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Managing smart work systems and their impact on developing workers capabilities in light of digital transformation

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Abstract: The main aim of this study was to investigate how managing smart work systems impacts the improvement of employee skills within Iraqi telecommunication companies amidst the digital transformation era. The study utilized the independent variable associated with managing smart work systems alongside the variable encompassing diverse skills (creative, cognitive, digital, and artistic), employing a descriptive analytical methodology. A cross-sectional survey was directly administered to 153 male and female employees working in the IT and HR departments of ITC. This study highlighted the intersection of information and human resources management within these organizations. Conducting statistical analysis using the SPSS program and employing multiple linear regression and hierarchical regression equations, the study uncovered several noteworthy findings. It was noteworthy that smart work systems management had a significant impact on improving employee capabilities within ITC. Additionally, the study identified the moderating role of digital transformation in the relationship between smart work systems management and employee skills, including creative abilities. Based on these results, the study suggests that ITC prioritize support for the information systems they utilize to improve data flow and facilitate effective information exchange.

Keywords: Digital transformation, Employee skill enhancement, Iraqi telecommunications sector, Smart work systems management.

1. Introduction

Advancements in information and communication technology (ICT) have led to notable innovations, enhancing organizational efficiency [1]. Business Operations Management (BPM), recognized as the standard for automating and overseeing business processes within organizations [2] serves as a platform for analyzing activities and key performance indicators (KPIs). This contributed to identifying areas for improvement and process re-engineering, which in turn contributed to integrating advanced real-time analysis capabilities into BPM and enhanced processes and captured opportunities. Utilizing data science techniques further improves operational efficiency, automates interactive processes, and guides process re-engineering efforts [3]. Smart work systems have emerged to enhance internal capabilities amidst the disruptions of digital transformation (DT) [4]. Consequently, the strategic use of digital technology to innovate business models poses external challenges, necessitating the adoption of smart practices [5]. In the context of continuous development and shifting settings, DT has become a critical organizational process [6] and a pivotal factor influencing companies' sustainability and competitiveness in the modern market. It involves strategically utilizing information and digital technology to enhance operations, develop services, and foster innovation, contributing significantly to organizations' survival and growth [7]. With the aid of data and advanced analytics, DT enables organizations to better guide their strategies, enhance operations, and meet customer needs effectively [8]. It also encompasses various concepts arising from the integration of modern digital technologies, including computers, artificial intelligence, and cloud computing. It generates vast amounts of new

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information crucial for decision-making and strategic planning within organizations [9]. The imperative for organizations to adapt and evolve in competitive environments has intensified with globalization, and to thrive, organizations must effectively integrate digital processes and collaborative tools [10]. Moreover, the technology is a key driver of DT, involving reorganizing categories and stages to constitute the transformation process [11]. However, challenges extend beyond implementing IT solutions, encompassing organizational change, cultural transformation, and human factors [12]. Successful DT requires addressing resistance to change and investing in building digital capabilities aligned with organizational strategy [13]. With regard to electronic management, which driven by technological advancements, it aims to enhance efficiency, service quality, safety, and adaptation to global trends. Amidst the backdrop of scientific and technological advancements characterizing the Electronic Revolution, a paradigm shift known as electronic management has surfaced, representing a contemporary trend in organizational governance. This approach aims to transition institutions into electronic entities utilizing information and communication technology to streamline their operations, transactions, and administrative functions [14]. It revolutionizes administrative procedures, streamlining workflows, reducing paperwork, and improving productivity. The positive influence of DT on organizational performance is generally acknowledged, allowing organizations to increase efficiency, enhance customer experiences, and obtain a competitive advantage in the market [15]. Embracing DT empowers organizations to thrive in dynamic business environments by fostering agility, adaptability, and innovation [16]. As for the matter of Smart Work Systems (SWS), they emphasize the concepts of smart work and rely on organizational intelligence, necessitating continuous environmental monitoring and adaptation initiatives [17]. By embracing organizational intelligence principles, organizations can capitalize on various intellectual shifts [18]. Besides that, DT reshapes organizational operations and stakeholder relationships [19] and businesses leverage SWS and digital platforms to optimize processes and achieve financial savings [20].

1.1. Problem Statement

The problem of the study lies in determining the collective impact of SWSM with its dimensions (smart work, creative orientation, environmental understanding, adaptation, and continuous learning) on the development of employees' capabilities across their dimensions (cognitive, creative, digital, technical/professional) in the context of DT and the challenges facing modern organizations, given their interaction with the environment. This may hinder them from achieving their goals, embodying their mission, and reaching their objectives. Therefore, organizations need to have a full understanding of these challenges and their level of impact, as well as develop various scenarios to deal with them. Additionally, there is a need to increase focus on investing in existing human capital and available information technology through a digital system based on transparency and information disclosure to diagnose these challenges.

The following queries can be used to formulate the study problem:

1. What is the extent of SWSM's impact on developing workers' capabilities or employees' capabilities (EC) across cognitive, creative, digital, and technical/professional dimensions, and how do contemporary organizations perceive and navigate challenges posed by DT and its interaction with the environment?
2. What strategies can organizations employ to increase their awareness of challenges, assess their impact, and formulate effective responses, and how can organizations optimize human capital investment and leverage information technology through transparent digital systems to address identified challenges?

These questions aimed to explore key issues related to the impact of SWSM on EC development, challenges associated with DT, and strategies for organizational adaptation and improvement. Specifically, the study sought to answer the following questions:

1. What effect does SWSM have on the EC in Iraqi telecommunication companies?

2. How does DT, as a modifying variable, influence the relationship between SWSM and EC, including creativity in ITC?

1.2. The Study's Objectives

The study aimed to assess the impact of SWSM on the development of EC in light of contemporary challenges, particularly DT, which involves the dynamic interaction between organizations and their environment, presenting both obstacles and opportunities. The study also contributed new insights to the existing knowledge base by exploring the effects of SWSM across dimensions such as smart work, creative orientation, environment understanding, adaptation, and continuous learning in ITC. Moreover, by considering DT as a modifying variable, the study sought to explore its impact on the relationship between SWSM and EC in the organization. This endeavour has the potential to enrich scientific research and enhance credibility by expanding understanding in key areas such as SWSM, creativity, capability development, DT, and the telecom sector. Furthermore, it aimed to offer empirical evidence to validate hypotheses related to these variables. The findings can provide valuable insights for practitioners and decision-makers within Iraqi telecom companies, enabling them to optimize workforce potential, enhance efficiency, and adapt to market dynamics.

This study's practical significance includes several objectives:

1. Insights to Company Officials: The study results offer valuable insights to officials within telecom companies, elucidating the role of SWSM in enhancing EC, especially in the context of DT. This understanding helps officials prioritize strategies, and mechanisms for optimizing workforce potential.
2. Strategic Decision-Making: Based on the study's findings, decision-makers can make informed decisions regarding workforce development initiatives, prioritizing investments in training and organizational restructuring efforts.
3. Enhancing Organizational Competitiveness: By nurturing a workforce with the essential for success in the digital era, telecom companies can position themselves as industry leaders by leveraging insights from the study.
4. Facilitating Organizational Growth and Sustainability: Equipping employees with requisite capabilities fosters innovation, increases efficiency, and maintains relevance in a competitive marketplace, leading to long-term success and sustainability.
5. Additionally, the study may offer recommendations for fostering a conducive work environment that promotes creativity, innovation, and continuous learning, positioning companies for success in the digital age. The findings can also inform future studies and guide decision-making in organizations facing similar challenges.

1.3. Study Hypotheses

To meet the study's objectives, the following hypotheses were formulated:

- The first main hypothesis (H01) is that there was no statistically significant effect, at the significance level ($\alpha \leq 0.05$), of SWSM and their combined dimensions (smart work, creative orientation, environmental understanding, adaptation, and continuous learning) on developing the EC in ITC.
- The second main hypothesis (H02) is that there was no effect of DT as a modifying variable on the relationship between SWSM and developing creativity and EC in ITC.

1.4. Study Model

The study model illustrated the interconnections among the principal variables examined in the research. It acted as a graphical depiction of the conceptual framework directing the study; Figure 1. provides a generic representation of this model.

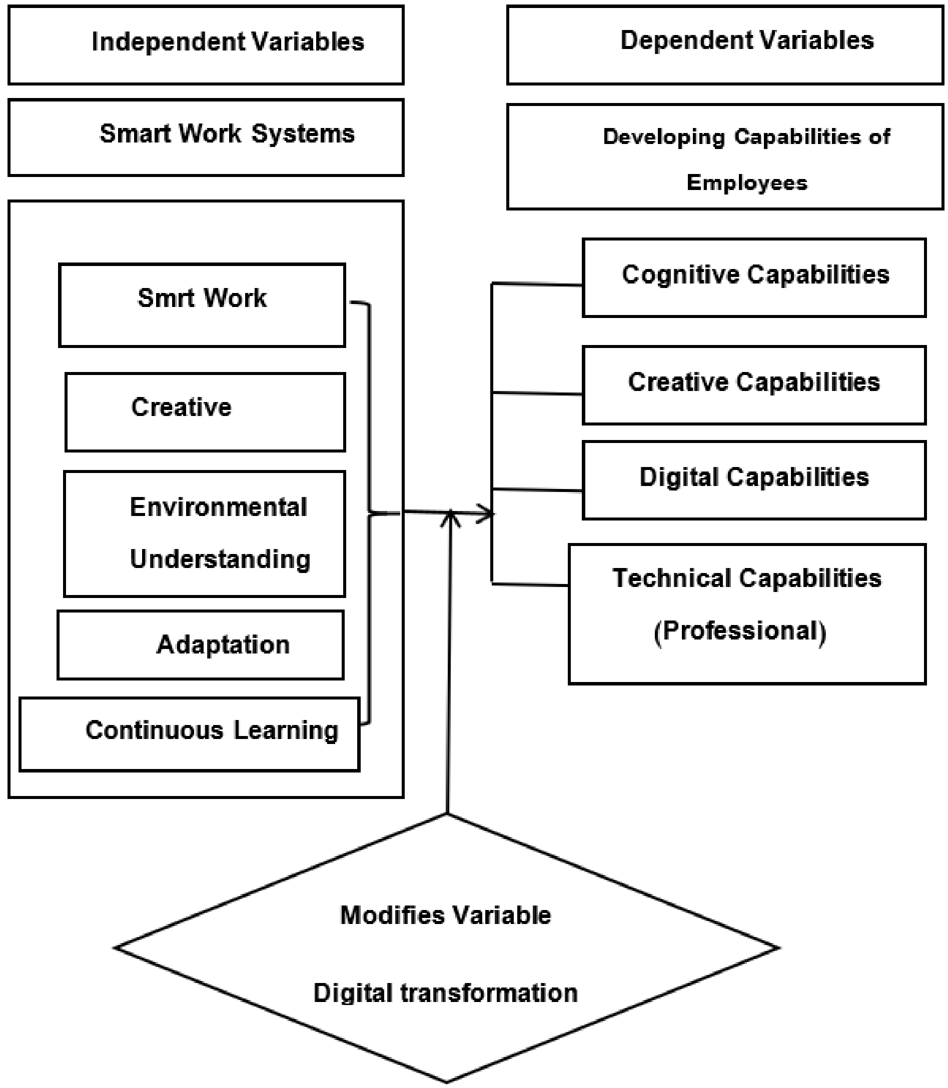

Figure 1.
Study variables.

This model illustrated how SWSM, encompassing various dimensions, influences the development of EC within ITC, and it examined how DT serves as a modifying variable in this relationship.

1.5. Study Limitations

- Spatial Boundaries: The study's focus on ITC restricted the findings' generalizability to other industries or geographic areas.
- Human Limitations: The individuals employed within ITC constrained the study's scope, potentially limiting the diversity of perspectives and experiences represented in the research sample.
- Time Constraints: The study was conducted within the timeframe of 2024, which might limit the ability to capture long-term trends or changes in organizational dynamics over extended periods. Additionally, temporal constraints might impact the depth and breadth of data collection and analysis.

2. Literature Review

2.1. Review of Previous Studies

Al Shobaki, et al. [21]: The study examined dimensions of smart organizations at the Palestine Institute of Technology, emphasizing strategic vision, culture of excellence, and motivational systems; recommendations included enhancing incentive plans, formulating strategic visions, and encouraging innovation.

- Alshrafi and Al Shobaki [22]: Investigated organizational leadership and smart organizational characteristics, and the study found a robust correlation between leadership and the attainment of smart organizational traits.
- Adamik and Sikora-Fernandez [23]: Focused on enhancing resilience in smart organizations amid Industry 4.0, the study integrated microeconomic and macroeconomic factors to navigate technological dimensions for sustainable growth.
- Petrillo, et al. [24]: Explored smart work repercussions in Italy, emphasizing objective delineation, reflection opportunities, and national initiatives to promote smart work practices.
- Al-Kaabi [25]: Investigated smart organizational traits' impact on entrepreneurial capabilities in the Department of Unified Card Affairs in Maysan, finding a positive correlation between smart traits and entrepreneurial development.
- Al-Shayeb [26]: Explored authentic leadership's influence on smart organizations in the Jordanian Telecommunications Group (Orange) and highlighted its contribution to smart organizational practices.
- Abdel-Jabouri [27]: Examined the relationship between information technology capabilities and smart organizational practices at the Hawija Technical Institute, finding a positive association benefiting organizational objectives and entrepreneurial prowess.
- Kilani [28]: Investigated the influence of smart business network characteristics on organizational performance in Jordan's industrial sector, revealing a positive attitude toward smart business traits and their significant contribution to organizational enhancement.

2.2. Theoretical Framework

2.2.1. The Independent Variable and its Sub-Dimensions

- Smart Work Systems Management (SWSM) refers to the strategic oversight and administration of smart work systems within an organization to optimize efficiency, decision-making, effectiveness, and adaptability in response to changing technological and environmental factors. It involves the integration of technology, processes, and human resources to facilitate seamless operations and foster innovation [29].
- Smart Systems (SS) prioritize sustainability, long-term success, and stakeholder satisfaction, adapting to external changes through continuous learning and transformation [30]. They enable organizations to make timely strategic decisions, align organizational practices, and sustain positive outcomes [31]. SWS, defined as strategic frameworks, empower organizations to navigate uncertainties and capitalize on opportunities, ultimately enhancing resilience and competitiveness [32].
- Smart Working (SW) offers a strategic and business-oriented framework for embracing intelligent and flexible working practices as the standard approach. SW, is a strategic framework emphasizing business efficiency and adaptability, promoting the adoption of flexible and smart working habits as the norm, urging a proactive stance on flexibility and actively seeking its benefits without waiting for employee requests. Flexibility limitations should align with demonstrable operational needs. It is not just good practice, but also a fundamental management skill, emphasizing a shift towards results-based management over physical presence, and decisions should consider overall work method expenses, including financial and environmental aspects like

building usage, resource consumption, and travel, aiming to minimize waste. Organizations are able to increase their adaptableness by being more flexible and swifter. Advanced SW enhances business efficiency, organizational agility, and employee well-being. Its key criteria consist of result-oriented administration, a culture based on trust, elevated degree of independence, flexibility in terms of work time and place, utilization of new tools and work atmosphere, reduced dependence on physical resources, and a willingness to embrace continuous change.

- Creative Orientation refers to a collection of administrative procedures and ongoing research-related initiatives that businesses implement to generate more chances for administrative creativity. The organizational mentality or strategy known as "Creative Orientation" places a high value on and encourages innovation and creativity within the business, which entails pushing staff members to think creatively, investigate fresh concepts, and try out cutting-edge methods for making decisions and solving problems. Creatively-oriented organizations value uniqueness, encourage risk-taking to explore novel opportunities and solutions, and cultivate brainstorming and cooperation. Woodman, et al. [33] and Gogoi and Barua have identified several factors that influence creative orientation [33, 34]. These factors include past reinforcement history, biographical variables, thinking styles, and capabilities (e.g., divergent thinking and ideational fluency), personality factors (e.g., self-esteem and locus of control), relevant knowledge, motivation, social influences (e.g., social facilitation and rewards), and contextual influences (e.g., physical environment, task, and time constraints.
- Environmental Understanding refers to the capacity of management within organizations to gather information from both external and internal environments, discern complexities and uncertainties present in the business environment, and employ effective decision-making methodologies. The comprehension and knowledge of the value of preserving the sustainability of the environment and ecosystems surrounding oneself by people or community groups [35]. The term "environment" is defined as the circumstances and physical conditions surrounding an organism or group of organisms, including the social and cultural factors that impact individuals or communities [36]. Essentially, it encompasses both the natural world and the built, technological, social, and cultural aspects in which humans exist. Furthermore, some define the environment more comprehensively as a holistic perspective of the world and its functions, incorporating various spatial, elemental, and socio-economic systems distinguished by their spatial qualities and the behaviors of abiotic and biotic forms [37].
- Adaptation pertains to a company's ability to quickly respond to external environmental factors and modify their strategies to align with new situations. It encompasses the decision–making process and actions taken to sustain the ability to handle present or anticipated future changes. Adaptation refers to the deliberate modifications made in anticipation of or in reaction to external impetuses. The predominant research approach to adaptation to environmental changes predominantly adopts an actor-centered perspective, highlighting the role of social actors in responding to particular environmental stimuli and prioritizing the reduction of vulnerabilities [38].
- Continuous Learning refers to an organization's capacity to acquire knowledge and skills through experience, facilitate ongoing employee development to foster continuous enhancement, adapt to changing circumstances, and cultivate a work surrounding which encourages life-long learning. This is crucial for addressing modern economy's challenges and maintaining competitiveness in the market. Put simply, continuous learning occurs at work if all personnel strive to learn on an ongoing basis through deliberate joint effort between the organization and its workforce, this is seen as a duty of every worker [39]. It manifests in the workplace when all individuals actively engage in ongoing learning, facilitated by the collaborative efforts of both the organization and its employees, and in environments that are conducive to continuous learning. Knowledge acquisition

is not only encouraged, but also perceived as a collective responsibility shared by every employee [40].

2.2.2. The Dependent Variable and Its Sub-Dimensions

EC are pivotal for organizational success, requiring a conducive environment for learning and growth [41]. Innovative capabilities distinguish productivity in modern management practices, contributing to organizational excellence [42] and EC involves refining methods to generate new ideas, implement work, and develop businesses [43]. Developing EC aligns with the demands of the modern era, impacting performance levels and the national economy positively [44]. EC encompasses the collective attributes possessed by individuals within organizations, enabling them to attain organizational excellence and elevate their performance levels, and these capabilities are segmented and evaluated across the following dimensions:

- Cognitive Capabilities refer to the intellectual achievements of personnel in response to changing situations. The cognitive abilities of workers inside an organization and the choices decided by senior executives have a significant impact on the company's strategic decisions, actions, and results. These decisions are influenced by their cognitive capacities [45]. Perception refers to the cognitive ability to obtain, screen, identify, and construe stimuli from the environment, utilizing past knowledge, anticipations, beliefs, and experiences. This process entails the assimilation of information from stimuli with pre-existing knowledge and beliefs to construe the qualities of environment [45]. Perception plays a crucial role in recognizing and understanding the possibilities and threats that emerge from environmental incidences of identifying, studying, and deducing trends of cause-and-effect. The speed of recognizing and interpreting environmental patterns determines how quickly a firm identifies emerging opportunities and threats, enabling it to take timely, responsive action and gain first-mover advantages [46].
- Creative Capabilities entail fostering employee creativity and innovation to boost organizational growth and efficiency. The definition of creativity is the generation of new ideas, which is crucial for continuous innovation within a company [47] and also involves turning these ideas into successful products, services, technologies, or market conditions [48] Leadership, challenge, tolerance of failure, diversity, entrepreneurship, and knowledge sharing are critical elements for innovation. Bessant and Tidd [49] underscore the significance of a strategic context, external relations, and a supportive structure and culture for innovation [49]. Leveraging employees' knowledge and skills is essential for fostering innovation within the organization [50]. Training programs can enhance employees' creative and problem-solving abilities, and workforce education contributes to a firm's innovative capability, particularly for technological companies; therefore, organizational learning should align closely with innovation goals [51].
- Digital Capabilities represent the effective utilization of technological resources and tools within organizations, enabling them to access and leverage information to adapt to evolving changes and advancements. The emerging concept of digital capability extends beyond basic IT skills and encompasses digital assets, yielding value through digital outcomes [52]. According to a study digital capability framework comprises six essential capabilities for organizational success: 1) Innovation, 2) Transformation, 3) IT Excellence, 4) Customer Centricity, 5) Effective Knowledge Worker, and 6) Operational Excellence [53]. Meanwhile, another study classified digital capabilities into three clusters: 1) Customer Experience, focusing on technology to meet customer expectations and enhance communication channels; 2) Operations Efficiency, emphasizing process optimization and automation with precise data; and 3) Workforce Enablement, utilizing digital tools to foster collaboration, skill development, and knowledge sharing across the organization [54]. These categorizations suggest that creative talents pertain to an organization's ability to effectively incorporate and utilize digital data and information technologies in its goods, services,

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processes, systems, and practices. This results in the creation of additional value for stakeholders [55].

- Technical (Professional) Capabilities: Encompassing meticulously planned activities and initiatives aimed at enhancing employees' professional skills. Organizations follow a structured approach to facilitate external training opportunities aligned with their objectives, provide standardized frameworks for professional development, and afford flexibility in the content of training activities. EC encompasses the organization's capability to execute tasks using employees' knowledge, skills, abilities, and competencies, and this includes fostering customer relationships, innovating with new technology, developing products and services, and adapting to changes in business, market, and regulations.

3. Methodology of the Study

3.1. Research Design

The study employed both descriptive and analytical methodologies to examine the influence of SWSM on EC within ITC, specifically in the DT setting. Descriptive methods presented and described the collected data, while analytical methods uncovered patterns and associations between variables to effectively understand the research objectives.

3.2. Data Collection Methods

- Study population and sample: The study population comprised male and female employees in ITC, specifically in the IT and HRM departments, totaling approximately 500 employees, to collect data. The researcher distributed questionnaires electronically via social networking sites and with the cooperation of the HR departments in the target companies, and a total of 153 questionnaires were suitable for statistical analysis, representing a sample size of 153 male and female employees. These participants were randomly selected from the study population, constituting 30% of the total population. Table 1. presents the distribution of sample members based on personal factors.

Table 1.
The distribution of sample members.

Variable	Level	Number	Percentage
Gender	Male	98	64.1
	Female	55	35.9
	Total	153	100.0
Job title	Employee	67	43.8
	Deputy head of department	37	24.2
	Head of department	49	32.0
	Total	153	100.0
Years of work experience	Less than 5 years	18	11.8
	5- less than 10 years	30	19.6
	10 years and over	105	68.6
	Total	153	100.0

- Data Collection Sources: To present data, the study employed descriptive analysis and field research methods. Information obtained from the primary sources, data collected through a questionnaire designed specifically for the targeted research sample, consisting of employees of ITC, the questionnaire distributed to the sample, and the data collected were subsequently analyzed and processed to formulate results and recommendations. As for the secondary sources, in the theoretical framework of the study, the researcher utilized secondary data sources, including Arabic and foreign references, articles, reports, previous studies, and various internet sites related to the research topic.

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3.3. Sampling Technique

The researcher devised a questionnaire as the primary instrument for the study, taking into account the research hypothesis and its dependent, independent, and control variables, while also considering relevant findings from prior research. In order to establish the legitimacy and content validity of the questionnaire, it was administered to a panel of experts who possess expertise and professional experience from Iraqi universities. Their feedback was incorporated to assess the questionnaire's coherence and relevance. Additionally, experts' opinions were solicited and reviewed to finalize the questionnaire's form. To measure the independent, dependent, and moderator variables more reliably, the questionnaire comprised four parts:

1. Demographic Information: The first part included questions about the demographic characteristics of the research sample members, such as gender, job title, and years of work experience.
2. SWSM: The second part consisted of 24 items explaining the independent variable of the study, which is the SWSM. These items are detailed in Table 2.

Table 2.
Dimensions of the independent variable (SWSM).

Dimension	Number of paragraphs	Sequence according to the survey
Smart work	4	1-Apr
Creative orientation	5	9-May
Environmental understanding	5	14-Oct
Adaptation	5	15-20
Continuous learning	5	20-24

3. EC: The third part consisted of a group of 17 paragraphs that explain the study's dependent variable, which is the EC. Table 3 shows the dimensions of the dependent variable.

Table 3.
Dimensions of the dependent variable (EC).

Dimension	Number of paragraphs	Sequence according to the survey
Cognitive Capabilities	4	4-1
Creative Capabilities	5	5-10
Digital Capabilities	3	11-13
Technical (Professional) Capabilities	4	14-17

4. DT: The fourth section of the questionnaire comprised 20 statements aligned with the adjusted study on DT (Study 14), and each statement was accompanied by a Likert scale structured as Strongly Disagree/Disagree/Moderately Agree/Agree to a Great Extent/Agree to a Very Great Extent.

3.4. Data Analysis Procedures

3.4.1. The Likert Scale

Respondents indicated their level of agreement or disagreement with each statement, facilitating the quantification and analysis of their perceptions regarding DT. The Likert scale's class length was determined using the equation:

Upper limit of options = 5, Lower limit of options = 1, and Number of levels = 3

Plug the values into the formula: Class Length:

$$\text{Class Length} = \frac{\text{Upper limit of options} - \text{Lower limit of option}}{\text{Number of levels}}$$

The arithmetic mean divided into three classes: The first class: Low rating level if the mean is (1-2.33), the second class: Moderate rating level if the mean is in the range (2.34-3.66), and the third class: High rating level if the mean is in the range (3.67-5.00).

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3.4.2. Normal Distribution Test

It was conducted based on participants' responses to verify whether the data are normally distributed. Skewness and kurtosis values were calculated, where skewness measures asymmetry and kurtosis measures the tails' thickness relative to the normal distribution. Interpretations for each dimension are as shown in Table 4.

Table 4.
Normal distribution test.

Field	Dimension	Skewness	Kurtosis
SWSM	Smart work	-0.32	-0.29
	Creative orientation	-0.55	0.33
	Environmental understanding	-0.24	-0.36
	Adaptation	-0.27	-0.35
	Continuous learning	-0.24	-0.45
EC	Cognitive capabilities	-0.42	-0.21
	Creative capabilities	-0.61	0.91
	Digital capabilities	-0.56	0.39
	Technical (Professional) capabilities	-0.07	-0.24
DT		-0.20	-0.55

3.4.3. Stability of the Study Tool

The researcher assessed the internal consistency of the research tool using Cronbach's alpha, a widely accepted method for measuring reliability. Cronbach's alpha evaluates the extent of homogeneity among the tool's statements, indicating the strength of the relationships between items within each dimension. Table 5 presents the reliability coefficients obtained for each dimension.

Table 5.
Reliability coefficients (Cronbach's alpha).

Field	Dimension	Reliability coefficient
SWSM	Smart work	0.870
	Creative orientation	0.905
	Environmental understanding	0.918
	Adaptation	0.906
	Continuous learning	0.920
SWSM		0.973
EC	Cognitive capabilities	0.873
	Creative capabilities	0.781
	Digital capabilities	0.871
	Technical (Professional) capabilities	0.856
	EC	0.905
	DT	0.898

- Interpreting the Results: A reliability coefficient (Cronbach's alpha) value closer to 1.0 indicates higher internal consistency, suggesting strong correlations among the items within each dimension, and generally, a reliability coefficient above 0.70 is considered acceptable for research purposes. However, higher values, such as those approaching 0.80 or higher, indicate stronger internal consistency and greater reliability of the questionnaire.
- Reliability Coefficients (Cronbach's alpha):

The dimensions "Creative Orientation," "Environmental Understanding," and" Continuous Learning "exhibit very high reliability coefficients, indicating excellent internal consistency" (0.905, 0.918, and 0.920, respectively). "Adaptation" also demonstrated strong internal consistency with a reliability coefficient of 0.906, and both "SWSM, SW" and " EC" displayed very high reliability coefficients, suggesting excellent internal consistency (0.870 and 0.905, respectively). "DT" showed a good reliability coefficient of 0.898, indicating acceptable internal consistency, and for "EC," "Cognitive

Capabilities," "Digital Capabilities," and "Technical (Professional) Capabilities" also demonstrated acceptable internal consistency with reliability coefficients of 0.873, 0.871, and 0.856, respectively. "Creative Capabilities" had a reliability coefficient of 0.781, which is acceptable but slightly lower compared to the other dimensions. It may benefit from a review of its items to further enhance internal consistency, if necessary. The reliability coefficients for the study fields and their dimensions ranged from 0.781 to 0.973, which are considered acceptable for application purposes, and the study tool exhibited good to excellent internal consistency reliability across most dimensions, enhancing the validity of the research findings. The acceptance rate of the reliability coefficient was 0.70 [56].

3.4.3.1. Multicollinearity Test (VIF Values)

For each dimension, the variance inflation factor (VIF) values were provided; the VIF values for "Smart Work," "Environment Understanding," "DT," "Creative Orientation," "Adaptation," and "Continuous Learning" ranged from 3.014 to 6.382; and none of the VIF values exceeded the threshold of 10, indicating that there was no significant multicollinearity issue in the model. However, some variables showed moderate levels of multicollinearity, which the researchers should consider in their analysis and interpretation of results. The study displayed satisfactory reliability coefficients and no significant concerns with multicollinearity, which instilled trust in the strength and validity of the research findings, as illustrated in Table 6.

Table 6.
Results of the multicollinearity test between the variables.

Dimension	The allowable variance	The variance inflation factor
Smart work	0.332	3.014
Creative orientation	0.164	6.089
Environmental understanding	0.230	4.353
Adaptation	0.157	6.382
Continuous learning	0.180	5.541
DT	0.176	5.674

The results presented in Table 6. indicate that the study model was devoid of multicollinearity issues among variables. This is evident from the variance inflation factor (VIF) values, which were all below 10, indicating acceptable levels of multicollinearity. Additionally, the permissible variance values met the acceptance criterion, with values exceeding 0.1.

3.4.3.2. Results of the Factor Analysis in the Field of SWSM

Table 7 displays the rotation matrix for the independent variable item "SWSM," comprising five dimensions measured using 24 items. This rotation matrix was derived through exploratory factor analysis to validate the SWSM construct. Based on the orthogonal rotation matrix, the rotation matrix displayed the factor loadings or correlations between each item (paragraph) in the questionnaire and the extracted factors (labeled as Factor 1 through Factor 5). The values in the matrix indicated the strength of the relationship between each item and the factors, and higher factor loadings (closer to 1) suggested a stronger correlation between the item and the factor. As for the determinant value, which assessed the overall strength of the relationship between the items, a lower determinant value indicated a stronger relationship among the items. The KMO value of 0.931 in this instance indicated high sampling adequacy, implying that the items were highly interrelated, as the KMO (Kaiser-Meyer-Olkin) test measured the sampling adequacy, with a higher value (closer to 1) indicating better suitability for factor analysis. Bartlett's Test assessed whether the correlation matrix significantly differed from an identity matrix, with a low significance level (Sig.) indicating that the correlations were not due to chance. The low p-value from Bartlett's Test supported the appropriateness of conducting factor analysis on these items. The results suggested that the items related to SWSM exhibited strong relationships and are suitable for factor analysis. The high KMO value and low p-value from Bartlett's Test further confirmed the validity of the factor analysis conducted on these items.

Table 7.
Orthogonal rotation matrix.

Number	Factors				
	1	**2**	**3**	**4**	**5**
1	0.583				
2	0.687				
3	0.747				
4	0.763				
5		0.725			
6		0.771			
7		0.600			
8		0.691			
9		0.652			
10			0.650		
11			0.769		
12			0.774		
13			0.756		
14			0.742		
15				0.658	
16				0.681	
17				0.727	
18				0.735	
19				0.738	
20					0.691
21					0.786
22					0.767
23					0.688
24					0.739
Determinant = 0.001, KMO test = 0.931					
Bartlett's Test = 3565.511, significance level (Sig.) = 0.000.					

3.4.3.3. Description of Results and CFA Procedures for SWSM

Model Specification defines a theoretical model with the latent variable "SWSM" and indicators like Smart Work, Creative Orientation, etc., and for Data Preparation, ensure data meet CFA requirements with continuous or ordinal variables, no missing data, and an adequate sample size. Model Estimation uses statistical software to estimate parameters, factor loadings, latent variable variances, covariance, and error variances. Finally, Model Fit Assessment evaluates model fit using fit indices CFI, TLI, RMSEA, SRMR, and desired values. CFI, TLI > 0.90; RMSEA, SRMR < 0.08. The Validity and Reliability Assessment in Figure 2 depicts confirmatory factor analysis of the SWSM variable.

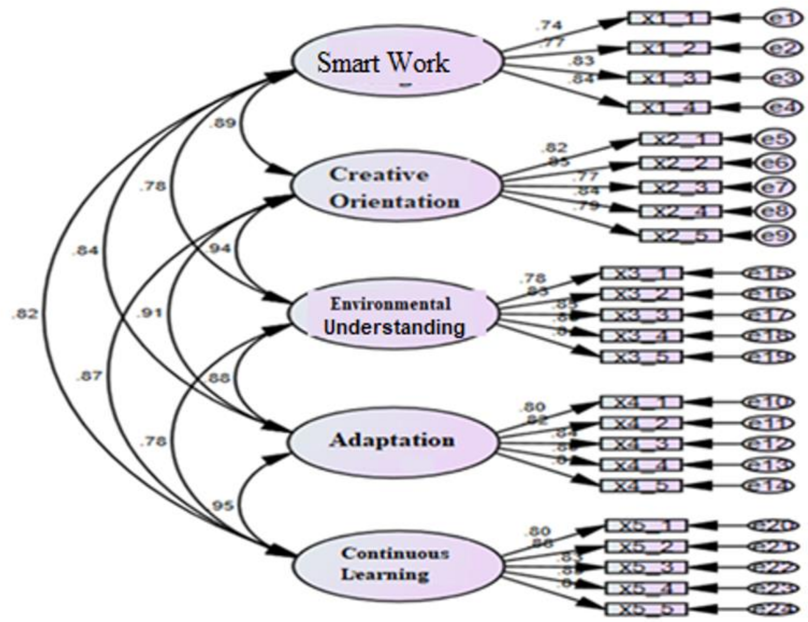

Figure 2.
CFA of the SWSM variable.

3.4.3.4. Results of the Factor Analysis in the Field of EC

Table 8. shows the rotation matrix for the dependent variable item EC, which includes (4) dimensions that were measured using 16 items.

Table 8.
Orthogonal rotation matrix.

Number	Factors			
	1	2	3	4
1	0.628			
2	0.579			
3	0.799			
4	0.785			
5		0.724		
6		0.822		
7		0.794		
8		0.680		
9		0.754		
10			0.659	
11			0.626	
12			0.735	
13				0.626
14				0.711
15				0.639
16				0.623
Determinant = 0.002, KMO test = 0.858 Bartlett's Test = 1791.043, significance level (Sig.) = 0.000.				

Below are the factor loadings and other relevant information for the confirmatory factor analysis (CFA) of the SWSM variable. Based on the provided data, the factor loadings represent the strength of the relationship between each item and its corresponding latent factor (dimension). The values ranging from 0.579 to 0.822 indicated moderate to strong relationships between the items and their respective factors, suggesting that the items were well-aligned with the underlying dimensions of EC. Concerning determinant, KMO Test, and Bartlett's Test, the determinant value of 0.002 suggested the presence of multicollinearity among the indicators, as the determinant was close to zero. The presence of multicollinearity might impact the model's stability and reliability, necessitating attention, while the KMO test value of 0.858 surpassed the recommended threshold of 0.5, suggesting the data's suitability for factor analysis. This suggested that the sample size and correlations between variables were adequate for factor analysis. Regarding the matter of Bartlett's Test resulted in a significant value ($p < 0.001$), indicating that the correlations between the variables were sufficiently large for factor analysis. This supported the appropriateness of conducting factor analysis on these items. Overall, while the factor loadings suggested meaningful relationships between the items and their respective factors, the presence of multicollinearity might require further attention. To improve the stability and reliability of the model, the researchers should consider addressing multicollinearity through methods such as data transformation or regularization techniques. CFA, a statistical technique, validates the measurement model by testing the relationships between observed variables (indicators) and latent constructs (factors) based on a hypothesized model. In a CFA of the EC variable, the main focus is on assessing how well the observed variables (items) align with the latent construct of EC. The standard regression weights, also known as factor loadings, are crucial indicators in CFA. A factor loading greater than 0.40 is generally considered acceptable, indicating that the observed variable adequately represents the underlying construct. Figure 3 shows the CFA of the EC variable.

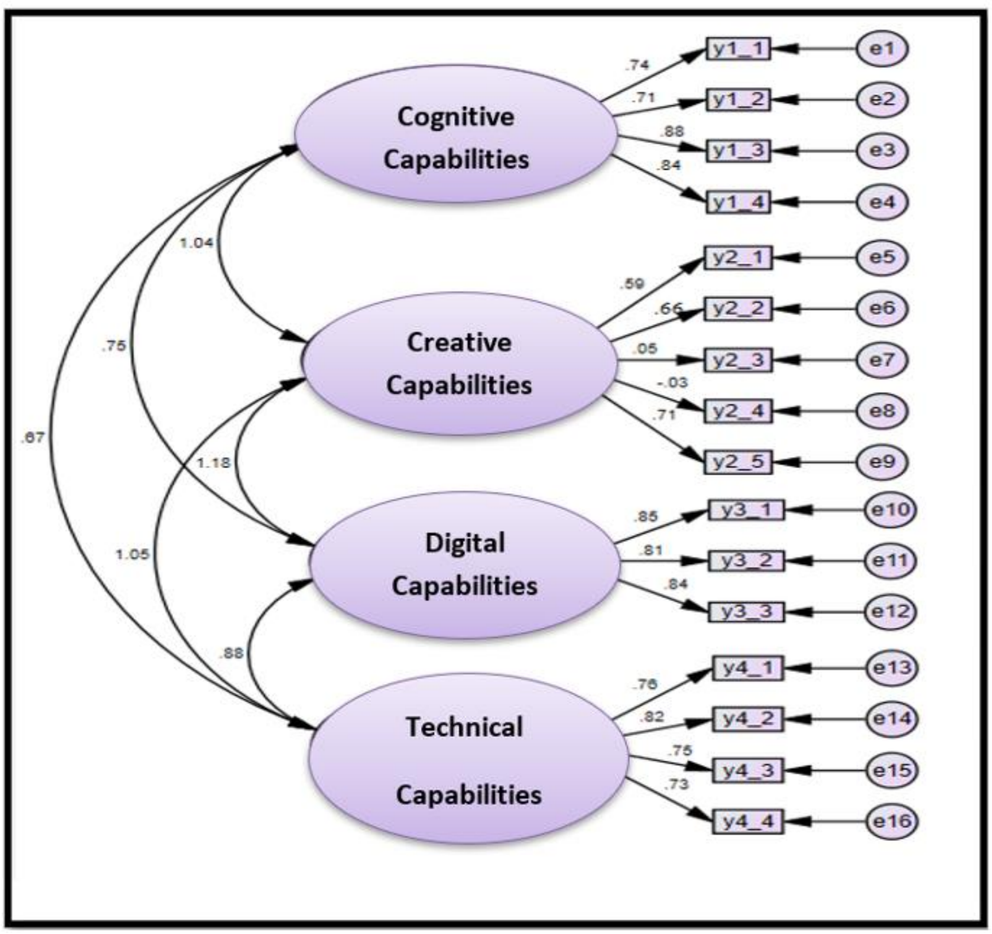

Figure 3.
CFA of the EC variable.

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3.4.3.5. The Results of the Factor Analysis for the DT Variable

The EC construct was validated by Exploratory Factor Analysis (EFA). Table 9 presents the rotation matrix for the DT variable, measured with 20 items. The provided information shows that the saturation percentages for all items ranged from 0.539 to 0.783, exceeding the threshold of 0.4. This suggested a strong relationship between the items and the DT construct, as the items exhibited adequate correlation with their respective factors. The matrix's determinant was 0.001, indicating that there was no problem with autocorrelation between the variables' elements. This suggested that the variables were independent of each other, supporting the validity of the factor analysis results. The KMO test result was 0.979, well above the acceptable threshold of 0.5. This indicated that the sample size was sufficient for accurate results in terms of the variables measured. A high KMO value suggested that the variables were highly correlated, supporting the suitability of factor analysis for the data. Bartlett's Test Statistic was 2354.626, with a significance level (Sig.) of 0.000, which was less than 0.05. This indicated a significant relationship between the sub-components of the DT variable. It confirmed that the variables were interrelated and suitable for factor analysis. The results suggested that the factor analysis of the DT variable had produced valid and reliable findings. The strong correlations between the items and their respective factors, along with the absence of autocorrelation and the significance of Bartlett's test, indicated that the DT variable's sub-components were well-defined and interrelated.

Table 9.
Orthogonal rotation matrix for paragraphs in the field of DT.

Number	Factors
	1
1	0.574
2	0.633
3	0.631
4	0.616
5	0.711
6	0.673
7	0.681
8	0.667
9	0.660
10	0.627
11	0.681
12	0.539
13	0.673
14	0.783
15	0.728
16	0.667
17	0.569
18	0.743
19	0.552
20	0.566

Determinant = 0.001, KMO test = 0.979
Bartlett's Test = 2354.626, significance level (Sig.) = 0.000.

Confirmatory factor analysis was employed to validate the DT variable, and validation of the variable's validity was confirmed when the factor loadings exceeded 0.40, as shown in Figure 4.

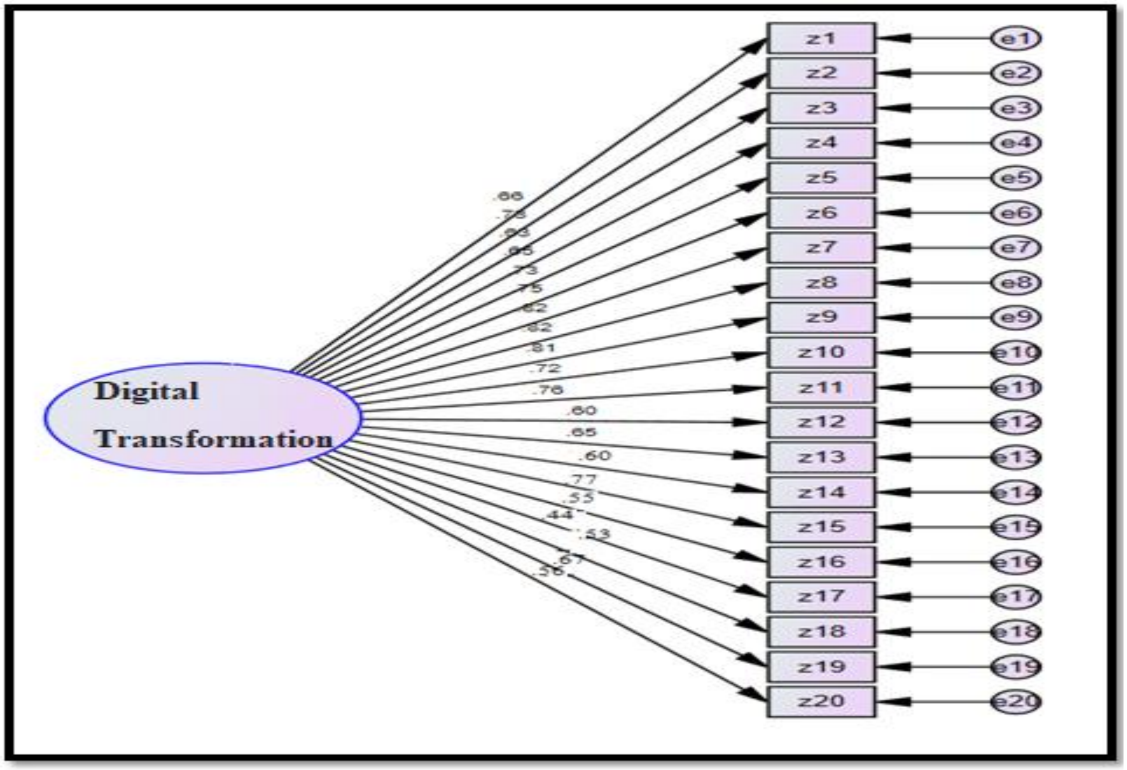

Figure 4.
CFA of the DT variable.

4. Results

4.1. Statistical Methods

To accomplish the study objectives and analyse the collected data, the researcher coded and inputted the data into the Statistical Package for the Social Sciences (SPSS), utilizing various statistical methods available in the software. The methods employed are abbreviated as follows:

1. Frequency (Freq.): Descriptive analysis is used to characterize the study sample, indicating item counts and the distribution of the study tool among participants.
2. Percentages (Percent.): Used to determine the proportion of frequencies relative to sample characteristics.
3. Mean (Mean): Calculated by the researcher to find the average response to each questionnaire statement and the overall average for each study dimension.
4. Standard Deviation (SD): Measures the extent to which readings deviate from the center of their distribution for each study tool statement.
5. Multiple Linear Regression (MLR): Employed to test hypotheses regarding the impact of the independent variable on the dependent variable.
6. Hierarchical Regression (HR): Utilized to examine hypotheses concerning the influence of a modifying variable on the relationship between the independent and dependent variables.

4.2. Descriptive Analysis

- Descriptive Analysis of the SWSM Variable: This section was conducted on the SWSM variable to assess its level within ITC. Arithmetic means and standard deviations were calculated using the ratings provided by the research sample for several magnitudes within the SWSM field, as well as including for the general view of the field. Table 10 presents these findings.

Table 10.
Descriptive analysis of the SWSM variable.

Rank	Dimension	Mean	Standard deviation	Evaluation level
1	Creative Orientation	3.76	0.70	High
2	Smart Work	3.75	0.70	High
3	Continuous Learning	3.69	0.79	High
4	Adaptation	3.64	0.78	Average
5	Environmental Understanding	3.61	0.75	Average
6	SWSM	3.69	0.68	High

Table 10 ranks dimensions based on mean values, with the evaluation level column interpreting results to indicate high or average SWSM levels. Descriptive statistics in Table 11 for the DT variable in ITC revealed:

- Cognitive Capabilities: Highest average score (3.76), indicating strong cognitive skills among employees.
- Creative Capabilities: Score of 3.72, showing a high level of creativity and innovation.
- Digital Capabilities: Average score of 3.61, suggesting satisfactory digital skills.
- Technical (Professional) Capabilities: Lowest score (3.36), indicating room for improvement. Overall, EC received an average score of 3.62, suggesting areas for growth. These insights shed light on the current state of DT in ITC, emphasizing strengths in cognitive and creative areas while highlighting opportunities for development in digital and technical skills to meet evolving demands.
- Descriptive Analysis of Changes in EC: To determine the level of EC in ITC, arithmetic averages and deviation standards were extracted for the research sample members' estimates of the dimensions of the EC field and the field as a whole, and Table 11 shows that.

Table 11.
Arithmetic means and standard deviations of EC dimensions and overall field.

Rank	Number	Dimension	Mean	Standard deviation	Evaluation level
1	1	Cognitive capabilities	3.76	0.78	High
2	2	Creative capabilities	3.72	0.63	High
3	3	Digital capabilities	3.61	0.87	Average
4	4	Technical (Professional) capabilities	3.36	0.91	Average
Field of Employees Capabilities as a Whole			3.62	0.63	Average

The overall average score for employees' capabilities stood at 3.62, indicating an average evaluation level. Among the sub-dimensions, arithmetic averages ranged from 3.36 to 3.76. "Cognitive Capabilities" ranked highest with an average of 3.76, indicating a high evaluation level. Following closely behind, "Creative Capabilities" scored 3.72, also reflecting a high evaluation level. "Digital Capabilities" attained an average of 3.61, signalling an average evaluation level, while "Technical (Professional) Capabilities" scored 3.36, similarly reflecting an average evaluation level.

- Descriptive Analysis of the DT Variable: In Table 12, the arithmetic means and standard deviations of the research sample members' estimates for the items in the field of DT and the field as a whole are presented. The arithmetic mean arranged the items in descending order, reflecting the respondents' perceived level of DT.

Table 12.
Aarithmetic means and standard deviations of digital transformation items.

Rank	Number	Item	Arithmetic mean	Standard deviation	Evaluation level
1	15	The company's management adopts a policy of continuous improvement in its approved electronic application systems.	4.05	0.81	High
2	6	The company is developing administrative processes related to DT.	4.03	0.85	High
3	14	The company's management is making efforts to invest in new opportunities that support DT.	4.02	0.92	High
4	19	The company's management is interested in constantly developing the skills of employees in the field of ICT.	3.94	0.83	High
5	20	The company relies on modern devices and equipment to access information in a timely manner.	3.93	0.86	High
6	16	The company's management is interested in providing high-value electronic services to meet the needs of students.	3.91	0.96	High
7	8	The company is interested in acquiring modern information and communications technology.	3.90	0.90	High
8	5	The company's management is interested in leadership in developing its electronic services.	3.88	0.94	High
9	18	The administration is looking for creative ideas to provide new electronic services and applications.	3.87	0.90	High
10	7	A company's ICT strategies support its business strategies.	3.81	1.06	High
11	12	The company has an advanced digital portal through which most activities are carried out.	3.80	0.93	High
12	17	The company's management attracts individuals with competencies and talents that enhance DT efforts.	3.79	0.97	High
13	13	The company's ICT infrastructure is highly flexible.	3.76	0.99	High
14	9	The company has the appropriate and supportive software to achieve DT.	3.71	1.02	High
15	11	The company has advanced communications networks that support DT.	3.65	1.03	Average
16	4	The company's management constantly follows developments in electronic management applications.	3.53	1.11	Average
17	10	The company interacts with customers through various social media.	3.52	1.05	Average
18	3	The company's work procedures are being developed to keep pace with digital changes in the communications environment.	3.47	1.19	Average
19	2	The company seeks to develop its infrastructure to enhance its DT strategy.	3.43	1.05	Average
20	1	The company's business strategies are adapting to DT efforts.	3.40	1.05	Average
		The field of DT as a whole	3.77	0.57	High

4.3. Findings

The summary of the key findings related to the level of DT in ITC and the results of hypothesis testing:

- Level of DT: The general average for the field of DT was 3.77, indicating a high level of evaluation, and Paragraph No. 15, stating continuous improvement in electronic application systems, had the highest average of 4.05, while Paragraph No. 1, about adapting business strategies to DT, had the lowest average of 3.40.
- Results of Hypothesis Testing (H01): For the Regression Analysis, the multiple regression model yielded an R^2 value of 0.751, indicating that 75.1% of the variance in employees' capabilities can be explained by the combined dimensions of SWSM, and for Statistical Significance, the F-statistic of

88.818 with a p-value of 0.000 indicated that the overall regression model was statistically significant at the 0.05 level. Regarding the Standardized Coefficients, Smart Work, Environmental Understanding, Adaptation, and Continuous Learning, they showed statistically significant positive relationships with the development of EC. However, Creative Orientation did not show a statistically significant relationship. The results rejected the null hypothesis (H01). There was a statistically significant effect of SWSM and their combined dimensions on developing employees' capabilities in ITC. Specifically, dimensions such as Smart Work, Environmental Understanding, Adaptation, and Continuous Learning played significant roles in enhancing EC in this context; Table 13 explains that.

Table 13.
Multiple regression equation for SWSM on EC in ITC.

Variable	**Non-standard transactions**		**Standardized transactions**			**R**	**R²**	**R² Adjusted**	**F**	**Statistical significance**
	B	**Standard error**	**ß**	**T**	**statistical significance**					
Regression constant	1.412	0.112	-	12.560	0.000	0.867	0.751	0.743	88.818	0.000
Smart work	0.100	0.048	0.148	2.084	0.039					
Creative orientation	0.105	0.069	0.154	1.526	0.129					
Environmental understanding	0.112	0.054	0.176	2.070	0.040					
Adaptation	0.119	0.060	0.060	2.002	0.047					
Continuous learning	0.163	0.053	0.273	3.057	0.003					

- Results of Hypothesis Testing (H02): There was no significant moderating effect of digital transformation on the relationship between SWSM and ITC workers' competencies. This hypothesis was tested using hierarchical regression analysis, using DT as a moderating variable. Therefore, the second main hypothesis (H02) was rejected, indicating DT's significant effect as a modifying variable on the relationship between SWSM and developing EC in ITC. Table 16 displays Hierarchical Regression Analysis of DT as a Modifying Variable on SWSM and EC in ITC.

Table 14.
Hierarchical regression analysis results on dt impact as a moderating variable on SWSM and EC development in ITC.

Variable	**First step**			**Second step**		
	ß	**T**	**statistical significance**	**ß**	**T**	**statistical significance**
Regression stability		12.560	0.000		7.207	0.000
Smart work	0.148	2.084	0.039	0.096	1.527	0.129
Creative orientation	0.154	1.526	0.129	0.128	1.435	0.153
Environment understanding	0.176	2.070	0.040	0.212	2.821	0.005
Adaptation	0.197	2.002	0.047	0.136	1.567	0.119
Continuous learning	0.273	3.057	0.003	0.100	1.213	0.227
DT				0.357	6.639	0.000
R	0.867			0.899		
Coefficient of determination R2	0.751			0.809		
ΔR2	-			0.058		
F	88.818			103.051		
Statistical significance	0.00			0.00		

In Table 14., the hierarchical regression analysis showed that 75.1% of the variance in EC was explained by SWSM alone ($R^2 = 0.751$). Upon introducing DT as a modifying variable in the second step, the explanatory power of the model increased to 80.9% ($R^2 = 0.809$), with an additional 5.8% variance accounted for ($\Delta R^2 = 0.058$). The significant coefficient of digital transformation ($\beta = 0.357$, $p < 0.001$) indicated its considerable impact on EC. Therefore, the second main hypothesis was accepted, suggesting that DT significantly modified the relationship between SWSM and developing EC in ITC.

5. Conclusion

The study highlights the significance of effectively implementing SWSM and embracing DT initiatives in ITC. While the findings indicate a high level of SWSM, there are opportunities for improvement in areas such as adaptation and environmental understanding. Moreover, the study underscores the importance of managing smart work systems in contributing to EC development, with DT playing a crucial role as a modifying variable. By implementing the recommended strategies, telecommunications companies in Iraq can strengthen their operational capabilities, foster innovation, and enhance competitiveness in the evolving digital landscape.

Overall, this study provides valuable insights for organizational leaders and policymakers, laying the groundwork for future research and strategic initiatives aimed at driving growth and success in the telecommunications sector.

6. Recommendations

Based on the above results, the study recommends the following:

1. Invest in Information Systems: Allocate resources to enhance information systems infrastructure to streamline internal processes, improve decision-making, and optimize operational efficiency.
2. Address Environmental Uncertainty: Conduct regular assessments of the external environment to identify potential threats and opportunities, allowing for proactive strategic planning and adaptation to market dynamics.
3. Enhance Technology Management: Establish a dedicated technology management department responsible for overseeing the integration of new technologies, managing digital transformation initiatives, and fostering innovation within the organization.
4. Utilize Knowledge Management: Develop robust knowledge management practices to effectively capture, share, and leverage organizational knowledge, facilitating continuous learning and adaptation.
5. Continuous Skills Development: Implement ongoing training programs to ensure employees remain equipped with the latest skills and competencies required for their roles, fostering a culture of CL and professional development.
6. Talent Retention and Upskilling: Prioritize initiatives aimed at retaining top talent within the organization by offering competitive compensation packages and opportunities for career advancement, while also investing in upskilling programs to enhance EC.
7. Implement Ongoing Performance Evaluation: Establish regular performance evaluation processes to assess employee performance, identify areas for improvement, and provide constructive feedback to facilitate growth and development.
8. Incentivize Innovation: Create incentives and recognition programs to reward employees for innovative ideas and contributions, fostering a culture of creativity and driving positive change within the organization.
9. Improve Communications Infrastructure: Invest in upgrading and expanding communications infrastructure to ensure reliable connectivity and meet the growing demands of customers and stakeholders.

Transparency:
The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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