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| RESEARCH ARTICLE

The Role of Information Technology IT Management in the Quality of Distance Education: An Applied Study on North Lebanese Technical Institutes

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| ABSTRACT
The global shift to distance education driven by the COVID-19 pandemic has underscored the critical importance of effective information technology management in educational institutions. This research examines the intricate relationships between IT management, teacher satisfaction, and the quality of distance education in Lebanese technical institutes. The study aims to investigate the mediating role of teacher satisfaction. A quantitative method was employed, gathering data from 132 educators across technical institutes in Northern Lebanon. The research combines principal component analysis (PCA) to validate the structure of the dimensions and structural equation modelling (SEM) to test the relationships between the latent variables. This approach confirmed the convergent and discriminant validity of the constructs measuring information technology management, teacher satisfaction, and the quality of distance education. The SEM results indicate that technology management directly influences the quality of distance education (β = 0.503) and teacher satisfaction (β = 0.421). The latter, in turn, has a significant direct effect on perceived quality (β = 0.544) and serves as a mediating variable in the relationship between technology and quality. A moderate but significant interaction effect (β = 0.054) further enhances this dynamic. The model's overall fit is satisfactory, confirming that the quality of distance education depends on well-managed technological infrastructure and a high level of teacher satisfaction with its use.

| KEYWORDS

Information Technology, Distance Education, Quality, Satisfaction, infrastructure.

| ARTICLE INFORMATION

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1. Introduction

The COVID-19 pandemic triggered an extraordinary global shift to online education, highlighting the critical need for a robust distance learning infrastructure in educational institutions (Dhawan, 2020). This transition has underscored the essential link between educational quality and effective information technology management. While technology serves as the foundation for distance education, the success of these systems is primarily determined by their implementation, management, and use within educational settings (Bao, 2020).

Distance education is often seen as a last resort, yet it signifies a meaningful advancement in democratizing education. First, distance learning dismantles geographical barriers. Students residing in rural areas or conflict zones can access quality courses without traveling. This accessibility opens doors for millions who previously considered education beyond reach. Furthermore, distance learning provides unmatched flexibility (Spatioti et al., 2022). Students can complete courses at their own pace and timetable, which is advantageous for those managing work, study, and family commitments. This flexibility makes education more inclusive and tailored to individual needs. Finally, this teaching approach can lower costs. By removing transportation, housing, and physical infrastructure expenses, distance learning can make education more affordable, allowing individuals from all socioeconomic backgrounds to access quality training. Despite its potential, distance learning raises valid concerns about the quality of education(Bergdahl & Nouri, 2021).

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First, the digital divide is a major obstacle. Not all students have equal access to high-performance computers and stable internet connections. This technological inequality can exclude the most vulnerable students, widening educational gaps. Furthermore, distance learning can impede social interaction and collaborative learning (Aristeidou et al., 2024). Spontaneous exchanges with peers and teachers, essential for cognitive and socio-emotional development, are often limited online. This loss can diminish motivation, deep understanding, and the development of vital interpersonal skills. Lastly, the quality of teaching can suffer. Many teachers, trained for physical classrooms, struggle to adapt their methods to the digital environment. They risk limiting themselves to online lectures without adequate training, neglecting the interactive and personalized engagement necessary for effective learning (Al Masarweh & Afandi, 2022).

In the Lebanese context, official technical colleges face unique challenges in implementing distance education technologies amidst ongoing political instability, health crises, and financial constraints. Lebanese technical education institutions have recently encountered unprecedented difficulties, including political unrest, economic collapse, and the COVID-19 pandemic (Maki et al., 2021). These challenges have heightened the need for effective distance education systems while creating obstacles to their implementation. Official technical institutes have traditionally focused on hands-on training and the development of practical skills, but have struggled to transition to virtual instruction models (Hammoud & Azzi, 2021). Despite substantial investments in technological infrastructure, many institutions find optimizing the quality of distance education challenging, indicating that technology alone is insufficient without proper management and user satisfaction (Al-Fakih & Hammoud, 2022). This research addresses a significant gap in the literature regarding the intersection of these variables in technology-driven educational environments. Additionally, it contributes to developing a comprehensive model that explains the relationships between IT management, teacher satisfaction, and educational quality in the Lebanese context of technical education.

Two research questions are addressed: first, what is the relationship between IT management and the quality of distance education in Lebanese technical institutes? Second, to what extent does teacher satisfaction mediate this relationship? This study examines the role of information technology management in enhancing the quality of distance education through the mediating factor of teacher satisfaction. The primary objective of this study is to examine the direct influence of IT management on the quality of distance education in Lebanese technical institutes. It evaluates the indirect effect through the mediating role of teacher satisfaction.

This research contributes to both theoretical understanding and practical applications in distance education management. Theoretically, it addresses the limited research on the interrelationships between IT management, teacher satisfaction, and education quality in technical education settings, particularly in developing countries facing multiple crises (Waller & Lubienski, 2017). From a practical perspective, the findings provide evidence-based insights for educational administrators to refine their IT management strategies, enhance the quality of distance education, and directly improve teacher satisfaction (Peppard & Ward, 2016). This study is particularly relevant due to the rapid rise in distance education prompted by the COVID-19 pandemic and the persistent challenges within the Lebanese education system. This research offers essential insights for educational institutions facing similar challenges by identifying how IT management impacts educational quality (Brown & Lee, 2021).

2. Literature Review

Distance learning has grown unprecedentedly in recent years, disrupting traditional educational paradigms. This teaching method has sparked heated debate between expanded access opportunities, technological challenges, and concerns about the quality of learning. Online learning became crucial for schools, universities, and organizations. Many institutions transitioned from face-to-face to emergency distance learning, requiring significant effort. Technology has been instrumental in improving educational effectiveness for centuries. Understanding the science of learning is essential for creating quality online learning experiences (Jones et al., 2023). Despite the stigma surrounding online learning, it has proven effective in ensuring learning continuity. Successful online programs are carefully designed by course designers who use technology to organize courses, present content, empower instructors, ensure accessibility, accommodate different learning styles, and encourage collaborative engagement (Aristeidou & Cross, 2021).

Information Technology (IT) Management

Information technology management in educational settings encompasses the comprehensive planning, organization, and coordination of all ICT-related activities (Laudon & Laudon, 2020). Research consistently shows that efficient IT management boosts educational accessibility, streamlines learning processes, and enhances interactions between students and teachers in online education environments (Bao, 2020; Dhawan, 2020). Additionally, properly managed IT systems provide advanced assessment tools, foster communication among educational stakeholders, and facilitate the creation of engaging educational content (Waller & Lubienski, 2017).

Thus, technologies are considered a means of pedagogy. They must be user-friendly and attractive, and promote the accessibility of courses by contributing to the application of Universal Design for Learning. To achieve the desired quality, three elements seem to be taken into account during the quality design phase: teachers' job design is guided, on the one hand, by the orientations,

principles, and recommendations resulting from research in the field and, on the other hand, by good practices for exploiting technologies.

Teacher Satisfaction

Teachers' satisfaction is an emotional state resulting from an individual's evaluation of their work through cognitive, affective, and conative dimensions. The cognitive dimension involves the teacher's evaluative judgment, which leads to the affective dimension (Liu & Zhang, 2021). Depending on the outcome, remediation is implemented to reduce dissatisfaction or enhance satisfaction; this corresponds to the conative dimension, where efforts and impulses facilitate a more satisfying transition to action. "Job satisfaction expresses a psychological state reflecting a positive perception of one's work or work experiences. Experienced in the performance of teachers' work, the core of which is the transmission of knowledge among teachers, considering the design, implementation, and assessment of their activity (Pedditzi et al., 2021). These feelings are linked to perceptions of comfort, professionalism, and effectiveness. A teacher can then express their degree of satisfaction either in the classroom during performance or outside the classroom later when they analyze and evaluate their actions and achievements"(Alhajri, 2022).

Empirical studies indicate a strong link between teacher satisfaction and the quality of education. Research from Stanford University demonstrated that higher student academic performance is directly related to teacher satisfaction (Ladd & Sorensen, 2021). Similarly, findings from Harvard suggest that content teachers are more inclined to adopt innovative and effective teaching strategies (Jackson & Bruegmann, 2019). These findings advocate that teacher satisfaction significantly mediates the relationship between IT management and educational quality, particularly in online learning environments where technology integration is crucial for effective teaching.

The Quality of Distance Education

Several approaches to quality coexist. In the analysis carried out by Lassoued et al. (2020) and Sergi et al. (2023), four axes of approach define quality: quality as value (Jasin et al., 2023), quality as excellence, quality as conformity to specifications (Nasir & Abdul Jabar, 2022), and quality as disconfirmation of expectations (Kesharwani et al., 2021). According to these different conceptions, quality takes two forms: "objective" quality and "subjective" quality. The "subjective" quality axis considers the user's perspective. This approach was developed in the field of services, where the characteristics of intangibility, immateriality, inseparability, and indivisibility have made it difficult to determine objective criteria for measuring quality. Without these objective measures, the approach allows users to assess their perception of quality based on their expectations (Abdullah, 2022). These expectations form personal standards of comparison. This approach to defining quality is the most widely used in education services.

3. Theoretical Framework

The expertise and engagement of educators play a crucial role in determining the quality of distance education. Teachers design digital learning resources in online settings, manage the educational process, employ appropriate teaching methods, foster meaningful student interactions, and assess learning outcomes (Brown, 2021). To perform these responsibilities effectively, educators must gain proficiency in various digital technologies, including learning management systems, virtual classrooms, and visual communication tools (Smith, 2022).

This study suggests that teacher satisfaction mediates the relationship between IT management and the quality of distance education. According to the theoretical framework, effective IT management enhances teacher satisfaction by providing a reliable technological infrastructure, adequate support systems, and suitable training opportunities. As teacher satisfaction increases, it, in turn, enhances educational quality through improved teaching methods, engaging learning materials, and effective interactions between students and teachers. The Lebanese official technical colleges, which prioritize practical and vocational training, have encountered significant challenges transitioning to distance education due to the hands-on nature of their curricula and limited technological resources. These contextual factors result in considerable uncertainties in effectively managing distance education. Four hypotheses are formulated from this analysis.

H1: IT management statistically influences the quality of distance education in Lebanese technical institutes.
H2: IT management statistically significantly influences teachers' satisfaction with technology.
H3: Teachers' satisfaction with technology statistically influences the quality of distance education.
H4: Teachers' satisfaction with technology mediates the relationship between IT management and the quality of distance education.

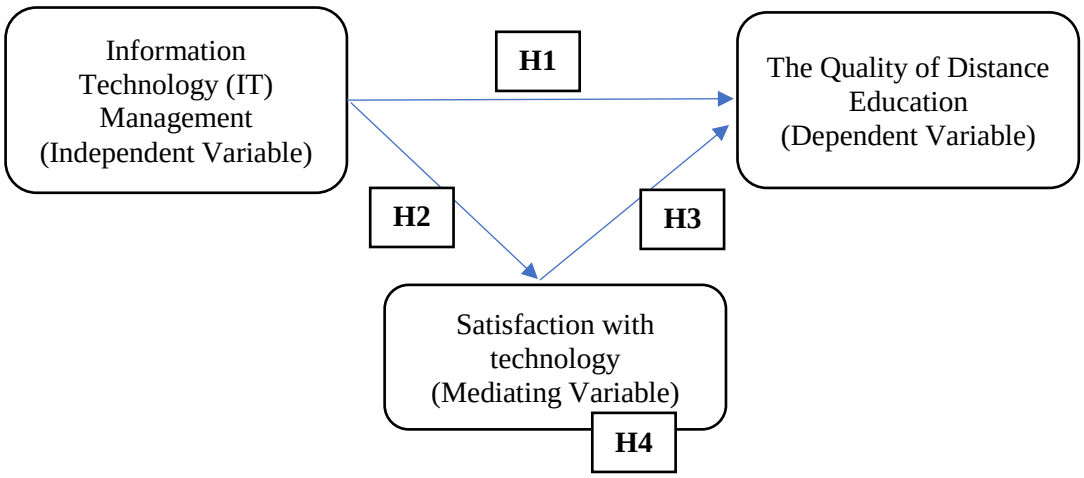

Figure 1: Conceptual Framework

4. Methodology

Quantitative methodologies aim to measure variables and test the model's hypotheses. This quantitative method was chosen for several reasons. First, it validates the factorial structure of the scales used to measure our constructs. Second, it assists in confirming the scales' factorial structure through simple structural equations. Third, it enables us to verify the validity of the research hypotheses using a large sample.

A survey method was used to gather teacher perspectives in Lebanon and collect quantitative data through a structured questionnaire. The research questionnaire consists of four main sections addressing the relevant topic. The questions were tailored to align with the research objectives, ensuring their validity. The scale statements were sourced from peer-reviewed academic publications, internationally recognized scientific sources, and theories relevant to the study's topic. It begins by gathering personal information from participants, including their gender, age, educational level, and teaching experience. The second section evaluates the role of the Information Department, the independent variable in this study, and includes seven items from the AAA study. The third section features seven items assessing teachers' satisfaction. Finally, based on teachers' perspectives on distance education, seven items were used to measure the quality of educational services.

The research focused on teachers from institutions in North Lebanon, covering the period from January 2023 to March 2023. It included teachers from official technical institutes in Lebanon who participated in online education. Conversely, teachers from private or public institutions and those not involved in online learning were excluded from this study. The study maintained participant anonymity and data security by adhering to ethical guidelines and obtaining approval from the university's Institutional Review Board (IRB) committee. All collected information was anonymized and securely stored. Participants received a consent form outlining the study's objectives, procedures, potential risks, and benefits. They were also informed about their right to withdraw from the research without facing any consequences. Each participant signed the consent form before completing the survey.

A group of 20 instructors completed a preliminary questionnaire to ensure clarity and refine the questions. Based on feedback from the pilot test, the questionnaire was revised. The psychometric properties of validity and reliability were evaluated to confirm the accuracy of the measurement tool and its results. The internal consistency of the questionnaire items was assessed using Cronbach's alpha coefficient, confirming the scale's reliability and stability. Validating accurate and objective data depends on the validity and ensured reliability of the measurement instrument.

This study employs various statistical methods to explore the impact of IT management on the quality of distance education. Initially, descriptive statistics highlight participant demographics. Correlation analysis evaluates the strength and direction of relationships between variables. The adopted inferential approach pertains to constructing measurement scales according to the principles of the Churchill paradigm (1979), supplemented by the analyses of Gerbing and Anderson (1988). This paradigm embraces two consecutive phases: exploratory and confirmatory factor analysis. Factor analysis is a data structuring approach (i.e., reducing the columns of the data matrix). Factor analysis summarizes the information in a table of individual/variable figures. It thus allows, on the one hand, to eliminate redundancies between certain initial variables by replacing them with a smaller number of composite variables or factors. On the other hand, it also allows for eliminating a certain number of variables that only provide marginal and uninteresting information. Exploratory Factor Analysis (EFA) is a method used to identify the structure of questionnaire items without imposing a predefined model. It involves the Kaiser-Meyer-Olkin (KMO) Test and Bartlett's Test, and is typically performed using Principal Component Analysis or Principal Axis Analysis. Factor retention criteria include eigenvalue > 1, screen plot analysis, and factor loadings.

In a confirmatory approach, this point of view ensures that the data collected verify a structure defined a priori, based on theoretical hypotheses or from previous studies. CFA is a structural equation modeling (SEM) technique used to verify the consistency of a

proposed factor structure with collected data. It involves using software like AMOS, assessing model fit using goodness-of-fit indices, and calculating internal reliability using Cronbach's Alpha. It also analyzes convergent and discriminant validity.
Structural equation modeling (SEM) is utilized to analyze the complex interactions among these variables, including their mediating effects, and to present the results visually. The mediation analysis investigates how IT management influences educational quality indirectly through intermediary factors. While p-values indicate the significance of the correlations identified, confidence intervals (CI) offer precision for the estimates, confirming the mediation effects and other statistical relationships crucial for understanding the study's hypotheses. Data analysis was performed using SPSS and AMOS software.

5. Results

This analysis explores how IT management enhances educational quality by impacting various factors. A dual approach was adopted to validate the measurement scales used in this study. An exploratory factor analysis (EFA) was first conducted on a pilot sample to identify the factor structure underlying each dimension (IT management, teacher satisfaction, quality of distance education). Then, a confirmatory factor analysis (CFA) was performed using AMOS software to test the validity of the proposed theoretical model. The adequacy of the model was assessed using several standard indices (CFI, TLI, RMSEA, SRMR). All scales were also subjected to a reliability test by calculating Cronbach's alpha.

Table 1. Frequencies and percentages of respondents' answers to questions related to personal information

	Frequency	Percent
Gender		
Male	36	27.3
Female	96	72.7
Age (years)		
[18-30]	2	1.5
[31-40]	51	38.6
[41-50]	61	46.2
More than 50	18	13.6
Educational level		
Professional technician	4	3.0
BSc.	72	54.5
Master	45	34.1
PhD	11	8.3
Experience in teaching		
[1-5]	1	0.8
[6-10]	16	12.1
[11-20]	83	62.9
[21-30]	29	22.0
More than 30	3	2.3
Total	**132**	**100.0**

Table 2 displays descriptive statistics for the study's factors, which include IT management, technology satisfaction, and the quality of distance education. The findings indicate a 95% confidence interval (CI) from 3.8 to 3.1 and a standard deviation (SD) of 0.9, reflecting modest variability. The mean score for IT management is 3.8. Teachers rate IT management positively, near the maximum value (on a scale of 5). The symmetrical distribution is consistent, with a skewness (Sk) of 0.19 and a kurtosis (Kr) of 0.41. This slightly flattened distribution means that the data are slightly less concentrated around the mean than in a normal distribution. Consequently, teachers positively perceive IT management, with relatively consistent responses and a slight positive trend.

Table 2. Descriptive statistics for the different variables (n=132)

	Mean	SD	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Information Technology (IT) Management	3.87	0.904	0.198	0.211	0.443	0.419
The Quality of Distance Education	3.32	0.986	0.642	0.211	0.058	0.419
Satisfaction with technology	3.17	1.016	0.864	0.211	0.076	0.419

SD= Std. Deviation

The quality of distance education has a mean score of 3.3 and a standard deviation (SD) of 0.98, indicating notable variability. The kurtosis 0.05 signifies a slightly flatter distribution than usual, while a skewness of 0.21 suggests a minor positive skew. Opinions on the quality of distance learning are mixed, with some respondents leaning toward criticism. In comparison, the average score for technology satisfaction stands at 3.1, with a standard deviation (SD) of 0.98, indicating a prominent positive skew. The kurtosis of 0.05 suggests a more peaked distribution. Satisfaction with technology appears relatively low, reflecting significant heterogeneity in responses. This may point to issues of accessibility, effectiveness, or usability.

The PCA reveals a strong, clearly defined structure with three main components that correlate with the variables in the theoretical model. The extraction values (commonalities) are all above 0.63, demonstrating that each indicator significantly contributes to its dimension. The high Total Variance Explained (TVE) values of 67.8% for IT Management, 84.7% for Satisfaction, and 83.9% for Quality of Education confirm that the extracted factors account for a substantial proportion of the variance, providing the model with robust explanatory power. The KMO indices (> 0.8) further support the validity of the PCA, demonstrating that the correlation matrix is adequate after dimension reduction.

Table 3. Discriminant validity (loadings)

	1	Extraction	TVE/ KMO
Information Technology (IT) Management			
IT7. The integration of technology helps me better organize my distance learning courses.	.840	.706	67.8%/ 0.825
IT6. The educational software and platforms are updated regularly.	.839	.704	
IT5. My institute's management actively encourages the use of information technology.	.826	.682	
IT1. My technical institute provides digital tools suitable for distance learning.	.814	.663	
IT3. Technical support is available and effective in case of problems with the digital tools.	.799	.638	
Satisfaction with technology			
TS5. I feel competent in using digital tools for teaching.	.945	.894	84.7/ 0.827
TS3. Remote teaching meets my professional expectations.	.922	.851	
TS6. I am motivated to continue teaching remotely in the future.	.911	.829	
TS2. I enjoy teaching remotely at my institute.	.905	.818	
The Quality of Distance Education			
QT4. Communication with students remains effective despite the physical absence.	.944	.891	83.9/ 0.888
QT5. The assessment of learning is fair in the online context.	.918	.842	
QT1. I can achieve my educational objectives despite the distance.	.904	.818	
QT2. My students have a good understanding of the content taught remotely.	.897	.805	

No cross-loading is observed between the components, confirming a clear distinction among the model's three dimensions. The items are assigned solely to their respective factors, ensuring satisfactory discriminant validity. The factor loadings (all above 0.79 and up to 0.94) indicate a strong correlation between the indicators and their corresponding latent factors, reflecting very good convergent validity for each dimension. For IT management, the indicators are all closely related to organizational capacity, technical support, and the digital environment. Teacher satisfaction is linked to perceived competence, motivation, and the compatibility between distance learning and professional goals. The quality of teaching relies on fundamental pedagogical elements: communication, assessment, achievement of objectives, and student understanding. The model is statistically robust, with each dimension being well-represented, reliable, and distinct. The model's three dimensions are empirically validated by PCA, justifying their use in mediation or structural analysis. Teachers perceive a consistency among the digital tools provided, their motivation and competence, and the quality of distance learning. Results pave the way for a more in-depth causal analysis between these variables.

Tolerance indices and VIF (Variance Inflation Factor) values assess multicollinearity, i.e., the overlap between variables in a predictive model. Tolerance values greater than 0.1 and VIFs close to 1 indicate the absence of problematic multicollinearity between the components. Each dimension measures a distinct construct, and the observed relationships between them are neither artificial nor due to statistical overlap.

Table 4. Divergent validity Correlations

	IT	TS	QT	Tolerance	VIF
IT. Information Technology (IT) Management	1			.860	1.163
TS. Satisfaction with technology	0.374**	1		.860	1.163
QT. The Quality of Distance Education	0.376**	0.772**	1		
**. Correlation is significant at the 0.01 level (2-tailed).					

The table displays the significant bilateral correlations at the 0.01 level among the three main dimensions of the model. A moderate but significant correlation is noted between organizational and technical capacity and teacher satisfaction (r = 0.374*). Therefore, effective digital infrastructure and support are essential for enabling more competent and motivated teachers to feel capable in their distance learning environment. An equivalent correlation is also noted between IT and the perceived quality of distance learning (r = 0.376*). Thus, institutional investment in technology correlates with perceived teaching quality. The strong relationship between satisfaction and the quality of distance learning (r = 0.772*) illustrates a direct and powerful association. Satisfied teachers who use digital tools believe their online teaching is effective and high-quality. The model is based on empirically distinct yet theoretically related variables, which validates its conceptual framework. The mediating role of satisfaction is statistically supported by its moderate correlation with the technological environment and its very strong correlation with the perceived quality of teaching. The results pave the way for mediation or structural equation model (SEM) analyses, ensuring divergent validity and non-multicollinearity.

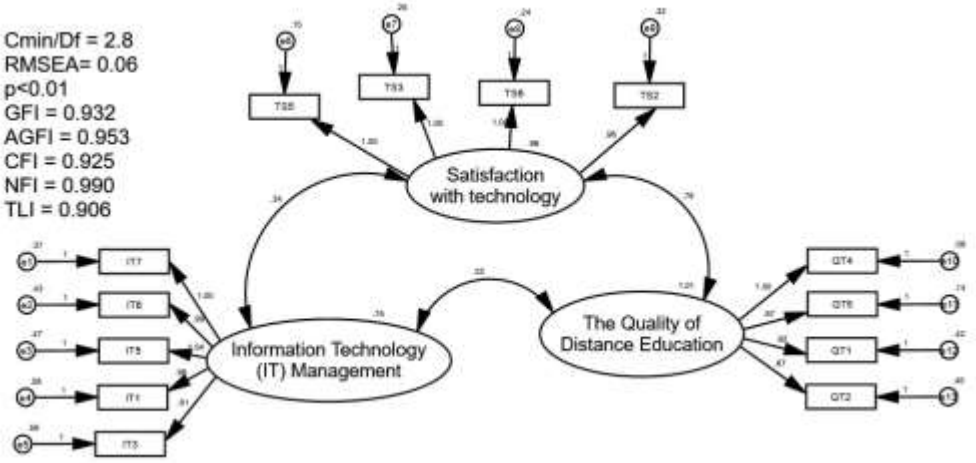

Figure 2: Diagram of the structural model of the study

The overall fit indices indicate that the structural model is statistically acceptable and fits the data well. Cmin/df = 2.8: value below the critical threshold of 3, suggesting a good fit. RMSEA = 0.06: value below 0.08, reflecting a low approximation error, therefore a good fit. GFI = 0.932, AGFI = 0.953, CFI = 0.925, NFI = 0.990, TLI = 0.906: all these indices exceed the thresholds of 0.90, confirming a very good model fit. In summary, the empirical data strongly support the proposed theoretical structure.

Table 5. Regression Weights

			Estimate	S.E.	C.R.	P
IT7	<---	Information Technology Management	1.000			
IT6	<---	Information Technology Management	.987	.100	9.862	***
IT5	<---	Information Technology Management	1.038	.105	9.919	***
IT1	<---	Information Technology Management	.959	.106	9.081	***
IT3	<---	Information Technology Management	.905	.104	8.665	***
TS5	<---	Satisfaction technology	1.046	.062	16.971	***
TS3	<---	Satisfaction technology	1.000			
TS6	<---	Satisfaction technology	1.005	.066	15.319	***
TS2	<---	Satisfaction technology	.960	.069	13.910	***
QT4	<---	Quality Distance Education	1.000			

			Estimate	S.E.	C.R.	P
QT5	<---	Quality Distance Education	.967	.044	22.078	***
QT1	<---	Quality Distance Education	.918	.063	14.560	***
QT2	<---	Quality Distance Education	.871	.061	14.241	***

The factor loadings of the items, which range from 0.75 to 1.05, are high and consistent across their respective dimensions. This reinforces the convergent validity of the indicators and highlights the relevance of the items retained in the PCA purification process. IT management directly influences Satisfaction, with a coefficient of 0.75. Therefore, a well-managed digital environment significantly enhances teacher satisfaction. Satisfaction also directly influences teaching quality, demonstrated by a coefficient of 0.78. Satisfied teachers view their distance learning experiences as effective and of high quality. Additionally, IT management directly affects teaching quality, with a coefficient of 0.33. While technology management partially impacts quality, satisfaction predominantly mediates this effect. The indirect effect of IT management on teaching quality, through satisfaction, is substantial, fully supporting the mediating role of teacher satisfaction.

Table 6. Regression Weights

				Estimate	S.E.	C.R.	P	Results
H1	Information Technology (IT) Management	→	The Quality of Distance Education	.503	.060	11.055	0.00	Supported
H2	Information Technology (IT) Management	→	Satisfaction with technology	.421	.091	4.619	0.00	Supported
H3	Satisfaction with technology	→	The Quality of Distance Education	.544	.053	10.237	0.00	Supported
H4	Information Technology (IT) Management X Satisfaction with technology	→	The Quality of Distance Education	.054	.012	4.383	0.00	Supported

The four hypotheses (H1 to H4) were statistically confirmed with significance values of $p < 0.001$, demonstrating the robustness and internal consistency of the model.

H1: Direct effect of IT management on the quality of distance learning ($\beta = 0.503$, CR = 11.055). This strong and significant effect indicates that effective technology management (infrastructure, digital tools, support) directly enhances the perceived quality of distance learning. Institutional investment in technology is a key lever for ensuring effective online learning.

H2: Direct effect of IT management on teacher satisfaction ($\beta = 0.421$, CR = 4.619). This result demonstrates that well-integrated and accessible digital tools enhance teacher satisfaction with their teaching environment. Satisfaction arises from an easy user experience, consistent accessibility, and responsive technical support.

H3: Direct effect of satisfaction on the quality of distance learning ($\beta = 0.544$, CR = 10.237). This relationship is the strongest in the model, showing that teacher satisfaction is central to the perception of quality distance learning. When teachers are motivated, confident, and satisfied with the available tools, this is reflected in the system's pedagogical quality.

H4: Interaction effect (IT × Satisfaction) on teaching quality ($\beta = 0.054$, C.R. = 4.383). Although this coefficient is smaller than the direct effects, it remains significant, indicating a moderating or interactional effect. Consequently, the effect of IT management on quality is reinforced when teachers are satisfied. In other words, even a good technological infrastructure is only fully effective if end users are satisfied.

Discussion

This study provides strong evidence on the impact of IT management on enhancing the quality of distance education in Lebanese technical institutes, highlighting teacher satisfaction as a crucial mediating factor. The data analysis unearthed several key findings that corroborate and expand upon earlier research in this field.

The significant positive correlation between IT management and the quality of distance education ($p < 0.001$) supports the findings of Bao (2020) and Dhawan (2020), who noted that effective IT management enhances educational accessibility and facilitates learning processes in distance education environments. Nevertheless, this study uniquely quantifies this relationship in Lebanese

technical institutes, which encounter specific challenges from ongoing political instability, economic crises, and the COVID-19 pandemic.

Regarding the mediating role of teacher satisfaction, our structural equation modeling revealed that teacher satisfaction partially mediates the relationship between IT management and educational quality, with significant direct effects (estimate = 0.50, $p = 0.001$) and indirect effects (estimate = 0.054, $p < 0.001$). This finding extends research by Ladd and Sorensen (2021) and Jackson and Bruegmann (2019), who identified connections between teacher satisfaction and educational outcomes but did not examine the specific mediating mechanisms in the context of distance education.

This study notably revealed that satisfaction with educational practices was a key mediator. This finding partially contrasts with the conclusions drawn by Martin et al. (2019) and Keengwe and Kidd (2010), who emphasized the importance of technological competence in enhancing the quality of distance education. In Lebanese technical education, results indicate that educators' comfort with teaching practices and lower anxiety levels regarding distance teaching have a more substantial impact than their contentment with the technology. This nuanced perspective supports Bates and Poole's (2003) claim that institutional support can be more critical than individual technological skills.

This analysis explores how IT management enhances educational quality by impacting various factors. A dual approach was adopted to validate the measurement scales used in this study. An exploratory factor analysis (EFA) was first conducted on a pilot sample to identify the factor structure underlying each dimension (IT management, teacher satisfaction, quality of distance education). Then, a confirmatory factor analysis (CFA) was performed using AMOS software to test the validity of the proposed theoretical model. The adequacy of the model was assessed using several standard indices (CFI, TLI, RMSEA, SRMR). All scales were also subjected to a reliability test by calculating Cronbach's alpha.

6. Conclusion

The model empirically validates the essential role of technology in the success of distance learning by evaluating teacher satisfaction. It demonstrates that satisfaction acts as both a mediator and an amplifier, reinforcing its strategic position in distance learning systems. Simply providing digital tools is insufficient; to maximize their impact, these tools must be relevant, accessible, and aligned with teachers' expectations. Institutions must integrate digital transformation with human support to ensure that technology enhances educational quality. Satisfaction serves as a vital bridge between digital resources and educational outcomes. School leaders can enhance the quality of distance learning by increasing access to, updating digital tools, strengthening technical support and ongoing training, and fostering a motivating environment for distance learning.

This research significantly advances theory and practice by examining how IT management impacts satisfaction with technology and the quality of distance education in technical educational settings, particularly in challenging contexts such as Lebanon. It demonstrates that effective IT management directly and indirectly enhances the quality of distance education by improving teacher satisfaction. The latter effect is largely driven by contentment with educational practices and reduced teaching anxiety, rather than satisfaction with technology. These findings hold significant implications for educational leaders, policymakers, and IT managers in Lebanese technical institutes and comparable settings. They indicate that strong support systems must complement IT infrastructure and management investments to boost educators' pedagogical confidence and alleviate anxiety regarding distance teaching, rather than merely enhancing technological satisfaction.

In conclusion, while distance learning provides opportunities, its challenges are significant. The digital divide, loss of social interaction, and teachers' difficulties in adapting threaten the quality of education. Investing in technological equity, rethinking teaching methods, and valuing interaction, even remotely, is crucial to realize its potential. Rather than choosing between in-person and remote learning, let us embrace a hybrid future. By combining the flexibility of digital technology with the richness of in-person interactions, we can create a more personalized, engaging, and relevant education system for the modern world.

For future research, more comprehensive investigations into the determinants of teacher satisfaction in distance learning environments are recommended, along with comparative studies across different geographic regions and educational levels. Additionally, it would be valuable to explore innovative IT management strategies in distance education and their effectiveness in improving educational quality and teacher satisfaction. Ultimately, longitudinal studies examining how these relationships evolve would provide deeper insights into the lasting effects of IT management on the quality of distance education. Educational institutions can enhance the learning environment and better cater to the evolving needs of educators and learners in distance education by addressing institutional barriers and prioritizing teacher satisfaction with instructional resources through IT tools.

This study encountered several limitations. Firstly, it focused exclusively on teachers and students at formal technical institutes in Lebanon, limiting the findings' applicability to other educational contexts or areas. Additionally, the research faced obstacles due to the reluctance or lack of cooperation from certain stakeholders who favor traditional approaches and resist change. Other limitations included restricted access to specific samples, doubts about the reliability of responses, insufficient background information needed for a comprehensive understanding of information technologies and distance education, and difficulties in collaboration among stakeholders due to their adherence to conventional educational practices. Many potential paths for future research remain to be pursued in upcoming studies. One option is to conduct similar research on a larger scale, involving a range of educational institutions in both Lebanon and abroad, to achieve more comprehensive and generalizable results. Additionally, it

is essential to examine how various factors, including educators' and learners' cultural and social characteristics, impact the distance learning experience and IT management. Longitudinal studies could yield valuable insights into how distance education experiences evolve and the enduring effects of IT management. Moreover, it is vital to develop new models and strategies for managing information technology within the education sector and evaluating their effectiveness in improving the quality of distance education. Finally, specific aspects of distance education, such as creating digital curricula or developing electronic assessment tools, should be emphasized and integrated with IT management to foster significant progress in this domain.

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