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Navigating Digital Transformation in the UAE: Benefits, Challenges, and Future Directions in the Public Sector

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Abstract: Digital transformation is a process in which the latest technologies are used in various business fields to keep pace with continuous changes. It involves the strategic and profound integration of digital technologies into an organization's core business operations, processes, and models. In this study, a quantitative approach was used to study the impact of DT adoption on public sector transformational change projects in the United Arab Emirates (UAE). The diffusion of innovation theory (DIT) and the unified theory of acceptance and use of technology model (UTAUT) were used in the factor analysis. This study highlights that digital transformation initiatives in the UAE have benefited from a strategic alignment with government initiatives, such as AI and blockchain strategies. However, public sector organizations face challenges, such as the high costs of technology adoption and cybersecurity risks during integration with legacy systems. The significance of social influence, including elements like use behavior and behavioral intention, was identified as essential for digital transformation, suggesting the importance of technology in job performance. Similarly, digital transformation projects improve IT competence and reduce resistance to change among leaders and individuals. The findings underscore the importance of investing in infrastructure and continuous IT training to sustain digital transformation. More studies are required across specific sectors to further explore the impact and scalability of DT initiatives in the UAE public sector.

Keywords: transformational change; digital transformation; IT competence; resistance to change; UAE public sector; digital acceptance

Citation: Alzarooni, A.I.; Alhashmi, S.M.; Lataifeh, M.; Rice, J. Navigating Digital Transformation in the UAE: Benefits, Challenges, and Future Directions in the Public Sector. *Computers* **2024**, *13*, 281. https://doi.org/10.3390/computers13110281

Academic Editor: Paolo Bellavista

Received: 6 September 2024
Revised: 22 October 2024
Accepted: 23 October 2024
Published: 29 October 2024

1. Introduction

The UAE is a pioneer in transformational projects in the public sector [1]. This journey began in 2007, when it launched its first comprehensive strategic plan [2,3]. Whereas many countries have implemented transformational change (TC) projects using digital transformation (DT) with varying levels of success, the UAE has achieved remarkable DT successes over the past ten years [1]. This was achieved by launching several strategies with a clear reliance on digitization and the use of modern technologies, such as DT strategy [4], artificial intelligence [5], and blockchain [6]. Many previous studies argue that widespread reliance on technology and DT has a positive impact on improving performance and effectiveness of resource management [7,8], in addition to strengthening organizational IT competence (IC) [9,10].

On the other hand, other studies have indicated DT's negative effects, including increased resistance to change (RC) due to fear of replacement, new challenges, and uncertainty [11]. However, while many studies explore DT in the private sector, there is limited research on its application in the public sector, particularly in understanding its impact on TC projects in government institutions. This study addresses that gap by focusing on the UAE's public sector. Understanding the nature of such relationships and

challenges surrounding the movement not only helps the departments engaged in efforts to prepare and prioritize resources, but it is also rather instrumental for organizations' conscious and efficient adaptation of these enablers, presenting a solid justification for an increased investment in developing IC and the implementation of more DT initiatives as part of other core competencies and challenges that support the transformation of today's organizations into the coming digital era.

This study contributes to the theoretical framework of DIT and UTAUT by demonstrating how DT initiatives in the UAE public sector enhance TC projects. By applying these models in a public sector context, the research extends their applicability beyond private sector studies, providing empirical evidence on the role of digital technologies in driving organizational change in government institutions by answering the following research questions:

(1) Do digital transformation initiatives have a positive impact on transformation change projects in the public sector in the UAE?

(2) How can we employ the potential of digital transformation to increase performance efficiency and improve quality of life in the public sector of the UAE?

The structure of this paper is organized as follows: Section 2 covers the literature review, conceptual framework, applied theories, and targeted factors; Section 3 details the methodology; and Section 4 presents the results. Section 5 provides the discussion, and Section 6 concludes the paper.

2. Literature Review

2.1. Transformational Change (TC)

TC has become a ubiquitous buzzword in the government sector, signifying a shift from incremental reforms to fundamental alterations in structures, processes, and mindsets. Understanding this term's nuances and applications is crucial, particularly in the context of administrative development globally and within the unique landscape of the UAE. It is important to recognize that TC is not a fixed concept. It encompasses a spectrum of approaches and definitions. A few authors define it as a fundamental shift in 'organizational paradigms' [12,13]. Others discuss the need for essential changes in government processes and emphasize the complexity and multi-dimensional nature of managing the transformation of public services [14]. Madanchian et al. argue that DT requires "organizational change processes" to leverage technology effectively [15].

In comparison, Kotter frames it as an eight-step model, emphasizing vision, leadership, and empowerment in the context of government [16]. Termeer et al. view it as a radical shift in government structures, processes, and policies [17], thus redefining the role and purpose of government [18]. Moreover, multiple factors, including organizational culture, leadership, and technology, impact TC projects [19]. However, achieving such transformations is fraught with challenges. RC and fear of the unknown [16], bureaucratic inertia, and lack of leadership commitment can hinder progress [20–23].

An overview of public sector reform experiences across Commonwealth countries through case studies reveals its significance in improving service delivery, enhancing accountability, and fostering economic growth. In addition, it involves a combination of capacity building, decentralization, performance management, and the use of technology [24]. Nevertheless, the UAE's change process could also face challenges on its way to TC. Resistance and slowing progress are the outcomes of cultural factors, vested interests, and a rigid decision-making process [4]. However, the UAE has done quite well in administrative reform through DT drives since 2007 [2] and has achieved remarkable successes, as highlighted in various international reports [1,5,25] and competitiveness indicators [26]. The extant literature review reveals that the UAE's experience in TC projects based on DT initiatives appears to have gained quite limited attention in the prior literature. Therefore, this study will explore the unique dimensions of DT through a first hypothesis: DT initiatives positively impact the success of TC projects in the context of the UAE public sector.

2.2. Digital Transformation (DT)

Significant technological and infrastructural changes have been implemented in the past three decades. These changes include the invention and successful integration of mobile and cloud computing, big data analytics, social media networks, artificial intelligence (AI), and the Internet of Things (IoT) [27,28]. Kim et al. argue that through these changes, governing bodies have felt pressure to integrate innovations such as collaborative value creation and governance processes, decision-making practices, and work arrangements, especially within the public service sector [27]. According to Buffat, through the partial or complete application of these technologies in their working systems and dealings with the public, the public sector has become a 'digital public service agency' [29,30].

The notion of DT has shifted over the last decade. Both private and public sectors have identified the growing importance of realizing organizational development in light of the fast-changing digital landscape [31]. Most traditional business models and continuous processes were affected by the growth of digital technologies that require new organizational management strategies [32,33].

Before defining DT, it is crucial to differentiate it from other related terms in this study area, especially between 'digitization' and 'digitalization'. Wuersch et al. [34] argue that DT, previously conceptualized as 'digitization', refers to the technological transformation from analog to digital. When defined as 'digitalization', it includes fundamental changes to business models and processes based on digitization initiatives [34]. On the other hand, digitalization is defined as using digital information and communication technologies to induce changes within business-oriented sectors. This ensures the efficacy or generation of new revenue and instigates value-adding opportunities, which has been extensively paired with the context of DT [35]. Drawing upon the grounded theory proposed by Wolfswinkel and responding to the exhaustive literature analysis of more than two hundred fifty scientific papers [35,36], DT is instead defined as '*a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies*'.

Therefore, DT is a process that involves the strategic and profound integration of digital technologies into an organization's core business operations, processes, and models [37]. It goes beyond simply implementing new technologies. Instead, holistic transformation improves an organization's operational performance, creates new competencies, and develops innovative business models [32,38]. DT is constituted to deliver change through the progressive introduction of technological tools like cloud computing, big data, IoT, and AI, which help organizations gather, analyze, and use data more effectively for better decision-making and work performance [37].

The multi-continental digital platform known as the Observatory of Public Sector Innovation (OPSI) advocates for innovation based on best practices in support of innovation in the public sector and documents seven principles for the DT governing public sector innovation, including the following: data-informed or data-driven decision-making that employs factual evidence to build consensus; openness via making information available to the public; design-driven where decisions and implementation should follow a discovery–prototyping–delivery cycle; and iterative processes [39]. Similarly, the Organization for Economic Cooperation and Development (OECD) offers twelve principles for the DT of the public sector [40,41].

Public sector organizations have been grappling with the challenges and opportunities presented by DT. The public sector has faced significant pressure to modernize and adopt digital technologies. This pressure stems from the need to achieve multiple objectives: improve service delivery, enhance citizen engagement, and increase operational efficiency [42,43], as well as to simultaneously build the organizational IC [9,10]. Prior researchers have outlined several internal and control factors that shape the success of DT in the public sector, namely organizational/managerial factors, IT capabilities, and environmental factors [44]. For instance, the work by Mergel et al., which compared 20 successful and 20 less successful cases of DT in the public sector, documented the need

for effective leadership, a culture of innovation, and strategic visions for DT [45]. DT research has also emphasized the need for DT initiatives to be directed by and integrated with an organization's corporate strategy [46] and highlighted the appropriateness of employees' digital skills and competencies for the transformation [47].

In this regard, it would be important not to underestimate the recent global COVID-19 pandemic that accelerated the DT of the public sector, which invested in enhancing public service delivery to help facilitate citizens' digital access. Such initiatives have been characterized by rising investment in digital infrastructure and designs, which are user-convenient frameworks and back-end design frameworks within the public sector [30,48]. According to Ahn and Che's survey, the use of artificial intelligence (AI) in the U.S. public sector is increasing, thereby increasing efficiency and effectiveness in day-to-day processes [28].

The UAE, for instance, has been one of the most active countries in practicing DT, especially in the public sector [25,49]. The government's initiatives are intended to transform the UAE into a leader in smart city technologies [10,50,51], which is a model for other countries in the region [37]. The UAE has invested heavily in digital infrastructure, such as high-speed internet and cloud computing, to facilitate the adoption of digital technologies in the public sector [52,53]. A study by Radwan et al. discovered that the UAE government has made significant progress in digitizing its services [50]. Finally, Hofmann and Ogonek called for more research concerning the effects of DT initiatives on the development of the IC in both the public and private domains [54]. This will be tested through the following:

Second Hypothesis: DT initiatives positively impact the improvement of IC in UAE public sector organizations

Nevertheless, the implementation of DT in the UAE public sector faces some challenges, as the following section describes. The high costs associated with implementing and maintaining digital technologies can be a significant barrier, particularly for resource-constrained organizations. The complexity of integrating legacy systems with new digital platforms can be a significant hurdle. Meanwhile, hacking and viruses may compromise the security of citizens' information [55]. Also, some factors slow down DT initiatives, particularly employee RC and the lack of digital skills among employees [56]. According to Wang, the RC factor represents a significant behavioral, or actionable, challenge for organizations in the implementation of DT, and ultimately leads to poor organizational performance [47]. In addition to this, Wang argues that cross-national research investigations should be used in order to gather data regarding how other contexts affect DT initiatives. This study comes to the test:

Third Hypothesis: DT initiatives positively impact reducing RC in UAE public sector organizations.

2.3. Theories Used in the Study

The application of DIT in this study was based on documented benefits to stakeholders in the public services sector in the UAE. Moreover, its application was also based on the benefits of the theory for the target population, in this case, public sector workers, since relevant respect and consideration for all involved stakeholders are intertwined with robust strategies for implementing innovative, digital-driven change [57,58]. The UTAUT framework comprises three direct constructs of behavioral intention and two direct determinants of actual use. Performance Expectancy (PE), Effort Expectancy (EE) and Social Influence (SI) make up the Behavioral Intention (BI) constructs, while Facilitating Conditions (FCs) and behavioral intention are the direct determinants of actual use [59,60] (Figure 1).

Performance Expectancy (PE) is "the extent to which an individual embraces the belief that usage of the system will assist in attaining improvements in job performance" [59]. This factor refers to the perceived usefulness of the technology, which is defined as the degree to which the user feels that the use of the technology will enhance performance with regard to the job or make it easier to accomplish a set task. The Effort Expectancy (EE) relates to the extent of perceived ease in the deployment of the technology with little effort by users,

while the Social Influence (SI) is the impact of the influence of social factors and people's opinions on any technology that the individual has the intention to use. It comprises perceived behavioral control (perceived social pressure) as well as a social image (how using the technology improves the status of the user) [59]. Lastly, Facilitating Conditions (FCs) outlines the measures in place to provide help and services to the users to enable, encourage, and enhance acceptance and implementation of the innovation, including IT assistance, tutoring, and physical resources [59,60].

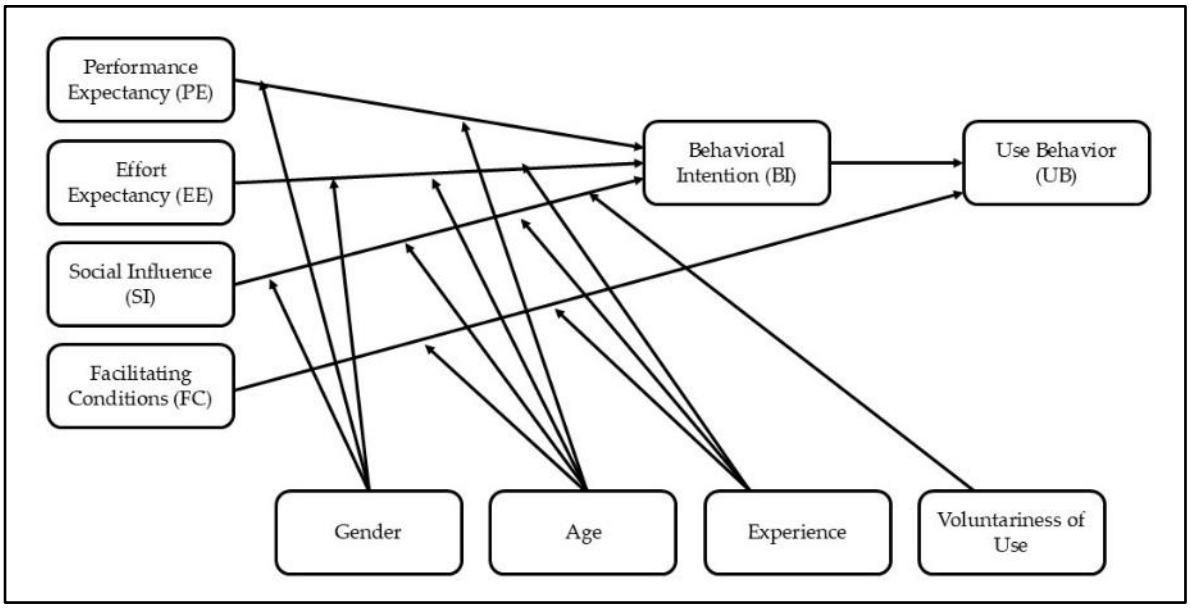

Figure 1. Unified theory of acceptance and use of technology [59].

Furthermore, UTAUT includes external variables that may impact the associations between the four core factors and Behavioral Intention (BI) to adopt a technology: gender, age, experience and voluntariness. The reasons why the UTAUT framework was chosen for this study are as follows. Firstly, as seen in the figure above, the proposed framework for context-aware Knowledge Management Systems (KMSs) has been expansive, well-defined, assertive, and piloted in various fields, including management, E-commerce, and the education sector. Secondly, the UTAUT framework has been found to be one of the most accurate technology acceptance models that can help explain the fluctuations observed in technology acceptance compared to other models [61].

To break down the flowchart diagram representing the "The UTAUT" here's an explanation of the arrows: Performance Expectancy directly influences Behavioral Intention to use the technology. If users find Effort Expectancy easy, it positively affects their Behavioral Intention. Social Influence impacts the user's intention to use technology, while Facilitating Conditions can influence the user's intention to use technology. Gender, Age, and Experience as a demographic variable may moderate the effects of the four constructs (Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions) on Behavioral Intention. Voluntariness of Use directly influences Use Behavior. Behavioral Intention to use technology directly predicts actual Use Behavior, which is the final outcome—whether the user actually uses the technology.

The integration of the two models allows the development of strategies that facilitate the adoption of digitally transformative projects in the UAE. For example, if digitally transformative projects are perceived as complex—a key feature of DIT—then responsible bodies are tasked with providing critical facilitating conditions—UTAUT—to address these concerns. Through establishing a nexus between the UTAUT and DIT theories, relevant stakeholders can implement innovations or transformative projects in a phased manner while paying attention to developed studies and ensuring the continuous monitoring of

adoption rates, which can be established through the gathering of feedback and making the necessary adjustments [58]. Conclusively, integrating UTAUT and DIT theories allows the creation of a holistic theoretical and conceptual framework that accounts for the individual-level factors of UTAUT and the innovation characteristics of DIT within the UAE public service sector, increasing the likelihood of successful technology adoption and diffusion.

3. Methodology

A quantitative approach was used to study the impact of DT adoption on public sector TC projects in the UAE. The DIT and the UTAUT models were used in the factor analysis. This study used a quantitative methodology to conduct a cross-sectional online survey [62]. The study examines the impact of DT adoption on public sector TC projects in governmental and semi-governmental institutions in the UAE in the context of federal and local governments. Online channels facilitated a broad audience reach through active professional networking, supporting the completion of the questionnaire [63]. Twitter (X), Facebook, and WhatsApp were the most widely used platforms for disseminating these questionnaires.

3.1. Study Design

A four-part online questionnaire was developed based on two sources as a data collection instrument. The first source of questions and themes was based on three general factors affecting the successful implementation of DT projects in the UAE. These, in turn, were drawn from an assessment of the literature detailing the perspectives of numerous stakeholders in the UAE's public sector through a systematic literature review [64]. The second source of questions and themes was based on a validated questionnaire developed by Viswanath, based on the UTAUT model [59].

A quantitative survey was integrated into this research based on the aim outlined above. The results produced from this survey data were utilized to create an improved comprehension of governmental TC projects in the public sector across the UAE, considering digital technology acceptability from the perspective of employees and managers. Various factors that impacted government projects in the country were evaluated, as shown in the table below (Table 1). The research considered three main themes, each of which possessed three sub-themes, generating a total of nine sub-themes. For instance, different sub-themes were considered under the main DT initiatives factors, such as digital by design, user-driven, and proactiveness, as illustrated in the table below. This categorization aimed to ensure time efficiency by considering fewer survey questions to foster participation. The themes involved were finalized based on their sub-themes and the codes and definitions considered.

Table 1. Factors considered in the study.

Theme and Sub-Theme	Code	Definition
Digital transformation initiatives	DT	Incorporation of digital innovation into various business areas, essentially transforming its operations and value delivery to clients.
Digital by design	DbD	A technique to incorporate digital technology (DT) and potential into the essential services, products, and operations delivery of public sector entities.
User-driven	UD	A technique where the experiences, preferences, and needs of the users are core to the development and establishment of processes, services, or products.
Proactiveness	Pr	Imitating and anticipating changes and processes instead of responding to events upon their occurrence.
IT competence	IC	The primary factors contributing to the success and effectiveness of government projects in UAE.
IT Infrastructure capability	ITIC	The projects' potential to effectively leverage, manage, and maintain its IT devices to aid the objectives and operations of the government's projects

Table 1. *Cont.*

Theme and Sub-Theme	Code	Definition
IT business-spanning capability	ITBSC	The potential of the government's IT sector to effectively encompass different elements of the projects to support its objectives, approaches, and procedures.
IT proactive stance	ITPS	The technique considered in government projects (in UAE) in the IT sector to addressing, prepare, and predict for opportunities and challenges concerning IT before they become critical or immediate.
Resistance to change	RC	The opposition or scepticism by workers in government projects to change in technologies, organization tincture, and production processes.
Cognitive resistance to change	CRtC	The mental limitations or issues that a worker in government projects faces when confronting different digital technology dynamics.
Behavioral resistance to change	BRtC	The behaviors or characteristics shown by workers in government projects across the UAE that negatively impact digital technology change efforts.
Affective resistance to change	ARtC	The attitudinal or emotional limitations a worker could be subjected to upon digital technology change within government projects in UAE.

Before dissemination, the questionnaire underwent several development stages, including identifying the type of data for collection relevant to the study, population targeting, and analyzing the distribution methods. Two languages were adopted for the questionnaire, Arabic and English, based on recommendations [65] on the importance of a clear and understandable language for prospective participants and to broaden the research scope.

3.2. Exclusion and Inclusion

The study included all professionals from different government project fields, such as IT management and many other professions in the UAE, based on their status, such as whether they are currently working or used to work on government projects. However, pilot study participants were excluded from the analysis as well.

3.3. Ethical Considerations

The issues of ethicality are always crucial, as researchers have to focus on protecting participants from harm, including the risk of identification in this particular case [66]. The management of data collection and processing for all study materials was exercised and formulated carefully, considering ethical research standards and adhering to established guidelines to comply with the University of Sharjah Research Ethics Committee (REC). In addition, participants were informed that their identity, identification number, and any other form of identification would be kept anonymous and concealed from anyone throughout the entire research process, from the design phase to the completion phase. Data availability was limited to the principal researcher and research supervisory team [67] and the Participant Information Sheet (PIS). Ethical clearance for the study was sought and given under reference number REC-23-11-03-01-PG.

3.4. Data Collection

Data were collected through a survey in Arabic and English on Google Forums, which took less than 15 min to complete. The survey link was shared with the public on WhatsApp, Facebook, and X (formerly Twitter) with the help of key public sector professional groups in the UAE. The survey was designed based on the guidelines outlined by Tarka [68] and includes 37 questions. Seven questions relate to the participants' demographic details, and one excludes those who have not been involved in or have not dealt with DT initiatives. Twenty-nine questions use a 7-point Likert scale to measure the attitudes and behaviors of respondents towards DT initiatives in the public sector in the UAE. Furthermore, the links were reposted several times over a period of 15 to 30 days to encourage all to participate in the research before closing the survey.

3.5. Data Analysis

The gathered data from the online questionnaires were exported to R Software 4.4.1, where cleaning was done by omitting outliers and checking spellings and null and duplicate values before the analysis. In addition, six questions from the questionnaire were reverse-coded. The analysis was carried out in three main steps, as illustrated in the table below (Table 2).

Table 2. Steps in the quantitative analysis.

Step	Analysis Carried Out	Formula or Analysis Tool
1	Evaluate essential elements impacting the public sector acceptance of digital technology in UAE	RII Formula in R Software
2	Mapping the relative importance index (RII) based on significant elements versus UTAUT constructs	Principal investigator depending on the themes' definition while rechecking the procedure and confirming with other members of the team
3	Ordinal regression analysis (OR), principal component analysis (PCA), and descriptive statistics	R Software

The First Step: This step of the study was primarily centered on identifying and analyzing the key factors influencing the acceptance of digital transformation (DT) by project managers within the public sector or government organizations in the UAE. It aimed to explore the various elements, such as technological, organizational, and cultural aspects, that impact how these managers adopt and integrate digital transformation initiatives in their respective projects. Hence, Radwan's Relative Importance Index (RII) formulation was considered, which defines the tools as the average score assigned to the respective factors in the assessment. The outcomes suggest that the closer the value was to one, the greater the significance of the element based on the participants' views. As a result, this technique has been integrated by different practitioners to quantitatively evaluate relative importance in various fields, such as infrastructure and construction education [50]. The RII formulae utilized in this study are illustrated in the expression below.

$$\mathrm{RII} = \frac{\sum \mathrm{W}}{\mathrm{A} * \mathrm{N}}, \text{ also expressed as}$$

$$\mathrm{RII} = \frac{\mathrm{W7} * (\mathrm{n7}) + \mathrm{W6} * (\mathrm{n6}) + \mathrm{W5} * (\mathrm{n5}) + \mathrm{W4} * (\mathrm{n4}) + \mathrm{W3} * (\mathrm{n3}) + \mathrm{W2} * (\mathrm{n2}) + \mathrm{W1} * (\mathrm{n1})}{\mathrm{A} * \mathrm{N}}$$

In the above, W was the weight the participants provided for the respective element, scored between 1 and 7 (1 = strongly disagree, and 7 = strongly agree). The highest weight was A, while N was the total number of participants.

The second step: This step entailed presenting detailed findings derived from the initial phase, where the Unified Theory of Acceptance and Use of Technology (UTAUT) was incorporated, along with various modifications, as depicted in the diagram below (Figure 2). This stage involved integrating the UTAUT model with specific adjustments to better align with the research context, leading to a comprehensive outcomes analysis. The primary constructs (independent variables) considered in the past assessment included facilitating conditions (geographical location, managerial experience, age, and gender), SI, EE, and PE under UB and BI.

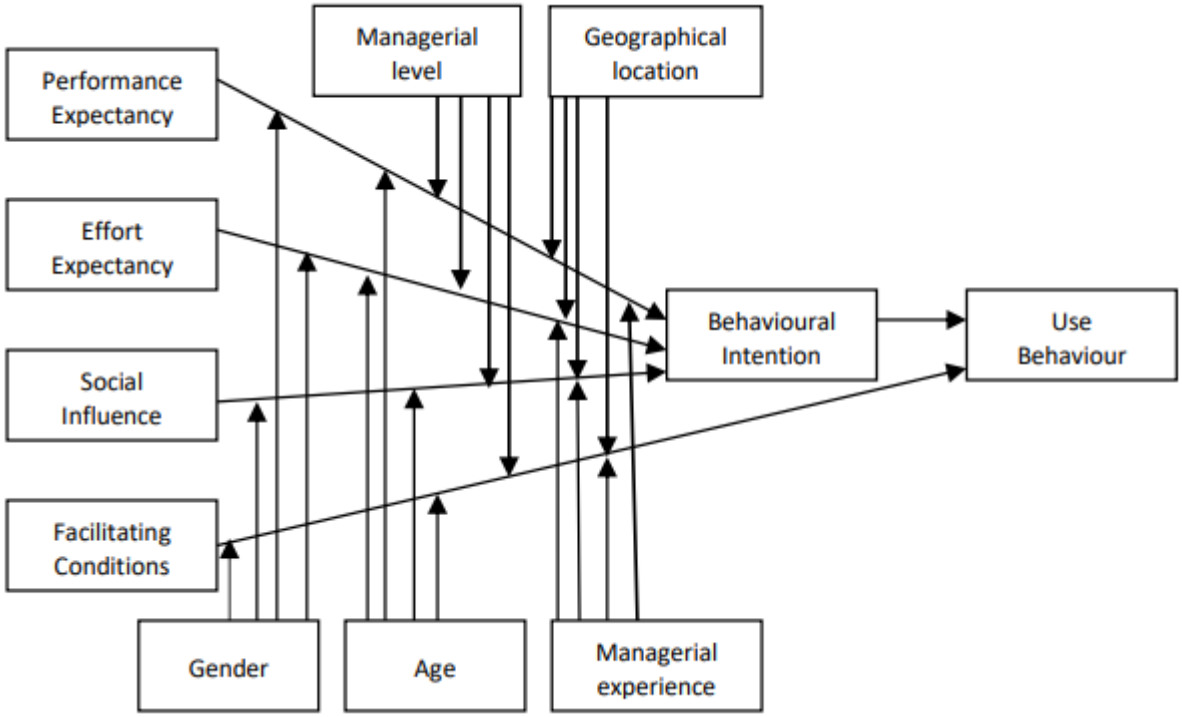

Figure 2. Adopted UTAUT with modifications.

This modified UTAUT model aims to understand how various elements impact technology adoption in different contexts. Here's an explanation of the arrows: PE directly influences BI to use the technology. If users find EE easy, it positively affects their BI. SI impacts the user's intention to use technology, while FCs (e.g., resources, support) can influence the user's intention to use technology. Demographic variables such as Gender, Age, and Managerial Experience may moderate the effects of the four constructs (PE, EE, SI, and FC) on BI. Managerial Level and Geographical Location directly influence BU, indicating that organizational context matters. Behavioral Intention to use technology directly predicts actual UB, which is the final outcome—whether the user actually uses the technology.

This step focused on mapping the importance identified in the themes based on the RII approach versus the UTAUT constructs for the purpose of further research. The themes involved were based on the identified importance. They were clustered with different constructs in the model to potentially impact the UB and BI of the TC project managers in the public sector across UAE in their efforts toward DT.

The third step: This phase was carried out to thoroughly assess and verify the various processes described in the following sections. This evaluation aimed to ensure that each process was accurately analyzed and validated according to the research objectives. By applying rigorous assessment methods, the goal was to confirm that the processes followed were reliable and consistent, ultimately enhancing the credibility and validity of the study's outcomes. This step was crucial in ensuring that any conclusions drawn from the research were based on sound and verifiable data. This step aimed to ensure the accuracy and reliability of the analysis by applying statistical techniques, thereby confirming the robustness of the research findings and methodologies employed throughout the study. Descriptive statistics focused on describing the demographics of the respondents. The common features of the participants' feedback could be demonstrated and compared. Hence, this assessment illustrated percentages, frequencies, standard deviations, and means. The next step aimed to apply principal component (PCA) analysis to minimize the number of UTAUT constructs to a reduced quantity while capturing similar data in huge datasets. The typical approach for the retention of factors, as suggested by Kaiser, indicates that only variables with eigenvalues of more than one should be retained, since those with values

less than one would negatively impact the reliability of the components [69]. Furthermore, this step employed Ordinal Regression (OR) assessment to evaluate the normality of data distribution while deciding the type of regression analysis necessary to statistically be the most appropriate for establishing a predictive framework for BI and UB.

4. Results

4.1. Data Cleansing

A comprehensive data cleansing process was executed to guarantee the integrity and reliability of the survey data for analysis. This process involved multiple key steps to eliminate any inconsistencies, errors, or incomplete responses that could compromise the quality of the data. These steps included identifying and removing duplicates, addressing missing values, correcting inaccuracies, and standardizing the data to ensure consistency. By performing this meticulous data cleansing, the study aimed to enhance the accuracy of the subsequent analysis, ensuring that only high-quality, reliable data was used to draw meaningful conclusions:

I. Filtering by work location: responses indicating a 'Work location' outside of the UAE were excluded, aligning with the study's focus on UAE-based professionals.
II. Combining educational levels: responses regarding 'Educational level' were consolidated into three categories: 'Pre-graduate' for those below a bachelor's degree, 'Graduate' for bachelor's degree holders, and 'Postgraduate' for those with an educational level higher than a bachelor's degree.
III. Job level categorization to ease coding of questions related to 'Job level,' responses were grouped into two broad categories: 'Employee' and 'Manager', and other non-employee responses were excluded.
IV. The number of employees' responses was categorized into two groups: 'Up to 500 employees' and 'More than 500 employees.
V. The exclusion of irrelevant organization types with responses providing 'Private' or 'Other' as an answer to the type of organization' question was omitted since the study only targets public sector organizations.
VI. Eliminating non-participants in automation projects using questions with respondents stating no participation or experience with the automation projects was omitted so that the responses only featured those with some experience with the projects.

Among the 350 residents of the UAE who were contacted, 296 participated in the study on fulfilling the criterion for informed consent, and the response rate achieved was 65.78%. To ensure confidentiality, the participants had to consent to various uses of their opinions and data, including non-attributable and anonymous use and data sharing for future analysis. After applying these data-cleaning processes, the number of respondents arrived at 296, which was then narrowed down to 215, validating the targeted population representation of the public sector TC in the UAE. These responses were enough to move to the next step of analysis. Consequently, 215 complete questionnaires were keyed into an Excel sheet and then transferred to an R software sheet for the subsequent analysis.

4.2. Respondents' Profile

Data from 215 participants used in this study analysis are summarized as follows:

I. Descriptive Statistics (Table 3)
II. Demographic Statistics

As is shown in Table 4, most of the survey participants—84.66 percent—were between the ages of 31 and 60, and 83.26 percent had more than ten years of work experience. Participants were 71.16% male and 28.84% female, with 95.82% of the participants holding graduate and postgraduate degrees. It is important to note that the participant segment was evenly distributed across the two work level and organization size categories, giving the study a richer and more diverse perspective. Most of the participants were from the

government sector at 83.72%, which is the larger sector compared to the semi-government sector. The demographic statistics for the survey indicate that they had attained the age of consent, were a variety of genders, and possessed vast knowledge and practical experience with respect to the field of TC projects and DT initiatives, as well as their impact on the UAE public sector. Moreover, the participants were able to adequately answer the survey questions.

Table 3. Descriptive Statistics.

	N	Mean	Std. Deviation
Age	215	2.22	0.693
Gender	215	1.29	0.454
Educational level	215	2.40	0.570
Job level	215	1.54	0.499
Number of employees	215	1.45	0.498
Type of organization	215	1.16	0.370
Years of experience	215	4.17	1.511
Valid N (listwise)	215		

Table 4. Sample demographic characteristic table.

Baseline Characteristic	N	%
Age		
Up to 30	23	10.70%
31 to 50	132	61.40%
51 to 60	50	23.26%
>60	10	4.65%
Gender		
Male	153	71.16%
Female	62	28.84%
Educational level		
Pre-graduate	9	4.19%
Graduate	111	51.63%
Postgraduate	95	44.19%
Job level		
Employee	98	45.58%
Manager	117	54.42%
Number of employees		
Up to 500	119	55.35%
>500	96	44.65%
Type of organization		
Governmental	180	83.72%
Semi-governmental	35	16.28%
Years of experience		
<5	11	5.12%
5 to 10	25	11.63%
11 to 15	33	15.35%
16 to 20	48	22.33%
21 to 25	43	20.00%
>25	55	25.58%

4.3. Results of Relative Importance Index (RII) Analysis

The RII value (Table 5) indicated that the factors involved in finding the variables were essential at various stages of the participant's responses in the structured questionnaire [70]. It is considered significant whenever the RII value is more than or equal to 0.60 [51]. Below is an RII valuation table for the identified factors:

Table 5. Significance of factors and overall rank.

Theme/Sub-Theme (Factors)	RII Value	Ranking
1- Digitization projects are drawn from leadership vision and strategic plan for the organization not isolated initiatives	0.8584718	5
2- Digitization efforts have reduced bureaucracy and addressed existing shortcomings	0.5149502	29
3- We treat digitization as a mandatory transformative element in all stages of service design and policy processes	0.7893688	16
4- The organization is promoting enhance the skills of using automated systems among all 1s to spread the digital mindset and culture	0.7813953	19
5- Digitization projects preferentially provide services through digital channels, while providing the same services to segments of the population with limited online access or inability to use digital technologies	0.7342193	25
6- Digitization focuses on simplifying procedures and re-engineering workflows and services based on understanding the needs of users and stakeholders	0.8644518	4
7- In our digitization, the user is present during the entire service lifecycle (design, development, implementation, delivery, monitoring and redesign) to enable co-creation between the user and administration	0.7534884	24
8- Digitization projects are designed in a way that encourages user feedback that allows for more user insights and lead to better design and service delivery	0.7614618	23
9- Digitization projects have achieved service delivery to users in convenient, convenient, and timely ways	0.8531561	6
10- Digitization projects invest user feedback to be able to shift from providing interactive service to providing a proactive service that exceeds user expectations	0.7946844	15
11- Digitization projects do live up to users' expectations and are considered more effective than traditional methods of service delivery	0.6159468	27
12- IT facilities' operations/services (e.g., servers, large-scale processors, performance monitors, etc.) are superior	0.8086379	12
13- The network communication is sufficient with good connectivity, reliability, and availability in our organization	0.8245847	9
14- The quality of IT application and services (e.g., Enterprise resource planning (ERP), Application Service Provider (ASP), software modules/components, emerging technologies, etc.) can meet our organization needs	0.7953488	14
15- Our organization has a clear understanding on how IT contributes to the competitive advantages	0.8299003	7

Table 5. *Cont.*

Theme/Sub-Theme (Factors)	RII Value	Ranking
16- Our organization integrates business strategic planning with IT planning	0.7840532	18
17- Our organization enables functional area and general management ability to understand the value of IT investment	0.7807309	20
18- We constantly keep up with new IT innovations	0.8172757	11
19- We constantly seek new ways to enhance the effectiveness of IT use	0.8252492	8
20- We establish an effective and flexible IT planning process and developing a robust IT plan	0.7654485	22
21- Digitization is necessary for the future of our organization and their competitive	0.9289037	2
22- The goal of change is clear, and the expected outcome is worth all the efforts and resources spent	0.8245847	10
23- Change will succeed	0.7720930	21
24- Change is a necessary culture and practice for organizations that seek to improve their performance.	0.9315615	1
25- I support organizational change and participate in their efforts and projects.	0.8764120	3
26- I welcome organizational change projects and do not believe that they may make me lose some of my current authority and privileges	0.7853821	17
27- Technology has simplified our careers	0.7009967	26
28- I do not think that digitalization will replace employees	0.5282392	28
29- I feel that I will be able to absorb new technologies	0.8046512	13

From the RII analysis above, the RII values were computed to outline the most relevant factors related to the adoption of digital technology among the UAE public sector in relation to DT, IC, and RC. The highest RII's (the top three) indicate that BI factors dominate in resistance to change. Other high RII values for factors such as EE and SI indicate that use and influence are relevant within the domain of the DT initiatives. This translates to a call to focus on the EE and the level of social norms concerning DT activities in order to improve the level of their acceptance; on the other hand, BI is the major determinant of resistance and, therefore, more effort should be directed towards changing the intention of the employer to comply with DT initiatives.

4.4. Correlation Analysis

Correlation Analysis Interpretation

The visualization presents the Pearson correlation coefficients between various factors (F1 to F29) (Figure 3). The values range from -1 to 1, where 1 represents a perfect positive correlation (as one variable increases, the other increases), and -1 represents a perfect negative correlation (as one variable increases, the other decreases), whereas 0 indicates no correlation. The key observations are as follows:

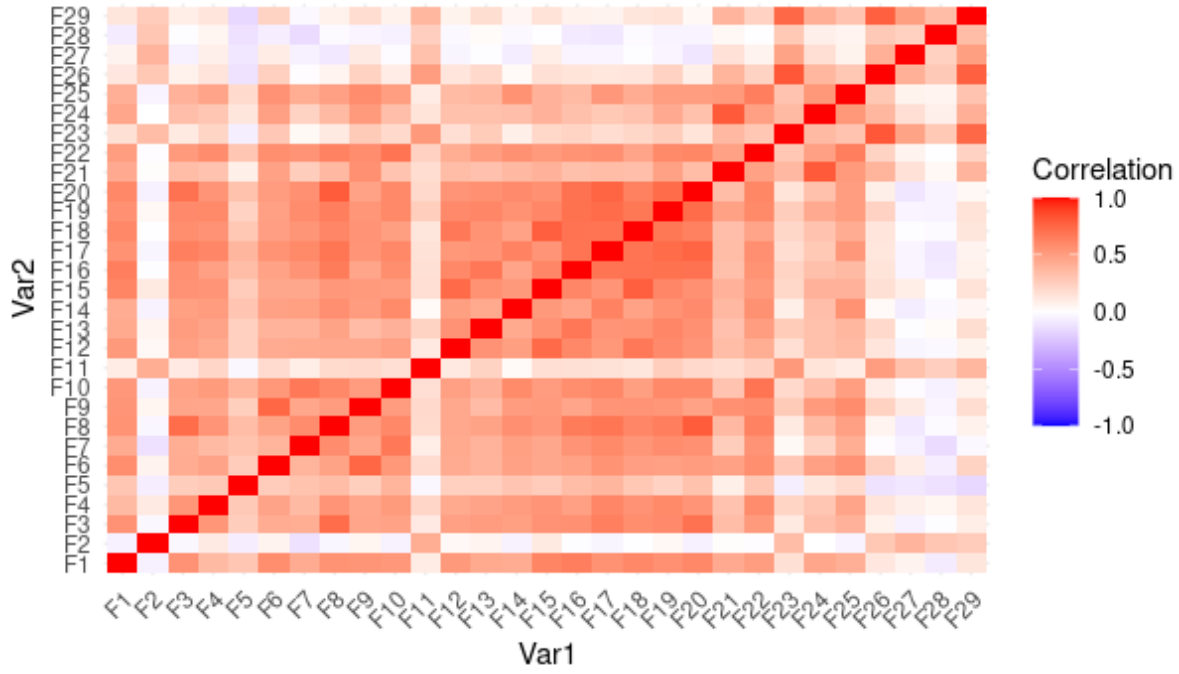

Figure 3. Correlation matrix heatmap.

Key: F1 to F29 represent the factors/themes.

The study identified strong positive correlations between several factors. For instance, F3 and F8 exhibit a correlation of 0.73, indicating that higher values in F3 are associated with higher values in F8. This suggests that these factors likely address similar aspects of digital transformation or related competencies. Similarly, F26 and F29 show a strong correlation of 0.78, which may involve variables related to RC, highlighting their close relationship. The study also observes moderate positive correlations. The correlation between F6 and F9 is 0.75, suggesting that as EE (F6) increases, SI (F9) also tends to increase.

Additionally, F1 and F6 correlate to 0.58, indicating that digitization leadership and EE are positively correlated and move in the same direction. The study also notes weak or negative correlations. For example, F2 and F1 have a slight negative correlation of −0.06, suggesting a minimal inverse relationship. Similarly, F5 and F29 exhibit a weak negative correlation of −0.17, indicating that as values in F5 increase, those in F29 slightly decrease. Other notable patterns include moderate to strong positive correlations among variables related to EE, SI, and BI, such as F17 and F19 (0.73) and F18 and F15 (0.78), which align IC factors with the overall success of DT initiatives.

4.5. UTAUT Constructs and Mapping Factors

There was a need to examine the UTAUT model's key components of PE, EE, SI, FCs, and BI. Subsequently, there was a revision on how the survey questions were designed for factors related to UTAUT constructs (Figure 4) and the major categories of the study (DT, IC, RC). This was accomplished by considering a full definition of each factor and sample questions that could be designed to measure it with respect to UTAUT's aim. It is understood that to do this, each question had to be assessed against the UTAUT model's conception of that particular definition. This step was carried out by the principal author while being checked by a research team member, the results of which demonstrated consistency with past studies [71,72] on the public sector based on DT. It was also necessary for the RII analysis results to organize the factors into groups based on their construction, and the purpose of the research was to identify what factors are the most important in every category and UTAUT construct.

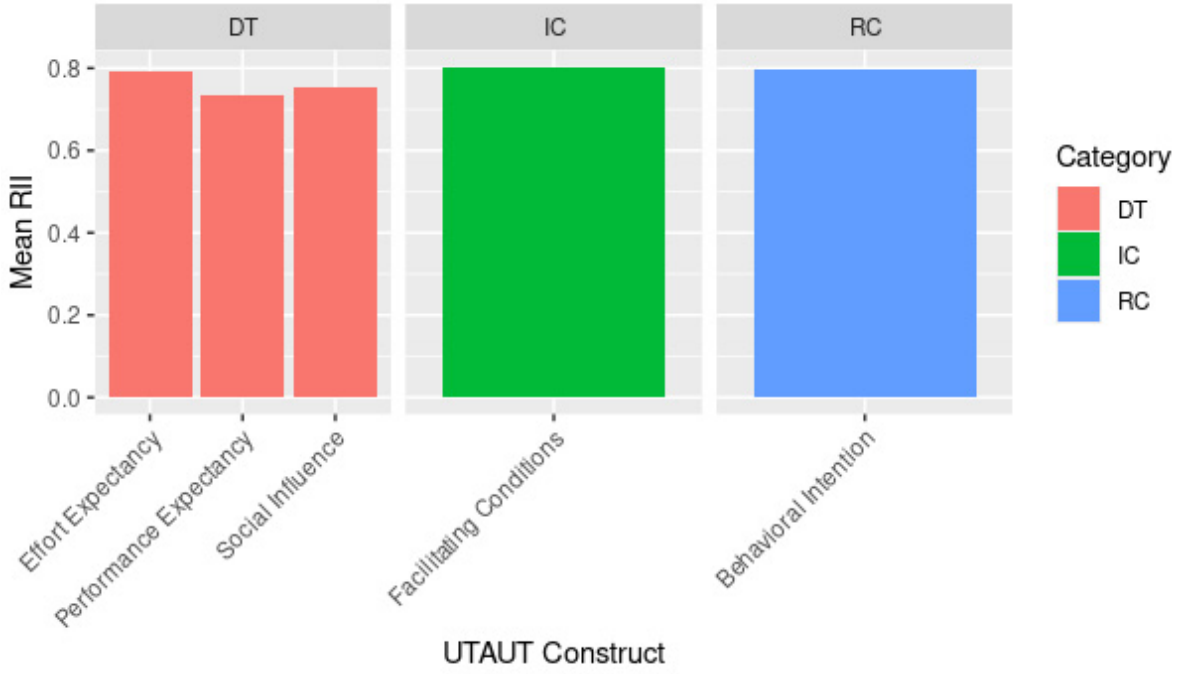

Figure 4. Mean RII by UTAUT construct and category.

A further assessment of how each UTAUT construct relates to each category by mapping the factors' importance across these dimensions (RII) while benefiting from these relationships followed (Figure 5). For instance, what UTAUT construct seems central to such a phenomenon as digital transformation? How would one categorize IC factors in terms of UTAUT constructs? It was, therefore, helpful to verify that both the mapping and the analysis were compliant with the theoretical framework and were logical in the context of the UAE public sector.

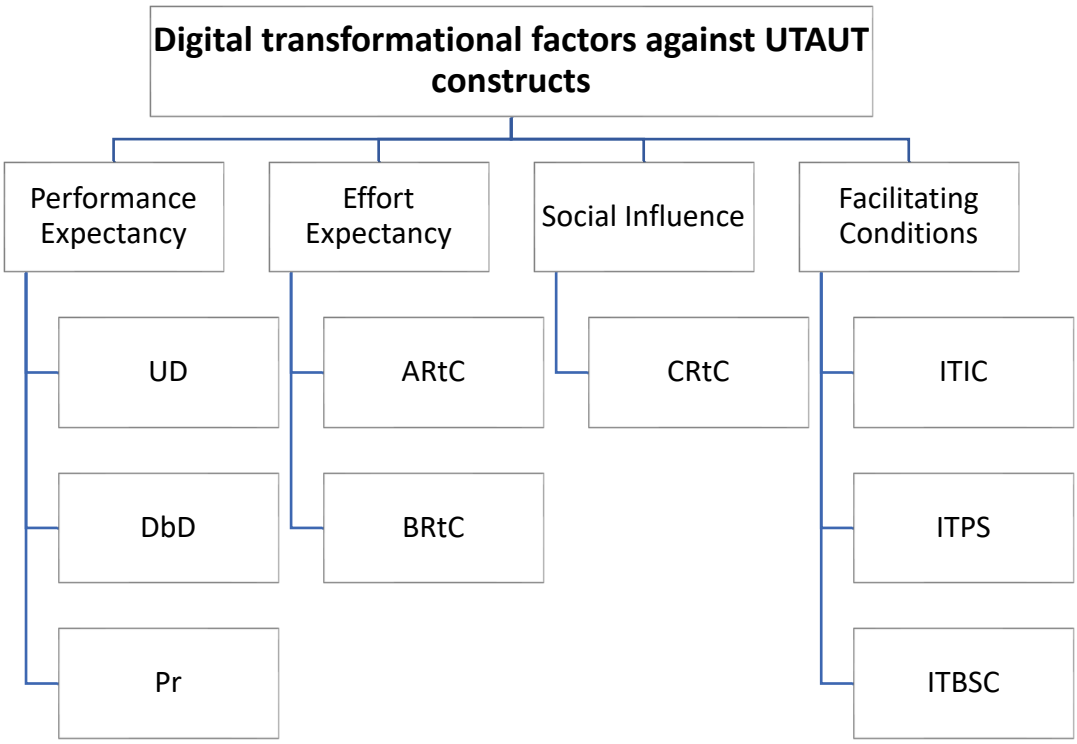

Figure 5. Nine themes of factors based on UTAUT main constructs.

Below is the categorization and assignment of the UTAUT constructs to each theme (Table 6):

Table 6. The categorization and the assignment of the UTAUT constructs to each theme.

Category	UTAUT Construct	Mean RII
DT	Effort Expectancy	0.7931340
DT	Social Influence	0.7545958
DT	Performance Expectancy	0.7356811
IC	Facilitating Conditions	0.8034699
RC	Behavioral Intention	0.7947582

From the mapping analysis above, the mapping of RII values to the UTAUT constructs shows that EE in the context of the DT project is the dominant construct, followed by the second most important construct of SI. FCs are the most critical construct in the context of IC, while BI is the most important for RC. To maximize the chances of successful DT projects it is crucial to concentrate on two aspects: EE making new technologies less complicated and using social factors to encourage people. Additionally, adequate FCs in terms of infrastructure, training, and so forth can raise IC, thereby decreasing RC.

4.6. Ordinal Regression Assessment (OR)

This part evaluated how one or more predictor variables and ordinal dependent variables were related. The process was carried out in the following steps:

I. Model Specification: the composite score of BI was treated as the ordinal dependent variable, and demographic factors, such as age, gender, educational level, job level, and years of experience, were the predictors.
II. Model Fitting: The ordinal logistic regression model was fitted with the cumulative logit function. This function performs well when ordered categorical outcomes are treated as a finite number of ordered categories resulting from the predictor variables. Also, coefficient estimation was employed: the regression coefficients constituting the predictor variables were computed.
III. Model Evaluation: the importance of the predictor variables was estimated through analysis of *p*-values; if a predictor had a *p*-value less than 0.05, then it was statistically significant otherwise.

From the OR analysis results (Table 7), it is evident that none of the predictors (age, gender, educational level, job level, or years of experience) had a significant effect on BI toward adoption of DT because all their *p*-values were greater than 0.05 (The 5% statistical significance level). Overall, while the thresholds in the model indicate an ordered dependent variable, individual demographic processes are not as paramount as organizational or systemic processes in the structure of BI. This suggests that strategies targeting the individual based on demographic variables are misguided and should be focused instead on changing the organization. Even EE and SI that lead to BI are relevant in many groups regardless of demographic differences. Below is the OR analysis output.

Table 7. The OR analysis output.

Formula: as.Factor (BI_Score) ~ Age + Gender + Educational.Level + Job.Level + Years.of.Experience				
Coefficients:				
	Estimate Std.	**Error**	**z Value**	**Pr (>|z|)**
Age	−0.12519	0.23707	−0.528	0.597
Gender	0.17865	0.28307	0.631	0.528
Educational level	−0.05358	0.21101	−0.254	0.800
Job level	0.29301	0.26576	1.103	0.270
Years of experience	0.16458	0.11857	1.388	0.165

4.7. Principal Component Analysis (PCA)

This step encompassed embedding factors affecting DT, IC, and RC in the context of UAE public sector activities. PCA makes analysis easier by correlating the initial factors into a small number of uncorrelated factors encompassing most of the original data information [73]. The steps involved could be considered statistically important whenever there is a strong correlation between the variables involved [74] and whenever the sample's Kaiser–Meyer–Olkin (KMO) test adequacy measure confirms the element's factorability. According to Tugiman, KMO accepted values are recommended to be more than 0.5 [75]. Hence, a strong correlation was seen for the involved UTAUT elements, and KMO among the constructs was 0.923 with sig < 0.05, as shown in the table below (Table 8).

Table 8. Bartlett's Test and KMO for all UTAUT constructs.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**0.923**
Bartlett's Test of Sphericity	Approx. Chi-Square	4557.736
	df	406
	Sig.	0.000 *

* *p*-value highly significant.

This method allowed for the ignoring of noise in the structure and minimized the number of interdependent observable quantities, thus increasing the ease of observation and simplifying the concentration of the analysis. This approach made it easier to identify the reasons for and the impact of the usage of DT initiatives.

Based on the PCA, it is evident that the first two components accounted for a significant amount of variance within the data set (approximately 40.9% for the first and 13.4% for the second) (Figure 6). The scree plot also validates that it is sufficient to focus on the first few components for the summary. In conclusion, according to the PCA, we can rationally group the factors influencing DT into several constructs—those that will still encapsulate the most critical information. An added advantage of this approach to best practice models is that it eliminates unnecessary overburdens and offers avenues for change interventions.

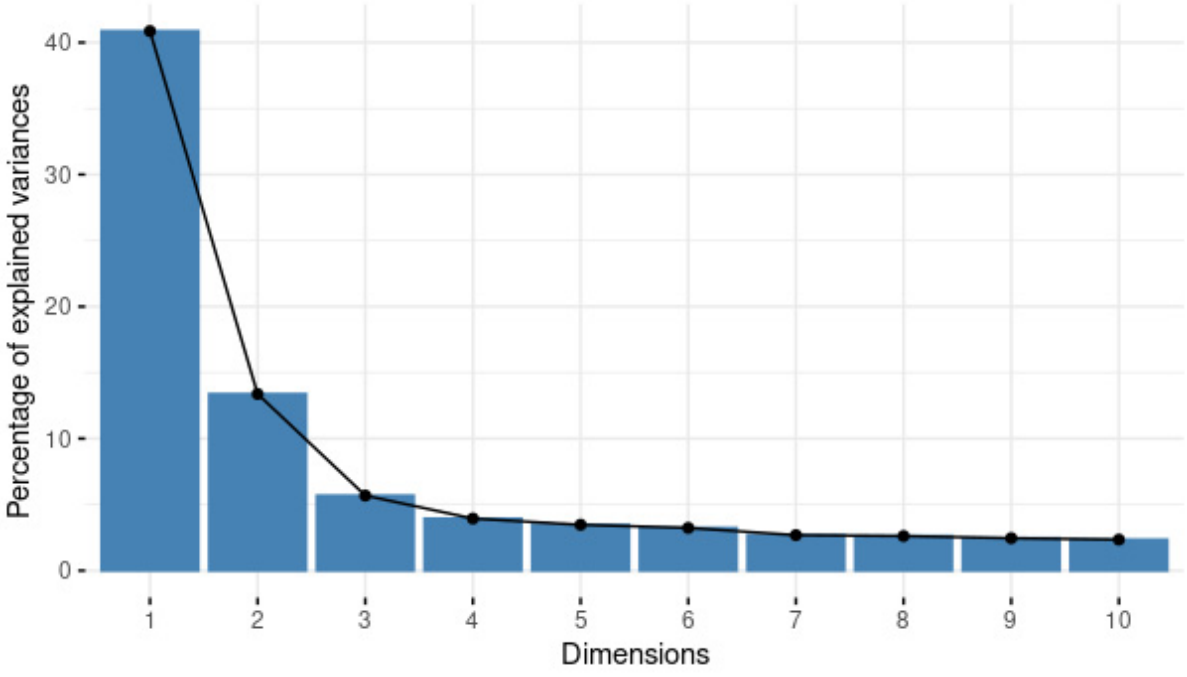

Figure 6. Screen plot.

5. Discussion

5.1. Key Findings

The UTAUT model was employed as an appropriate theoretical framework to examine the factors influencing Use Behavior (UB) and Behavioral Intention (BI) toward digital technology in the UAE public sector. This study builds on existing research by extending the application of the UTAUT and DIT frameworks to the public sector context [59]. DT is seen to have a considerable influence on the public sector in the UAE through the success of change initiatives and the improvement of operation results. Such measures contribute to the simplicity of managing change by improving employees' technical know-how and decentralized decision making in organizations. They enhance the expected effort and change the attitude of the employees toward new technologies.

Furthermore, although UTAUT has generally been used in private-sector technology adoption research, this study conveniently demonstrates its applicability to public sector DT initiatives. Moreover, this study also contributes to the literature by presenting new factors that shed light on the relationship between facilitating conditions (FCs) and resistance to change (RC) [47]. The study also underlines effort expectancy by reasoning that employees are more likely to adopt change when new technologies are easy to use and aligned with organizational objectives [58]. Based on the hypotheses tested, the study confirms that DT initiatives positively impact various areas. It states that they increase the likelihood of success in transformational change (TC) projects (Hypothesis 1), increase IT competence (IC) in public sector organizations (Hypothesis 2), and decrease resistance to change (RC) from employees (Hypothesis 3). These outcomes demonstrate the need for ongoing work in the task of implementing DT in the context of the public sector. The evaluations of IT integration, organizational objectives, and supportive social context must be promoted to foster this behavioral change.

These findings contradict earlier postulates that imply that resistance to change can be attributed to the organization's culture alone [16]. However, the present study's findings indicate that behavioral intention is a critical determinant, offering theoretical support for the argument that public sector organizations should not only ensure leadership engagement but also address cognitive load resistance through convenient technological tools. The results of this study also show that there are useful theoretical constructs highlighted by this study's thematic groupings based on Digital Transformation (DT), IT Competence (IC), and Resistance to Change (RC) for the stakeholders in the public sector. These outcomes, albeit measured differently, support Snyder's study regarding the expansion of business cognizance [76], as well as Zuti's identification of the enhancement of leadership frameworks and business practices in contemporary public sector entities [77]. The survey included additional variables, like years of experience, type of organization, and gender, into the UTAUT constructs, and then analyzed them statistically.

The findings also highlight the importance of social influence in UB and BI, and that by promoting or increasing social influence, it may help increase the readiness of public sector employees for DT initiatives. Additionally, IC was established as another key factor influencing the usage of technology, especially in terms of infrastructure and facilitating conditions. Moreover, facilitating conditions supported technology use and reduced commitment to change by presenting the connection between organizational IC and BI and RC in the UAE public sector related to technology-based projects.

The study calls for further research to explain why the results for RC factors are non-significant. Other DT-related factors which have remained important include proactive strategies and user-initiated processes, although more research is necessary into their development. Several moderating factors also affected the study's outcomes, including years of experience, organizational type, and gender. Overall, the findings advance our knowledge of the difficulties of engaging in DT within the public sector, providing policymakers with insights that may aid in formulating strategies necessary to support DT across distinct governmental departments.

5.2. The Study's Implications

This research study has argued for adopting rational DT initiatives, including creating structured DT implementation frameworks that would include IT support, user interfaces, and strategic implementation plans. Effective project management and robust communication channels were also identified as essential components for the success of DT projects.

The DT approach also has the advantage of improving civilian performance and delivering government services. DT initiatives contribute to improved infrastructure and a technologically supported work environment and can enhance decision-making and performance. Moreover, IT competence is preeminent in implementing this change, since employees in a firm require proper skills and platforms to run effectively. These measures positively impact employees' quality of life and, ultimately, citizens' standard of living, thanks to improved quality of public service delivery.

Beyond practical implications, the study offers broader contributions across academic, educational, and societal domains. Cost savings as a result of reduced bureaucratic procedures and efficient service delivery seem to provide worthwhile economic gains resulting from DT. For instance, implementing automated services can decrease the number of administrative tasks and free up resources that can be used for other important assignments [28]. In teaching, case studies from this research can be used to develop public administration curricula highlighting real-world DT applications. Bearing this in mind, the use of these ideas in educational contexts will help prepare future leaders to apply best practices of change management attitudes toward the transformations [39].

The study also provides strong policy implications, as the paper shows that governments can use DT to pursue long-term national strategic goals, such as smart city initiatives and improving the quality of public services. From the analysis of the findings, the following recommendations should be given to policymakers: consider infrastructure improvements and training programs that will enhance employee IT competence [51]. This will also improve performance and minimize organizational resistance to change. In addition, specific interventions—either targeting individual employees or focusing on particular organizational units, are necessary to ensure effective implementation. The findings of this research will be of great importance to the UAE in its implementation of various e-government policies and the identification of the main issues that may hinder the adoption of best practices in integrating digital technologies in the region.

The impacts of DT initiatives are most noticeable regarding the category of social prospects, especially in citizen participation and the availability of facilities. If the digital channels are well aligned, the citizen can receive services faster and more transparently, thereby enhancing their quality of life [30]. Furthermore, using e-government services can both help create neighborly perceptions of institutions and promote their perception as being responsive to the public. This aligns with the UAE's long-term vision of transforming the country into a digital governance model and supports a culture of trust and innovation [50].

Moreover, our conceptual framework focuses on how public behavior and perception is influenced by digitalization. As the government delivers simple services efficiently and effectively, citizens will become accustomed to better efficiency and quality, and hence to constant improvement. This means that public perception is critical to the sustained success of DT initiatives, as noted by prior research.

5.3. Limitations and Strengths

This study employed the UTAUT framework to examine DT across various sectors, such as healthcare, commerce, government, services, business, academia, and the public sector. While the model's impact on behavior was globally recognized, a standardized theoretical framework was lacking, leading some studies to adopt multiple constructs from the original theory. Diverse teams with varying expertise reviewed the study, yielding comprehensive results.

A diverse group of scholars reviewed the research to ensure alignment with prior studies on digital transformation within the public sector. Nonetheless, the study faced certain limitations. The study targeted DT implementation employees and managers, thus excluding other positions and areas of the public domain. Moreover, carrying out the surveys online created difficulties regarding the issue of sample size and selection within the context of the study's time frame. Despite engaging statisticians in the research process, the nature and size of the analysis pertinent to the study posed some difficulties, especially regarding the lengthy schedule and the large-scale nature of the project.

6. Conclusions

This research aimed to explore the impact of digital transformation (DT) on technological change (TC) within the public sector in the UAE. The results emphasize that effort expectancy (EE), social influence (SI), and facilitating conditions (FCs) are critical factors in promoting the acceptance of DT and reducing resistance to change (RC). Key practical recommendations from the study include enhancing IT infrastructure, providing comprehensive employee training programs, and ensuring that leadership strategies align with digital transformation's overarching goals. Moreover, DT has the potential to boost productivity, revamp public services, and improve the overall well-being of citizens.

Policymakers should prioritize action-based strategies to address the challenges DT poses, particularly cognitive resistance. This research contributes significantly to understanding how organizational change interacts with DT initiatives and positions the UAE as a leading example for other governments to follow in achieving higher levels of innovation through the adoption of digital technologies. By aligning these efforts, the UAE can serve as a model for fostering innovation and leveraging DT to enhance public sector performance globally.

Author Contributions: Conceptualization, S.M.A.; methodology, A.I.A.; data curation, A.I.A.; formal analysis, A.I.A.; writing—original draft preparation, A.I.A.; writing—review and editing, S.M.A., M.L. and J.R.; Supervision, M.L. and J.R. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding authors.

Conflicts of Interest: The authors declare no conflict of interest.

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