with its correlations to all other constructs. The results indicate that discriminant validity is established for all constructs. In every case, the diagonal value for a construct is greater than its correlations with any other construct. This demonstrates that each construct shares more variance with its own indicators than it shares with any other construct in the model, confirming they are measuring distinct variables.

Table 4: Sample Adequacy test for the dataset

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.714
Bartlett's Test of Sphericity	Approx. Chi-Square	13102.480
	Df	231
	Sig.	.000

Source: Calculations based on 563 respondents using Smart PLS 3

Table 4 shows that the results for the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity confirm that the dataset is suitable for factor analysis. The KMO value of

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.714 exceeds the commonly accepted threshold of .70, indicating that the strength of the relationships among variables is adequate. This means that the sample size is appropriate for the analysis. Furthermore, Bartlett's Test of Sphericity is highly significant (Sig. = .000), allowing the rejection of the null hypothesis that the correlation matrix is an identity matrix. This means there are sufficient correlations between the variables to proceed with factor analysis.

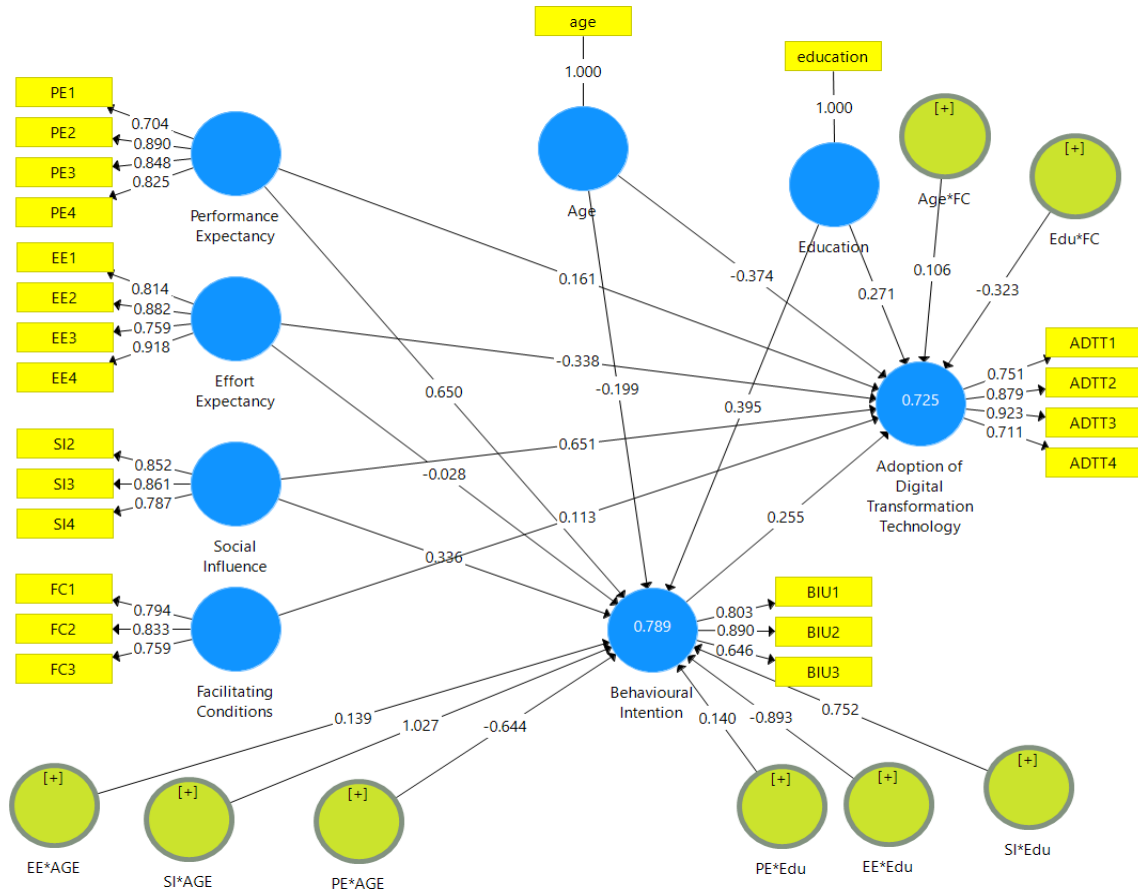


Figure 2: Structural Equation Model

Source: Calculations based on 563 respondents using Smart PLS 3

According to Zhang (2022), SEM is a statistical technique that deals with the inquiry and analysis of complex multivariate research data. While simpler methods like regression with the PROCESS macro are useful for preliminary or simple analyses, SEM is the definitive tool for testing theories involving direct and indirect effects. Its ability to model latent constructs and to test intricate networks of relationships simultaneously makes it the standard for rigorous modeling in the social sciences. The model, as shown in Figure 2, presented the relationships between different variables of the study. It also shows the path analysis along with the loadings of the statements. This shows how the model is well built, especially by observing the R-squared, which is one of the evaluation metrics of the model. It also shows the moderating effects and how they would affect the dependent variables.

Table 5: Path Coefficients for the Structural Equation Model

Path Hypotheses	Original Sample	Standard Deviation	T Statistics	P Values
Behavioral Intention -> Adoption of Digital Transformation Technology	0.255	0.038	6.728	0
Age -> Adoption of Digital Transformation Technology	-0.374	0.027	13.67	0
Age -> Behavioral Intention	-0.199	0.036	5.582	0
Education -> Adoption of Digital Transformation Technology	0.271	0.027	9.877	0
Education -> Behavioral Intention	0.395	0.078	5.07	0
Performance Expectancy -> Adoption of Digital Transformation Technology	0.161	0.042	3.801	0
Performance Expectancy -> Behavioral Intention	0.65	0.054	11.941	0
Effort Expectancy -> Adoption of Digital Transformation Technology	-0.338	0.042	7.966	0
Effort Expectancy -> Behavioral Intention	-0.028	0.098	0.29	0.772
Social Influence -> Adoption of Digital Transformation Technology	0.651	0.038	17.081	0
Social Influence -> Behavioral Intention	0.336	0.071	4.742	0
Facilitating Conditions -> Adoption of Digital Transformation Technology	0.113	0.039	2.921	0.004
Moderating Effect				
PE*AGE -> Behavioral Intention	-0.644	0.078	8.263	0
PE*Edu -> Behavioral Intention	0.14	0.09	1.56	0.119
EE*AGE -> Behavioral Intention	0.139	0.021	6.697	0
EE*Edu -> Behavioral Intention	-0.893	0.174	5.126	0
SI*AGE -> Behavioral Intention	1.027	0.064	15.968	0
SI*Edu -> Behavioral Intention	0.752	0.081	9.265	0
Age*FC -> Adoption of Digital Transformation Technology	0.106	0.016	6.593	0
Edu*FC -> Adoption of Digital Transformation Technology	-0.323	0.028	11.606	0
Mediating Effect				
Performance Expectancy -> Behavioral Intention -> Adoption of Digital Transformation Technology	0.166	0.034	4.89	0
Effort Expectancy -> Behavioral Intention -> Adoption of Digital Transformation Technology	-0.007	0.026	0.275	0.783
Social Influence -> Behavioral Intention -> Adoption of Digital Transformation Technology	0.086	0.025	3.392	0.001

Source: Calculations based on 563 respondents using Smart PLS 3

Table 5 clarifies that the behavioral intention has a significant positive impact on the adoption of digital transformation technology. As individuals age, their behavioral intent weakens, and they rely on digital transformation technology with a 99% confidence level. Thus, H2 is supported. On the other hand, the more educated the employee, the stronger

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their behavioral intention and the adoption of digital transformation technology at a 99% confidence level. Observing the direct effect of the variables on the adoption of digital transformation. It appears that the higher the performance expectancy, social influence, and facilitating conditions, the more likely employees are to adopt the new technology. This means that H1 and H3 are supported. It appears that social influence had the greatest impact, followed by performance expectancy, and then facilitating conditions. On the other hand, it seems the less effort it would require to use the technology, the less likely they are to adopt a digital transformation. The result may be that even if it consumes a lot of effort, it is still mandatory to use, and for this reason, the effort expectancy has a significant negative impact on the adoption of digital transformation.

Observing the behavioral intention, both performance expectancy and social influence had a direct positive significant impact on behavioral intention. On the other hand, the effort expectancy seems to have an insignificant impact on the behavioral intention at the 0.05 level of significance. This may be explained due to the strong moderating effect of education, which weakens the relationship between effort expectancy and the behavioral intention at a 99% confidence level. This shows that the more educated individuals are, the less likely they are to think about the amount of effort required to adopt new technology, and focus only on its fruitful results. The results also show that education had a significant moderating effect on the relationships between behavioral intention and social influence. Thus, H6 is partially supported. It strengthens the relationship between the variables. Age also plays a significant moderating role in the relationships between performance expectancy and social influence with behavioral intention at a 99% confidence level. Thus, H5 is partially supported. Regarding the adoption of digital transformation technology, both age and education had a significant moderating role in its relationship with facilitating conditions. Thus, H7a and H7b are supported

Noticeably, since effort expectancy had no significant impact on behavioral intention after the moderating effect was added, there will be no mediating effect in the relationship between effort expectancy and adoption of digital transformation. On the other hand, the behavioral intention mediates significantly the relationship between the adoption of digital transformation technology and both the performance expectancy and the social influence. This shows that the behavioral intention mediating effect does not eliminate the direct effect of the variables on the adoption of the technology. Thus, behavioral intention is a partial mediator supporting H4 partially.

Table 6: Model Evaluation Metrics for the Structural Equation Model

Variable	R Square	R Square Adjusted	SSO	SSE	Q ²	SRMR	NFI
Adoption of Digital Transformation Technology	0.725	0.72	2252	1203.48	0.466	0.097	0.672
Behavioral Intention	0.789	0.785	1689	946.076	0.44		

Source: Calculations based on 563 respondents using Smart PLS 3

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The increase in R^2 value from 0.654 and 0.660 to 0.725 and 0.789 for digital transformation technology adoption and behavioral intentions, respectively, after including moderating effects in the model, highlights its significance. The results indicated that, as shown in Table 6, age, education, performance expectations, effort expectations, social influence, and facilitating conditions accounted for 72% and 78.5% of the variance in digital transformation technology adoption and behavioral intentions, respectively. The Q^2 value, which is the measure of cross-redundancy validation, was greater than zero, proving that the model has good predictive power. The fit of the statistical model is assessed using a metric called the standardized root mean squared residuals (SRMR). The model is thought to have a good fit to the data, the closer the number is to zero, which is less than 0.1. The Normed Fit index (NFI) was found to be 0.672. This shows that the model fits the dataset better than the null model by 67.2% (Rachmawati & Mohaidin, 2019).

10- Discussion

According to the first hypothesis, which examined the impact of facilitating conditions on the adoption of digital transformation technologies, the findings of this study indicated a significant positive relationship. This result is consistent with the assumptions of the UTAUT model, where facilitating conditions are considered essential factors that enable effective technology adoption by providing the necessary organizational and technical support. This result aligns with the findings of Nepal and Nepal (2023), as well as Shaikh and Amin (2024), who found that facilitating conditions had a significant positive impact on the adoption of technologies in the banking sector using the extended UTAUT model. Similarly, Abbad (2021) reported that facilitating conditions have a significant direct positive effect on user behavior in the educational systems of developing countries. This can be explained by the fact that when a bank's working environment welcomes and supports new technology by providing the required tools, skills, and knowledge, the adoption of that technology becomes smoother, particularly within the Agricultural Bank of Egypt.

Regarding the second hypothesis, which examined the impact of behavioral intention on the adoption of technologies, this hypothesis was supported by the findings of this study. This is a foundational hypothesis in theories such as the UTAUT model and the Theory of Planned Behavior. Within this theoretical framework, intention is considered the most immediate determinant of actual user behavior. This result aligns with the findings of Abbad (2021) and Haron et al. (2021), who both discussed the role of behavioral intention as having a direct impact on user behavior as well as a significant mediating effect in the relationship between UTAUT factors and behavior.

The results indicate that performance expectancy and social influence are strong, positive, and highly significant drivers of behavioral intention, while effort expectancy is non-significant, thereby providing only partial support for the third hypothesis. This pattern is increasingly observed in complex, professional technology adoptions, where performance expectancy and social influence outweigh concerns about initial effort expectancy. Dwivedi et al. (2011) identified this pattern through a meta-analysis of 43 UTAUT studies, particularly in the context of ERP system adoption, showing that for complex technologies integral to employees' work, performance expectancy and social influence consistently

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outweigh effort expectancy in shaping behavioral intention. Their review showed that the majority of the literature identified performance expectancy and social influence as significant predictors, whereas effort expectancy had a weaker relative impact compared to other UTAUT factors. They argue that in such contexts, employees expect a learning curve when adopting new systems, making ease of use less influential on their ultimate intention to adopt the technology.

The mediating role of behavioral intention is supported for both performance expectancy and social influence. This indicates that they influence adoption not only directly but also indirectly by shaping the intentions of employees. Thus, the fourth hypothesis is partially supported. This finding reinforces the theoretical sequence proposed by UTAUT and is empirically supported by studies like Haron et al (2021), who found that intention fully mediated the effect of performance expectancy, social influence, and effort expectancy on adoption of mobile banking. Conversely, the mediation for effort expectancy was not significant, which is a direct consequence of its non-significant direct effect on intention itself. The different findings may be a result of applying the model in education, while this study is applied in the banking system, which makes the usage of the system more mandated.

Regarding the fifth hypothesis, some interesting patterns have emerged. The results provide strong evidence for the moderating role of age. The significant interaction effects with performance expectancy, effort expectancy, and social influence indicate that age significantly controls the impact of performance expectancy, effort expectancy, and social influence on intention. Regarding the moderating role of age with performance expectancy, it suggests that the positive effect of performance expectancy on intention is weaker for older employees. On the other hand, the strong positive moderating role on the relationship between social influence and behavioral intention indicates that social influence becomes a much more powerful driver of intention for older employees. The significant moderation for the relationship between effort expectancy and adoption of digital technology further underlines that the relationship between effort expectancy and intention is also stronger as the older the individual gets. These findings are consistent with several studies. Venkatesh et al. (2003) identified age as a key moderator in UTAUT, showing that social influence and effort expectancy are more important for older users, while younger individuals rely more on performance expectancy. Kim et al. (2024) similarly found that older employees are more influenced by social factors, whereas younger ones focus on ease of use. However, Dwivedi et al. (2011) found that age effects vary by context, and in complex systems, the impact of effort expectancy often weakens regardless of age.

Observing the sixth hypothesis, the analysis reveals that education is a significant moderator for several paths. The highly significant interactions with effort expectancy and social influence impact on behavior intention demonstrate that an employee's education level fundamentally changes how they perceive and react to technological and social cues. The negative coefficient for education moderating the relationship between effort expectancy and behavior intention suggests that higher education weakens the relationship between effort expectancy and intention, likely because more educated employees are more confident in their ability to learn new systems, regardless of how much time it takes to learn

them. The positive coefficient for the relationship of social influence indicates that social influence is more important for more highly educated employees. The non-significant moderation for education on the relationship between performance expectancy and behavior intention suggests that the belief that a new system will help job performance is universally important, regardless of educational attainment. The relationship related to performance expectancy was found to be significantly moderated by education, as by Mahmoud and Abdelaziz (2024). On the other hand, the findings related to social influence contradicted the significant mediator role of behavioral intention found in the banking industry.

Lastly, the seventh hypothesis, the education and age were found as significant positive moderators in the relationship between facilitating conditions and the adoption of a new digitized system in the bank. This can be explained by the fact that older employees need more training and skill to be able to use new systems. This finding supports the limitation found by Abbad (2021), who discussed that age is a potential moderator in the relationship between facilitating conditions and the adoption of new technologies. On the contrary, education weakens the relationship between facilitating conditions and the adoption of new technologies. Thus, the less educated need more skills and training to be able to smoothly adopt new technologies. It seems to contradict the results obtained from Mahmoud and Abdelaziz (2024); however, this may be related to the different industry of tourism when compared to banking.

11- Conclusion

This study successfully addressed the problem of limited adoption of digital transformation systems among employees in Egypt's public banking sector by applying the Unified Theory of Acceptance and Use of Technology (UTAUT) model to the Agricultural Bank of Egypt. The findings provided a comprehensive understanding of employee adoption behavior, revealing that performance expectancy, social influence, and facilitating conditions are the strongest determinants of behavioral intention and actual system usage, while effort expectancy was found to be statistically insignificant. Furthermore, the moderating effects of age and education offered valuable insights into how demographic characteristics shape technology adoption, older employees being more influenced by social and organizational factors, while highly educated employees focus on performance outcomes rather than ease of use.

The study contributes theoretically by extending the UTAUT model to a mandatory use, public-sector environment, incorporating demographic moderators that deepen understanding of employee behavior in digital transformation contexts. Practically, the findings provide evidence-based guidance for decision-makers in government institutions to design more effective digital training, support, and engagement strategies tailored to different employee groups. At the policy level, the findings align with Egypt Vision 2030 and the Digital Egypt Initiative, providing practical insights to guide future government digital transformation initiatives. Ultimately, this study bridges the gap between national digital strategies and actual employee adoption behavior, strengthening both academic understanding and practical implementation of digital transformation in Egypt's public sector.

12- Recommendations

Based on the findings, this study recommends that government institutions, particularly the Agricultural Bank of Egypt, adopt targeted digital training programs tailored to employees' age and education levels, as older employees require more practical training and ongoing support, while younger and more educated staff may benefit from advanced, performance-oriented modules. Organizational support and technical infrastructure should be strengthened through reliable systems, continuous maintenance, and accessible technical assistance to enhance facilitating conditions. Leadership should actively promote a digital culture by modeling positive technology use and fostering peer influence, which was shown to strongly affect behavioral intention. Moreover, integrating digital adoption indicators into employee performance evaluations and incentive systems can reinforce performance expectancy and sustain engagement. Establishing continuous feedback and monitoring mechanisms will also ensure that employees' challenges and suggestions are incorporated into future digital initiatives. Collectively, these measures can help accelerate digital transformation in Egypt's public sector, ensuring that employee readiness and motivation align with the national goals of the Digital Egypt initiative and Vision 2030.

13- Limitations and Future Research

This study, while offering valuable insights into digital transformation adoption within the Agricultural Bank of Egypt, is not without limitations. The research was conducted within a single public institution in Egypt, which may limit the generalizability of the findings to other sectors or countries. Moreover, the cross-sectional design restricts causal inference and does not capture changes in employee attitudes over time as they gain more experience with digital systems such as Finacle. Additionally, the sample was skewed toward younger and female employees, with relatively few older or highly educated respondents, which may affect subgroup analysis robustness. The study also excluded potential determinants such as trust, organizational culture, and self-efficacy that could further explain technology acceptance. Future research should address these limitations by employing longitudinal or mixed-method approaches, integrating objective system usage data, and replicating the study across different public and private sector organizations. Expanding the model to include psychological and organizational variables and comparing results across cultural or institutional contexts would enhance the explanatory and predictive power of the UTAUT framework in understanding digital transformation adoption.

References

- Abbad, M. M. (2021). Using the UTAUT model to understand students' usage of e-learning systems in developing countries. *Education and Information Technologies*, 26(6), 7205-7224.
- Abdelmonem, S. K., & Radwan, K. A. M. (2023). The impact of digital transformation on organizational mindfulness: A field study applied to employees at branches of the Agricultural Bank of Egypt in the New Valley Governorate. *Journal of Administrative, Financial and Quantitative Research*, 3(4), 239-304. <https://doi.org/10.21608/safq.2024.251167.1070>
- Agricultural Bank of Egypt. (n.d.). Biogas project. Agricultural Bank of Egypt. Retrieved September 7, 2025, from <https://abe.com.eg/biogasProject.html>.
- Alalwan, A. A., Dwivedi, Y. K., & Rana, N. P. (2017). Factors influencing adoption of mobile banking by Jordanian bank customers: Extending UTAUT2 with trust. *International Journal of Information Management*, 37(3), 99-110.
- Alshammari, S. H., & Rosli, M. S. (2020). A review of technology acceptance models and theories. *Innovative Teaching and Learning Journal (ITLJ)*, 4(2), 12-22.
- Attuquayefio, S., & Addo, H. (2014). Using the UTAUT model to analyze students' ICT adoption. *International Journal of Education and Development using ICT*, 10(3).
- Baharudin, H., & Khodari, S. N. T. (2022). The use of youtube motivates students in improving their Arabic listening skills. *International Journal of Academic Research in Business And Social Sciences*, 12(6), 1152-1164
- Dwivedi, Y. K., Rana, N. P., Chen, H., & Williams, M. D. (2011). A Meta-analysis of the Unified Theory of Acceptance and Use of Technology (UTAUT). In IFIP international working conference on governance and sustainability in information systems-managing the transfer and diffusion of it, 155-170. Berlin, Heidelberg: Springer Berlin Heidelberg.
- Edo, O. C., Ang, D., Etu, E. E., Tenebe, I., Edo, S., & Diekola, O. A. (2023). Why do healthcare workers adopt digital health technologies-A cross-sectional study integrating the TAM and UTAUT model in a developing economy. *International Journal of Information Management Data Insights*, 3(2), 100186. <https://doi.org/10.1016/j.jjime.2023.100186>.
- Egypt Today. (2020). *AOI, ABE sign deal to promote digital transformation*. Egypt Today. Retrieved September 7, 2025, from <https://www.egypttoday.com/Article/3/89921/AOI-ABE-sign-deal-to-promote-digital>
- Elbatanouny, S., Dafoulas, G., & Saleeb, N. (2023). Exploring Factors Affecting Mobile Government Services Adoption in the Egyptian Context. *Journal of Theoretical and Applied Electronic Commerce Research*, 18(4), 1820-1837. <https://doi.org/10.3390/jtaer18040092>
- Elgamal, N. H., & Al-Aassy, O., B. (2024). The impact of digital transformation on organizational performance in the banking sector in Egypt: An application on the

Agricultural Bank of Egypt. International Journal of Administrative, Economic and Financial Sciences, 3(9), 63–98.

ElKheshin, S., & Saleeb, N. (2020). Assessing the adoption of e-government using TAM model: Case of Egypt. *International Journal of Managing Information Technology (IJMIT)*, 12(1), 1–14. <https://doi.org/10.5121/ijmit.2020.12101>.

Elrashidy, O., Selim, H., & Kaoud, H. (2024). Exploring mobile payment adoption in Egypt: Challenges, behaviors and predictions. *Arab Journal of STI Policies*, 5(5), 10-20. <https://doi.org/10.21608/ARABSTI.2024.386069>

FirstBank. (2025, February 3). *Agricultural Bank of Egypt's digital transformation, its impact on deposits and loans volume*. FirstBank. Retrieved September 7, 2025, from <https://en.firstbankeg.com/10155>

Food Business Africa. (2024). *Agricultural Bank of Egypt expands network, enhances digital services*. Food Business Africa. Retrieved September 7, 2025, from <https://www.foodbusinessafrica.com/agricultural-bank-of-egypt-expands-network-enhances-digital-services>

Haridy, M., & Gaber, R. (2024). Factors affecting Customers' intention to use e-government in Egypt. *المجلة العلمية للدراسات التجارية والبيئية*, 15(1), 888-916

Haridy, S. M., Gaber, H. R., & Elsamadicy, A. (2025). Factors affecting customers' attitudes toward the intention to use electronic government services in Egypt. *The Academic Journal of Contemporary Commercial Research*, 5(1), 1–20.

Haron, H., Hussin, S., Yusof, A. R. M., Samad, H., & Yusof, H. (2021). Implementation of the UTAUT model to understand the technology adoption of MOOC at public universities. *IOP Conference Series: Materials Science and Engineering*, 1062(1), 012025. IOP Publishing. <https://doi.org/10.1088/1757-899X/1062/1/012025>

Kamel, S. (2021). The Potential Impact of Digital Transformation on Egypt. *Economic Research Forum Working Papers*, 1488, 1–75.

Khamis, R. (2023). *Measuring citizens' acceptance and usage of e-government services: Applying the Technology Acceptance Model (TAM) in Egypt* [Master's thesis, The American University in Cairo]. AUC Knowledge Fountain. <https://fount.aucegypt.edu/etds>.

Kim, Y., Blazquez, V., & Oh, T. (2024). Determinants of generative AI system adoption and usage behavior in Korean companies: Applying the UTAUT model. *Behavioral Sciences*, 14(11), 1035. <https://doi.org/10.3390/bs14111035>

Lee, C., & Coughlin, J. F. (2015). PERSPECTIVE: Older adults' adoption of technology: an integrated approach to identifying determinants and barriers. *Journal of Product Innovation Management*, 32(5), 747-759.

Mahmoud, A., & Abdelaziz, M. (2024). The Impact of Accepting Digital Transformation Technologies on Employees' Intention to Use: Education Level as a Moderator. *Minia Journal of Tourism and Hospitality Research MJTHR*, 18(2), 1-27.

- Malekpour, M., Sedighi, M., Caboni, F., Basile, V., & Troise, C. (2025). Exploring digital transformation and technological innovation in emerging markets. *International Journal of Emerging Markets*, 20(13), 96-121. <https://doi.org/10.1108/IJOEM-02-2023-0147>.
- Ministry of Communications and Information Technology (MCIT). (2024). *MCIT Yearbook 2024: Digital Egypt*. Ministry of Communications and Information Technology, Egypt. Retrieved from <https://mcit.gov.eg>
- Morris, M. G., & Venkatesh, V. (2000). Age differences in technology adoption decisions: Implications for a changing work force. *Personnel Psychology*, 53(2), 375-403. <https://doi.org/10.1111/j.1744-6570.2000.tb00206.x>
- Moussa, A., & Tarek, S. (2023). *Digital transformation and its impact in Egypt: A comprehensive literature review*. *International Journal of Professional Business Review*, 8(8), 1–20. <https://doi.org/10.26668/businessreview/2023.v8i8.2755>.
- Nepal, S., & Nepal, B. (2023). Adoption of Digital Banking: Insights from a UTAUT Model. *Journal of Business and Social Sciences Research*. 8(1), 17-34. <https://doi.org/10.3126/jbssr.v8i1.56580>.
- Nyimbili, L., & Chalwe, M. (2023). A review of technology acceptance and adoption models and theories. *International Journal for Multidisciplinary Research (IJFMR)*, 5(6), 1-10
- Shaikh, I. M., & Amin, H. (2024). Consumers' innovativeness and acceptance towards use of financial technology in Pakistan: extension of the UTAUT model. *Information Discovery and Delivery*, 52(1), 114-122.
- Tariq, M., Maryam, S. Z., & Shaheen, W. A. (2024). Cognitive factors and actual usage of Fintech innovation: Exploring the UTAUT framework for digital banking. *Heliyon*, 10(15). <https://doi.org/10.1016/j.heliyon.2024.e35582>.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.
- Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 157-178.
- Yan, Y., Qiu, X., & Wang, X. (2024). Does corporate digitization affect shadow banking business? Evidence from Chinese listed companies. *Heliyon*, 10(17). <https://doi.org/10.1016/j.heliyon.2024.e37468>
- Cheung, G. W., Cooper-Thomas, H. D., Lau, R. S., & Wang, L. C. (2023). Reporting reliability, convergent and discriminant validity with structural equation modeling: A review and best-practice recommendations. *Asia Pacific Journal of Management*, 1-39.
- Nasution, M. I., Fahmi, M., & Prayogi, M. A. (2020, March). The quality of small and medium enterprises performance using the structural equation model-part least square (SEM-PLS). In *Journal of Physics: Conference Series* (Vol. 1477, No. 5, p. 052052). IOP Publishing.

Rachmawati, I., & Mohaidin, Z. (2019, May). Understanding the mediating roles of satisfaction and switching barriers on user experience and loyalty chain in Indonesia GSM Operators. In 1st International Conference on Economics, Business, Entrepreneurship, and Finance (ICEBEF 2018) (pp. 482-491). Atlantis Press

Zhang, H. (2022). Structural equation modeling. In *Models and Methods for Management Science* (pp. 363-381). Singapore: Springer Nature Singapore.

Questionnaire Form

First Section: General Background

1- Gender:

☐ Male

☐ Female

2- Age:

☐ Less than 25 years old

☐ 25- less than 35 years old

☐ 35- less than 45 years old

☐ More than 45 years old

3- Educational qualification:

☐ PhD

☐ Master

☐ Bachelor

☐ Intermediate qualification

4- Experience years in the current organization:

☐ Less than 5 years.

☐ 5- less than 10 years.

☐ 10- less than 15 years.

☐ More than 15 years.

5- Job title

☐ Employee.

☐ Manager.

☐ Department Head.

☐ other, please specify:

Second Section:

Please indicate (✓) in the appropriate place, that expresses your opinion with each of the following statements:

Choices extend from: 5: (strongly agree) 4: (agree) 3: (neutral)
 2: (disagree) 1: (strongly disagree)

Statements		1	2	3	4	5
UTAUT Factors						
Performance Expectancy						
1	I believe that adopting digital transformation technologies will support me in performing my work tasks more effectively.					
2	Using digital transformation technologies enables me to get things done faster.					
3	The use of digital transformation technologies enhances my overall work productivity.					
4	Applying digital transformation technologies in my job improve my professional development opportunities, such as promotions or salary increases.					
Effort Expectancy						
5	I find it easy to interact and communicate effectively when using digital transformation technologies in my work.					
6	I can quickly learn the skills required to use the digital transformation technologies in my government institution.					
7	I find digital transformation technologies easy to use and straightforward.					
8	Acquiring the necessary skills to use digital tools in my job is simple for me.					
Social Influence						
9	My colleagues believe I should use digital transformation tools in performing my job duties.					
10	Individuals whose opinions I respect at work encourage me to use digital transformation technologies.					
11	The support of executive management has made it easier for me to engage with digital transformation technology					

$$= 341 =$$

Statements		1	2	3	4	5
12	My organization generally supports the use of digital transformation technologies in daily operations.					
Facilitating Conditions						
13	I have the tools necessary to use digital transformation technologies in my workplace.					
14	I have the knowledge and skills needed to effectively operate digital systems related to my job.					
15	Technical support is readily available in my organization to help resolve issues related to digital transformation technologies.					
Intention to Use						
١	In the future, I intend to continue using the system to carry out my work-related tasks.					
٢	I will regularly use system services as part of my daily job responsibilities.					
٣	If given the opportunity, I will prefer to use system platforms to perform job-related activities.					
Actual system use						
1	I consider myself a regular user of the system.					
2	I tend to use the system routinely.					
3	I complete most of my routine tasks through the system.					
٤	Using the system has become a regular part of my work activities					