Journal of Digitovation and Information System

http://jdiis.de/index.php/jdiis

Navigating the Digital Landscape: Exploring the Interplay of Digital Leadership, E-Learning Anxiety, and Innovative Behavior

Abdul Salam*

Energy Engineering and Management, Instituto Superior Tecnico, University of Lisbon, Lisbon Portugal

Abstract

This study investigates the associations between digital leadership, e-learning anxiety, innovative work behavior, and psychological capital among 200 IT employees in Lisbon, Portugal. Self-administered surveys were used to collect data, and structural equation modeling was employed for data analysis. The results demonstrate that digital leadership has a positive direct impact on innovative work behavior, while e-learning anxiety has a negative direct impact on innovative work behavior. Moreover, psychological capital plays a moderating role in the relationship between e-learning anxiety and innovative work behavior. Individuals with higher levels of psychological capital are less affected by e-learning anxiety and more likely to engage in innovative work behavior. These findings emphasize the significance of digital leadership and psychological capital in promoting innovative work behavior, particularly in the context of e-learning anxiety among IT employees. The study suggests that organizations should prioritize the development of digital leadership skills and support the positive psychological resources of their employees to enhance their ability to cope with challenges and achieve their objectives.

Keywords

Psychological capital, Digital Leadership, E-Learning Anxiety, Innovative Behaviour, Psychological Capital Theory

Article Information

Received 25 August 2022
Revised 20 December 2022
Accepted 10 April 2023
https://doi.org/10.54433/JDIIS.2023100020
ISSN 2749-5965

1. Introduction

The Portuguese IT sector has recently placed a greater emphasis on digital transformation and innovation (Santos & Castanho, 2022). To enhance their operations and develop new products and services, many businesses are investing in cutting-edge technology and tools like cloud computing, blockchain, and artificial intelligence. Lisbon's IT staff is expected to be well-versed in digital technology and quick to adopt new ones (Faria, 2022). In Lisbon, Portugal, most IT workers are highly educated and technically skilled, and many of them have degrees in computer science, engineering, or similar subjects. They work in a variety of sectors, such as financial services, telecommunications, and software development (Faria, 2022; Santos & Castanho, 2022). Lisbon has a high demand for IT skills, thus many businesses provide attractive compensation and benefits packages to entice and keep the best candidates (Santos & Castanho, 2022). Portugal's employment rate dropped from 56.70 percent in the third quarter of 2022 to 56.40 percent in the fourth.

.

*Corresponding author: e-mail addresses: Abdul.salam@tecnico.ulisboa.pt (A. Salam)

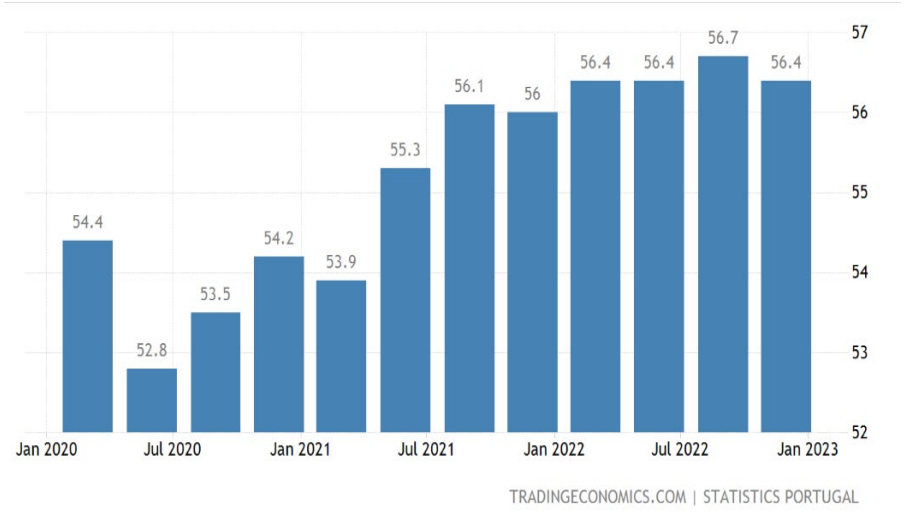

Figure 1: Portugal's Employment rate

Innovative behavior refers to the ability of individuals to generate and implement new ideas and solutions (Hooi & Chan, 2022). This can involve creating new goods or services, discovering more effective methods of operation, or coming up with creative answers to challenging issues. For an organization to succeed, innovation is essential, especially in the quickly developing and ever-evolving field of information technology (Erhan et al., 2022). Innovative work practices are becoming more crucial for IT personnel in Lisbon, Portugal, where the technology sector is expanding quickly, to stay competitive and promote company growth (Rafique et al., 2022). IT staff members that exhibit innovative work behavior can assist their firms in staying on top of the latest developments in technology and market trends. They can also aid in streamlining procedures, boosting productivity, and boosting client happiness (Erhan et al., 2022; Hooi & Chan, 2022; Rafique et al., 2022).

Digital leadership refers to the ability of leaders to effectively lead and manage digital transformation initiatives in their organizations (de Araujo et al., 2021). Using technology and digital tools to promote innovation, improve teamwork, and streamline operations is known as digital leadership (Bach & Sulíková, 2021). It also requires creating a digital strategy that supports the organization's objectives and guiding principles while maintaining abreast of market developments and upcoming technologies (Borah et al., 2022). Digital leadership is crucial for attaining corporate goals and raising organizational performance in the context of IT employees in Lisbon, Portugal (Erhan et al., 2022). Leaders will be better able to foster innovation and maintain competitiveness in a market that is changing quickly if they can successfully manage the complexity of digital transformation and motivate their staff to adopt new technology and methods of working (Hooi & Chan, 2022; Schwarzmüller et al., 2018).

E-learning anxiety, on the other hand, refers to the feelings of stress and apprehension that some individuals experience when engaging in online learning activities (AlJhani et al., 2022). Using digital technologies to access courses, tutorials, and other learning resources, e-learning has grown in popularity as a tool for people to pursue education and training remotely in recent years (Heckel & Ringeisen, 2019; Keskin et al., 2023). E-learning has many advantages, including accessibility and flexibility, but it can also make some people anxious. E-learning anxiety may be particularly pertinent in the context of IT workers in Lisbon, Portugal, as the technology sector necessitates ongoing professional development and upskilling to stay current with the latest technologies and practices. In order to improve their skills and expertise, many IT personnel may be compelled to participate in e-learning programs (AlJhani et al., 2022; Azzi et al., 2022; Godoy et al., 2021; Pelucio et al., 2022).

A person's good psychological state of growth, sometimes referred to as psychological capital,

might include resilience, optimism, hope, and self-efficacy (Godoy et al., 2021). These psychological tools can aid people in overcoming obstacles, adjusting to change, and achieving their objectives (Azzi et al., 2022). Organizations are placing more emphasis on psychological capital as a means of boosting workers' productivity and well-being (Pelucio et al., 2022). For IT professionals in Lisbon, Portugal, where the technology sector is expanding quickly, psychological capital may be especially important given the variety of difficulties they confront, including high levels of stress and pressure to keep up with emerging technologies (Peng et al., 2022; Zeike et al., 2019). The present study aims to examine the relationships among digital leadership, e-learning anxiety, innovative behavior, and the moderating role of psychological capital. The study will contribute to the understanding of the role of digital leadership, e-learning anxiety, and psychological capital in fostering innovative work behavior among IT professionals in Lisbon, Portugal. By investigating these relationships, the study can provide insights into how organizations can enhance digital leadership practices, alleviate e-learning anxiety, and cultivate psychological capital to promote innovative work behavior among IT professionals.

2. Literature Review

2.1. Psychological Capital Theory

Psychological Capital Theory, developed by Godoy et al. (2021) and Pelucio et al. (2022), places significant importance on the psychological resources of individuals, including hope, self-efficacy, optimism, and resilience (Azzi et al., 2022). These resources have been widely studied and applied in various fields such as organizational behavior, leadership, and human resource management. According to the theory, individuals with high levels of psychological resources are more resilient in the face of stress, adversity, and change (Zeike et al., 2019). Moreover, they tend to be more driven, engaged, and productive at work, making them more likely to achieve their objectives and aspirations.

In the context of digital leadership, effective leadership and communication in a digital world are crucial (Peng et al., 2022). Digital leadership requires leveraging technology and employing innovative strategies to drive organizational success. On the other hand, e-learning anxiety refers to the uneasiness or concern experienced by individuals when using digital technology for educational purposes. To foster innovative work behavior, individuals need to exhibit creative problem-solving skills and a willingness to take calculated risks (Azzi et al., 2022). Psychological Capital theory encompasses four key components: Hope, which represents the confidence and drive to find ways to achieve desired goals (Peng et al., 2022); self-efficacy, which is the belief in one's ability to carry out specific actions or behaviors required to achieve desired outcomes; optimism, which involves looking at life and the future with a positive outlook and overcoming challenges; and resilience, which refers to the ability to bounce back from setbacks, learn from mistakes, and adapt to new circumstances (Paek et al., 2015; Pelucio et al., 2022).

Individuals with high levels of Psychological Capital, particularly self-efficacy and resilience, are better equipped to handle the challenges of digital leadership and overcome e-learning anxiety (de Araujo et al., 2021). They possess the courage and drive to take risks and explore new ideas, making them more likely to exhibit innovative work behavior. Research has shown a positive correlation between Psychological Capital and innovative work behavior, indicating that individuals with higher levels of Psychological Capital are more inclined to engage in innovative practices (McLafferty et al., 2021). Psychological Capital leaders are also more effective in fostering creativity within their teams and organizations. However, e-learning anxiety can pose a threat to the development of Psychological Capital as it can diminish optimism and self-efficacy in a virtual learning environment (Alsudais et al., 2022). Therefore, it is essential for organizations to provide training and support to help employees overcome e-learning anxiety and enhance their Psychological Capital, ultimately fostering a conducive environment for innovative work behavior.

2.2. Digital Leadership and E-learning Anxiety

The development of digital technologies has brought about significant changes in the way we study and work (Bach & Sulíková, 2021). E-learning systems have emerged as a result of technological advancements, revolutionizing the education industry. Particularly during the COVID-19 pandemic, the adoption of online education has increased significantly (Alsudais et al., 2022; Breuer & Szillat, 2019). However, the transition to digital learning has not been without challenges. E-learning anxiety has emerged as a critical issue affecting both students and teachers. This literature review aims to explore the relationship between digital leadership and e-learning anxiety (Arora et al., 2021).

Digital leadership refers to the ability of leaders to leverage digital technologies to drive growth and innovation within their organizations, including the educational sector (de Araujo et al., 2021). In the educational context, digital leadership involves utilizing technological advancements to enhance the quality of instruction and student performance. Digital leaders must embrace change, adapt to emerging technologies, and effectively guide their teams in the digital era (Schwarzmüller et al., 2018; Zeike et al., 2019). E-learning anxiety encompasses the feelings of apprehension or fear experienced by students when using digital learning platforms. Factors such as technology-related concerns, limited technological skills, and a sense of isolation in online learning contribute to this anxiety (Papa et al., 2018). E-learning anxiety can have a significant negative impact on the educational process, leading to lower academic performance and higher dropout rates. Digital leadership plays a vital role in alleviating learners' anxiety by providing appropriate support and resources (Rafique et al., 2022).

Effective digital leadership entails ensuring learners have access to suitable tools and technology, providing clear instructions on their usage, and offering opportunities for practice (Pelucio et al., 2022). Additionally, digital leaders can foster a sense of community among learners, reducing anxiety associated with online learning. By facilitating online dialogues, promoting group work, and enabling communication between students and teachers, digital leaders contribute to a supportive learning environment (ÖZMEN et al., 2020; Woon et al., 2021). Anxiety holds significance because digital leaders can mitigate learners' apprehension about online learning (Pelucio et al., 2022). Creating an optimal learning environment is a fundamental aspect of digital leadership, which involves leveraging digital technology to drive growth and innovation in various organizational sectors, including education (McLafferty et al., 2021; Zhang et al., 2020). By providing essential support and tools, digital leaders can alleviate learners' anxiety concerning online learning (Qalati et al., 2022). Ensuring access to appropriate tools and technology, delivering clear instructions, and facilitating practice with the tools are essential components of effective digital leadership (ÖZMEN et al., 2020). Moreover, digital leaders can foster a sense of connection among learners by encouraging online interactions, group work, and communication with peers and teachers (Keskin et al., 2023). By being attentive to the challenges faced by users of digital learning platforms and offering necessary tools and support, digital leaders can create a positive learning environment that promotes student engagement, academic performance, and overall well-being (Erhan et al., 2022). Studies have shown that providing clear instructions, feedback, promoting cooperation and interaction, and other digital leadership behaviors positively influence learner satisfaction and reduce e-learning anxiety (Heckel & Ringeisen, 2019). Keskin et al. (2023) found a significant influence of digital leadership on learners' anxiety towards online learning, with each dimension of digital leadership—digital literacy, digital strategy, digital culture, and digital innovation—positively correlating with the reduction of e-learning anxiety. Thus, it is hypothesized that;

H1: Digital Leadership significantly impact on e-learning anxiety.

2.3. E-learning Anxiety and Innovative Work Behaviour

E-learning anxiety refers to the feelings of apprehension or fear experienced by students when using digital learning platforms (Faria, 2022). It can arise from various factors, including fear of technology, lack of technical knowledge, and a sense of loneliness during online studying (de Araujo et al., 2021). E-learning anxiety has a significant negative impact on the educational process, leading to lower academic performance and higher dropout rates. Innovative work behavior refers to the level of

engagement of employees in activities such as generating new ideas, implementing new processes, and adapting to change (Hooi & Chan, 2022). Both e-learning anxiety and innovative work behavior have garnered increased interest in recent years (Alsudais et al., 2022; Bach & Sulíková, 2021).

The relationship between e-learning anxiety and innovative work behavior is examined in the following literature review. Several studies have indicated that e-learning anxiety can hinder innovative work behavior (Alsudais et al., 2022; Azizi et al., 2022; Bach & Sulíková, 2021; Chen et al., 2021). Breuer and Szillat (2019) found a negative correlation between employees' e-learning anxiety and their engagement in innovative work behavior. Employees with higher levels of e-learning fear were less likely to exhibit innovative work behavior, which could impact organizational performance negatively. According to Chen et al. (2021), addressing e-learning anxiety is crucial for fostering innovative work behavior among employees.

Research has also shown that digital leadership plays a significant role in reducing e-learning anxiety and promoting innovative work behavior. Keskin et al. (2023) found a negative correlation between employees' e-learning anxiety and their engagement in innovative work behavior. Additionally, digital leadership practices that encourage engagement and collaboration were positively correlated with innovative work behavior. Alkis et al. (2017) identified a similar relationship, highlighting the influence of digital leadership on reducing learners' anxiety about online learning and fostering innovative work behavior. Bülbül et al. (2021) found that employees with high levels of e-learning anxiety were less likely to engage in interactive whiteboarding, which could negatively impact organizational performance. Overcoming e-learning anxiety is crucial for promoting innovative work behavior.

Furthermore, Heckel and Ringeisen (2019) demonstrated that digital leadership significantly impacts the reduction of learners' e-learning anxiety and positively influences innovative work behavior. Borah et al. (2022) also emphasized the role of digital leaders in creating a supportive learning environment that encourages collaboration, experimentation, and risk-taking, thereby reducing e-learning anxiety and promoting innovative work behavior. Based on the existing literature, the following hypothesis is proposed:

H2: E-learning anxiety significantly impacts innovative work behaviour.

2.4. Mediating Role of E-Learning Anxiety

"E-learning anxiety" refers to the fear or discomfort experienced by individuals when using digital technology for learning or training purposes (Erhan et al., 2022). It encompasses concerns about using new software or applications, fear of making mistakes, and apprehension about keeping up with the pace of learning. E-learning anxiety can diminish motivation to engage in digital learning, which, in turn, can impact creative work practices (Faria, 2022). In the context of encouraging innovative work practices, "digital leadership" has emerged as a crucial factor (Azzi et al., 2022; Breuer & Szillat, 2019). However, some individuals may experience anxiety when utilizing digital tools for education or training, thereby limiting their capacity for creative work behavior. This research review aims to explore the relationship between digital leadership, e-learning anxiety, and creative work practices (Heckel & Ringeisen, 2019).

Innovative work behavior is known to benefit from effective digital leadership. Leaders with a strong understanding of digital technology can foster an innovative culture by providing employees with the necessary tools and resources to think outside the box (Ma et al., 2021). Digital technology also facilitates collaboration and knowledge sharing, leading to the generation of fresh ideas and solutions. Digital leadership refers to a leader's ability to effectively utilize digital technologies to advance organizational objectives. On the other hand, innovative work behavior pertains to the extent to which individuals willingly engage in novel and imaginative job-related activities (Grieve et al., 2017; ÖZMEN et al., 2020).

This study proposes that while digital leadership promotes innovative work behavior, this relationship may be influenced by e-learning anxiety. In other words, employees with high levels of e-learning anxiety may be less inclined to engage in innovative work behavior, even when their

managers possess strong digital leadership skills. Maia and Dias (2020) and Pelucio et al. (2022) argue that e-learning anxiety can mediate the relationship between digital leadership and creative workplace behavior. For instance, Arora et al. (2021) conducted a study in a Korean telecommunications company and found that e-learning fear partially mediated the impact of digital leadership on employees' innovative work behavior. Similarly, Borah et al. (2022) investigated Chinese workers in the manufacturing sector and found that e-learning anxiety partially mediated the association between digital leadership and innovative work behavior.

Several studies have explored the relationship between digital leadership, e-learning anxiety, and innovative work behavior. Alkis et al. (2017) conducted a study among employees of a Korean telecommunications business, while Heckel and Ringeisen (2019) focused on Chinese employees in the manufacturing industry. Borah et al. (2022) investigated the relationship among Chinese employees in the hotel industry. Based on the above literature, the following hypothesis is proposed:

H3: E-learning anxiety mediates the relationship between digital leadership and innovative work behaviour**.**

2.5. Moderating Role of Psychological Capital

"Psychological capital" refers to a positive psychological state that enables individuals to effectively manage anxiety and overcome challenges in the workplace (McLafferty et al., 2021). The use of digital technology and e-learning has gained significant attention in recent years. This research review examines the relationship between e-learning anxiety, psychological capital, and creative work behavior (Pelucio et al., 2022). Studies have demonstrated that e-learning anxiety can hinder creative work behavior. Employees experiencing anxiety when using e-learning platforms may be less inclined to adopt creative work practices, thus limiting their contribution to organizational success (Faria, 2022; Peng et al., 2022). On the other hand, psychological capital has been found to enhance innovative work behavior. Individuals with higher levels of psychological capital are more likely to engage in innovative job behaviors, even in the face of difficulties or failures. Psychological capital comprises four essential traits: hope, efficacy, resilience, and optimism (Qalati et al., 2022; Woon et al., 2021).

As e-learning has gained popularity, organizations increasingly provide online learning environments for their employees. However, some employees may experience anxiety when using e-learning tools, which can hinder their creative work behavior. Those with higher levels of psychological capital, characterized by a positive psychological state, are better equipped to manage anxiety and navigate workplace challenges (Schwarzmüller et al., 2018). Research suggests that psychological capital may moderate the relationship between e-learning anxiety and creative work practices. For example, McLafferty et al. (2021) conducted a study on Pakistani university students and found that psychological capital mediated the association between e-learning anxiety and innovative work behavior. They discovered that while e-learning anxiety had a negative impact on innovative work behavior, this effect was less pronounced among students with higher levels of psychological capital. Similarly, Papa et al. (2018) examined Chinese employees and found that psychological capital moderated the relationship between e-learning anxiety and innovative work behavior. They observed that while e-learning anxiety negatively influenced employees' capacity for innovative work, this effect was mitigated among individuals with higher levels of psychological capital.

Faria (2022) investigated the relationship between e-learning anxiety, psychological capital, and innovative work behavior among Pakistani university students. The study revealed that psychological capital tempered the association between e-learning anxiety and creative work practices. Specifically, even when experiencing anxiety related to e-learning, students with higher levels of psychological capital were more likely to engage in innovative work behavior. Akçay and Kayiş; Alkis et al. (2017) explored the connection between work engagement, psychological capital, and e-learning anxiety among Pakistani university students. The study found that psychological capital mediated the association between work engagement and e-learning anxiety. Particularly, even when experiencing worry related to e-learning, students with higher levels of psychological capital were more likely to maintain interest in their work. Considering the above discussion, the following hypothesis is

proposed:

H4: Psychological capital moderates the relationship between e-learning anxiety and innovative work behaviour.

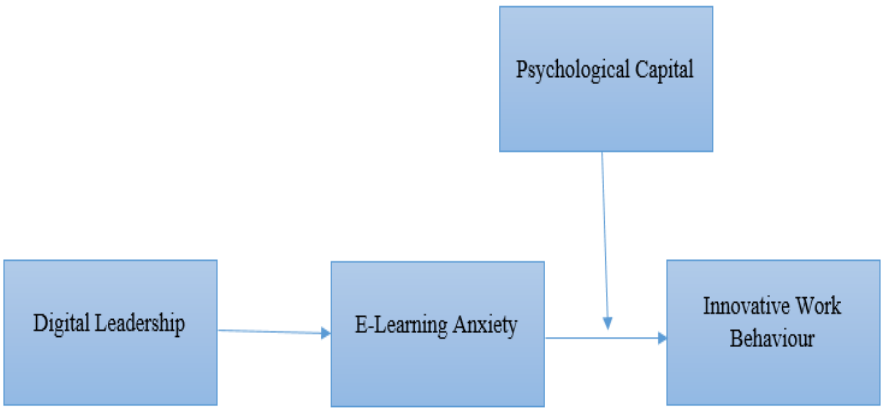

Figure 2: Conceptual Framework

.

3. Research Methodology

The research methodology employed in this study was quantitative and explanatory. A sample of 200 IT employees in Lisbon, Portugal was selected using convenience sampling, a non-probability sampling technique, due to the unknown population. The deductive research approach was adopted, wherein hypotheses were formulated based on existing theory and previous research, and empirical data was collected to test these hypotheses. The study utilized a cross-sectional time horizon, collecting data from the respondents only once. This design was suitable for investigating relationships between variables and testing hypotheses. The data collected was numerical in nature, and statistical analysis was employed to analyze the data.

3.1. Unit of Analysis

A questionnaire was used as the instrument to gather data and test the proposed relationships based on the variables. The questionnaire was distributed among the 200 IT employees in Lisbon, Portugal. Clear instructions were provided, explaining each element of the instrument. It was emphasized that the data would be kept confidential and not shared with anyone else. Ethical and legal considerations were upheld by ensuring anonymity, with no names or individual identifiers mentioned.

The collected data underwent analysis using the statistical software smart PLS (Purwanto et al., 2021). This software was utilized to perform various tests and obtain statistical support for developing solid arguments in support of the hypotheses. In summary, the research methodology involved the selection of a sample using convenience sampling, the utilization of a quantitative and explanatory approach, the collection of data through a questionnaire, and the analysis of data using smart PLS software. These steps were carried out to achieve the research objectives and test the formulated hypotheses based on the literature review.

3.2. Measurements scale

The research methodology employed in this study utilized a questionnaire as the instrument for data collection. The questionnaire consisted of a total of 21 items, and the questions were designed to be answered on a 5-point Likert scale, ranging from strongly agree to strongly disagree. The scale was structured in such a way that a response of 5 represented strong agreement, while a response of 1 represented strong disagreement.

3.2.1 Digital Leadership

To measure the independent variable of digital leadership, six items were adapted from Breuer and Szillat (2019). These items focused on aspects such as network character trust, information, learning guides, feedback, new ideas, and the fast-changing environment.

3.2.2 E-learning anxiety

For the mediating variable of e-learning anxiety, five items were adapted from Alkis et al. (2017). These items addressed areas such as writing disgust or displeasure, social avoidance, social embarrassing situations, and privacy concern anxiety.

3.2.3 Psychological capital

The moderating variable of psychological capital was measured using a scale adapted from Paek et al. (2015), consisting of four items. These items focused on problem-solving ability, thinking of multiple ways to overcome challenges, handling multiple tasks, and future orientation as it relates to work.

3.2.4 Innovative work behavior

The dependent variable of innovative work behavior was measured using six items adapted from Erhan et al. (2022). These items assessed aspects related to innovation, creativity, and idea generation, specifically focusing on the freedom and motivation felt by employees to share their thoughts.

4. Result

The current study determines that digital leadership, e-learning anxiety and innovative behaviour and moderating role of psychological capital, as well as psychological capital theory involved, IT employees in Lisbon, Portugal.

4.1. Demographics

The demographic information of the sample for the current study (N=200) are presented in Table 1. The participants in the study were IT personnel in Lisbon, Portugal, and the study focused on exploring the relationship between psychological capital theory, digital leadership, e-learning anxiety, and innovative behavior. The examination of the model indicated that the age, gender, and experience models were suitable for IT workers in Lisbon, Portugal.suitable.

Table 1: Demographic profile			
Demography	**Description**	**No. of Responses**	**%**
Gender	Male	130	65
	Female	70	35
Age	25-35	70	35
	35-45	60	30
	Above 45	70	35
Qualification	FSC/FA	80	40
	BSC/BA	120	60
Experience	1-2 Years	80	40
	2-3 Years	70	35
	More than 3 Years	50	25

Analyzing the demographic profile presented in Table 1, it is observed that in Lisbon, Portugal, 65% of IT workers were men, while 35% were women. The age distribution of IT workers was as follows: 35% were aged 25-35, 30% were aged 35-45, and 35% were above 45 years old. Regarding qualifications, 40% of the IT personnel had FSC/FA qualifications, while 60% had BSC/BA qualifications. In terms of experience, 40% of the IT workers had 1-2 years of experience, 35% had 2-3 years of experience, and 25% had more than 3 years of experience**.**

4.3 Measurement model

The measurement model, the factor loadings, validity, and reliability of the data collected from 200 IT workers in Lisbon, Portugal, were evaluated using PLS-SEM. The measurement model quantifies the relationship between a set of latent variables and a collection of observable variables. It assesses how effectively the observable variables represent the underlying constructs or latent variables they are intended to measure.

4.3.1 Composite Reliability, Cronbach's Alpha

Table 3 presents the results of composite reliability (CR), Cronbach's Alpha, and average variance extracted (AVE) for the variables in the measurement model. All variables demonstrated satisfactory reliability, with Cronbach's Alpha values ranging from 0.845 to 0.879 and CR values ranging from 0.888 to 0.909 (Hair Jr et al., 2020). The AVE values, which indicate convergence validity, exceeded the threshold of 0.50 (Fornell & Larcker, 1981).

Table 2: Composite reliability, Cronbach's Alpha and AVE values			
Variables	**Cronbach's Alpha**	**CR**	**AVE**
Digital Leadership	0.849	0.888	0.572
E-Learning Anxiety	0.854	0.895	0.632
Innovative Work Behaviour	0.879	0.909	0.626
Psychological Capital	0.845	0.895	0.682

"Note: CR=composite reliability; AVE=average variance extracted; CA= Cronbach's Alpha"

4.3.2 Discriminant Validity (HTMT)

To further assess discriminant validity, Table 4 displays the heterotrait-monotrait (HTMT) ratio of correlations. The values in the table demonstrate that the variables have discriminant validity as the correlations between different constructs are lower than the correlations within the same construct (Hair Jr et al., 2020; Fornell & Larcker, 1981).

Table 3: Discriminant validity

	DL	ELA	IWB	PC
Digital Leadership	0.756			
E-Learning Anxiety	0.700	0.795		
Innovative Work Behaviour	0.743	0.654	0.791	
Psychological Capital	-0.607	-0.512	-0.670	0.826

Having met the reliability, validity, and discriminant validity requirements, researchers proceeded with structural route analysis. The results of the measurement model laid the foundation for further analysis of the relationships between the latent variables in the study.

4.4 Structural Equation Model

Structural equation modeling (SEM), a statistical model, was employed to explain the connections between a group of latent variables and their observable indicators or variables. SEM is a versatile and effective approach for assessing complex theoretical models and hypotheses. It integrates factor analysis, regression analysis, and path analysis to create a comprehensive model that elucidates both direct and indirect interactions between variables. The model consists of latent variables, which are unobserved factors underlying the observed variables, and observed variables, which are the variables actually measured. The R^2 values range from 0 to 1, with strong, moderate, and weak categories falling within the range of 0.13 to 0.67, as defined by Hair Jr et al. (2020).

4.4.1 Direct Relation

In the analysis of the direct relationships, the research investigated the association between psychological capital theory, digital leadership, e-learning anxiety, and innovative behavior, including the moderating role of psychological capital. The study involved IT employees in Lisbon, Portugal, and employed PLS-SEM to assess the relationships between digital leadership and e-learning anxiety. A direct relationship refers to a specific type of relationship where a change in one variable is associated with a predictable change in the other variable in the same direction. The results indicate a significant relationship between digital leadership and e-learning anxiety ($\beta = 0.700$, $t = 24.391$, $p = 0.000$), supporting hypothesis H1. Additionally, the relationship between e-learning anxiety and innovative work behavior was found to be significant ($\beta = 0.422$, $t = 7.400$, $p = 0.000$), supporting hypothesis H2 (Hair Jr et al., 2021).

Table 4: Direct Relation

	Original Sample	T Statistics	P Values	Decision
Hypothesis 1	0.700	24.391	0.000	Supported
Hypothesis 2	0.422	7.400	0.000	Supported

4.3.3 Mediating Effect

Regarding the mediating effect, mediation involves a third variable that explains the statistical link

between an independent and dependent variable. By adding e-learning anxiety as a mediating variable, the significant relationship between digital leadership and innovative work behavior remained (β = 0.295, t = 6.249, p = 0.000), supporting hypothesis H3.

Table 5: Mediating Effect

	Original Sample (O)	T Statistics	P Values
Digital Leadership -> E-Learning Anxiety -> Innovative Work Behaviour	0.295	6.249	0.000

4.4.2 Moderating Effect

Next, the study examined the moderating effect, which occurs when a third variable influences the relationship between an independent and dependent variable. The results demonstrate the significant moderating role of psychological capital between e-learning anxiety and innovative work behavior (β = -0.454, t = 9.229, p = 0.000), confirming hypothesis H4 (Hair Jr et al., 2021).

Table 6: Moderator Hypothesis Testing

	B-value	(STDEV)	T-value	P value
ELA*PC -> IWB	-0.454	0.049	9.229	0.000

5. Discussion

The present study examined the relationships between digital leadership, e-learning anxiety, psychological capital, and innovative behavior through structural equation modeling. The findings revealed significant direct relationships between digital leadership and e-learning anxiety, as well as between e-learning anxiety and innovative work behavior. The mediating effect of e-learning anxiety was confirmed, indicating its role in explaining the relationship between digital leadership and innovative work behavior. Moreover, the moderating role of psychological capital in the association between e-learning anxiety and innovative work behavior was found to be significant.

The results suggest that individuals with effective digital leadership skills are less likely to experience anxiety related to e-learning, highlighting the importance of strong digital leadership in reducing e-learning anxiety. Additionally, digital leadership facilitates better time management, planning, collaboration, and control over the learning environment, enhancing confidence in performing online learning activities. Furthermore, the findings indicate a significant relationship between e-learning anxiety and innovative work behavior. This emphasizes the need to explore the impact of e-learning anxiety on creative work practices, particularly in contemporary workplaces where e-learning is increasingly prevalent. Employers can contribute to a supportive learning environment by addressing e-learning anxiety and providing necessary training and support to enhance digital literacy and e-learning skills, fostering creativity and problem-solving among employees.

By incorporating e-learning anxiety as a mediating variable, the study showed that it partially explains the association between digital leadership and innovative work behavior. Adjusting for the effects of e-learning anxiety enables a more accurate assessment of the direct influence of digital leadership on creative work behavior. Thus, developing strong digital leadership qualities can mitigate the negative effects of e-learning anxiety and promote a more innovative organizational culture. Moreover, the findings demonstrated the significant moderating role of psychological capital in the relationship between e-learning anxiety and innovative work behavior. Individuals with higher levels of psychological capital are more likely to engage in innovative professional behavior, even when experiencing high levels of e-learning anxiety. Factors such as personality traits, prior e-learning experiences, and the complexity of e-learning platforms may influence the moderating function of psychological capital.

In summary, this study contributes to understanding the intricate interplay between digital leadership, e-learning anxiety, psychological capital, and innovative behavior. The findings highlight the importance of fostering strong digital leadership skills, addressing e-learning anxiety, and promoting psychological capital to cultivate a conducive environment for innovation and success within organizations.

6. Conclusion

This study contributes to the understanding of the relationships between digital leadership, e-learning anxiety, innovative behavior, and psychological capital among IT workers in Lisbon, Portugal. The findings suggest that e-learning anxiety partially mediates the association between digital leadership and innovative behavior, while psychological capital moderates the relationship between e-learning anxiety and inventive activity. These results have theoretical and practical implications.

Theoretical implications include highlighting the significance of digital leadership in promoting innovative behavior among IT professionals. Organizations that invest in training personnel in digital leadership are likely to experience improvements in innovation and competitiveness. Additionally, addressing e-learning anxiety and providing support to employees can foster creative behavior. Therefore, businesses need to be aware of obstacles and difficulties related to online learning and offer assistance to alleviate e-learning fear. Furthermore, organizations should prioritize the development of employees' digital leadership abilities through training and initiatives that promote digital cooperation, communication, and literacy. By creating a supportive work environment that promotes positive psychological states such as self-efficacy, optimism, hope, and resilience, businesses can help employees overcome their fears of online learning and enhance their psychological capital.

Practical implications also highlight the importance of investing in employees' psychological capital to support innovative behavior and enable them to cope with the challenges of online learning. Developing positive psychological traits can enhance employees' ability to handle stress, adversity, and engage in creative problem-solving. Therefore, organizations should focus on fostering positive psychological states among IT workers in Lisbon, Portugal, to facilitate their ability to deal with e-learning anxiety and exhibit innovative behavior.

However, it is important to acknowledge the limitations of this study. The sample size of 200 IT workers in Lisbon, Portugal may restrict the generalizability of the results. Future research should aim to replicate these findings using larger and more diverse samples. Additionally, self-reported measures used in this study may introduce bias and measurement errors. Future studies should consider employing objective assessments to enhance the validity and reliability of the results. Moreover, the cross-sectional design of the study limits the ability to establish causality between the variables. Longitudinal designs would provide more insights into the relationships between psychological capital, innovative behavior, e-learning anxiety, and digital leadership.

Future research directions include investigating other human and organizational factors that may influence the relationships between digital leadership, e-learning anxiety, innovative behavior, and psychological capital. Examining the effectiveness of interventions aimed at fostering psychological capital, reducing e-learning anxiety, and improving digital leadership skills can further enhance our understanding. Additionally, cross-cultural studies can explore the applicability of these findings across different markets and nations.

In conclusion, this study contributes valuable insights into the connections between digital leadership, e-learning anxiety, innovative behavior, and psychological capital among IT employees in Lisbon, Portugal. While there are limitations, future research opportunities exist to build upon these findings and advance our understanding of these important topics.

References

Akçay, A., & Kayiş, A. R. Cyberostracism and knowledge sharing: The mediating role of social anxiety in e-learning environments. *Journal of Educational Technology and Online Learning*, *6*(1), 33-47.

AlJhani, S., Alateeq, D., Alwabili, A., & Alamro, A. (2022). Mental health and online learning among medical students during the COVID-19 pandemic: a Saudi national study. *The Journal of Mental Health Training, Education and Practice*, *17*(4), 323-334.

Alkis, Y., Kadirhan, Z., & Sat, M. (2017). Development and validation of social anxiety scale for social media users. *Computers in Human Behavior*, *72*, 296-303.

Alsudais, A. S., Alghamdi, A. S., Alharbi, A. A., Alshehri, A. A., Alzhrani, M. A., Keskin, S., Şahin, M., & Althubaiti, A. M. (2022). Social anxiety in E-Learning: Scale validation and socio-demographic correlation study. *Education and Information Technologies*, *27*(6), 8189-8201.

Arora, S., Chaudhary, P., & Singh, R. K. (2021). Impact of coronavirus and online exam anxiety on self-efficacy: the moderating role of coping strategy. *Interactive Technology and Smart Education*.

Azizi, Z., Rezai, A., Namaziandost, E., & Tilwani, S. A. (2022). The Role of Computer Self-Efficacy in High School Students' E-Learning Anxiety: A Mixed-Methods Study. *Contemporary Educational Technology*, *14*(2).

Azzi, D. V., Melo, J., Neto, A. d. A. C., Castelo, P. M., Andrade, E. F., & Pereira, L. J. (2022). Quality of life, physical activity and burnout syndrome during online learning period in Brazilian university students during the COVID-19 pandemic: A cluster analysis. *Psychology, Health & Medicine*, *27*(2), 466-480.

Bach, C., & Sulíková, R. (2021). Leadership in the Context of a NewWorld: Digital Leadership and Industry 4.0. *Managing global transitions*, *19*(3).

Borah, P. S., Iqbal, S., & Akhtar, S. (2022). Linking social media usage and SME's sustainable performance: The role of digital leadership and innovation capabilities. *Technology in Society*, *68*, 101900.

Breuer, S., & Szillat, P. (2019). Leadership and digitalization: Contemporary approaches towards leading in the modern day workplace.

Bülbül, A. H., Demirbas, G., & Odabasi, H. F. (2021). Anxieties of Secondary School Students during Distance Learning in COVID-19 Pandemic. *World Journal on Educational Technology: Current Issues*, *13*(4), 1153-1161.

Chen, X., Qi, H., Liu, R., Feng, Y., Li, W., Xiang, M., Cheung, T., Jackson, T., Wang, G., & Xiang, Y.-T. (2021). Depression, anxiety and associated factors among Chinese adolescents during the COVID-19 outbreak: a comparison of two cross-sectional studies. *Translational psychiatry*, *11*(1), 148.

de Araujo, L. M., Priadana, S., Paramarta, V., & Sunarsi, D. (2021). Digital leadership in business organizations. *International Journal of Educational Administration, Management, and Leadership*, 45-56.

Erhan, T., Uzunbacak, H. H., & Aydin, E. (2022). From conventional to digital leadership: exploring digitalization of leadership and innovative work behavior. *Management Research Review*, *45*(11),

1524-1543.

Faria, L. (2022). The Effect of Personality on Work Motivation and Its Impact on Organizational Citizenship Behavior of Employees of Public Department in Portugal. *International Journal of Social Sciences and Educational Studies*, *9*(2), 96-110.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, *18*(1), 39-50. https://doi.org/10.1177/002224378101800104

Godoy, L. D., Falcoski, R., Incrocci, R. M., Versuti, F. M., & Padovan-Neto, F. E. (2021). The psychological impact of the COVID-19 pandemic in remote learning in higher education. *Education Sciences*, *11*(9), 473.

Grieve, R., Kemp, N., Norris, K., & Padgett, C. R. (2017). Push or pull? Unpacking the social compensation hypothesis of Internet use in an educational context. *Computers & education*, *109*, 1-10.

Hair, J. F., Astrachan, C. B., Moisescu, O. I., Radomir, L., Sarstedt, M., Vaithilingam, S., & Ringle, C. M. (2021). Executing and interpreting applications of PLS-SEM: Updates for family business researchers. *Journal of Family Business Strategy*, *12*(3), 100392. https://doi.org/10.1016/j.jfbs.2020.100392

Hair Jr, J. F., Howard, M. C., & Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research*, *109*, 101-110.

Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). Partial least squares structural equation modeling (PLS-SEM) using R: A workbook. In: Springer Nature.

Heckel, C., & Ringeisen, T. (2019). Pride and anxiety in online learning environments: Achievement emotions as mediators between learners' characteristics and learning outcomes. *Journal of Computer Assisted Learning*, *35*(5), 667-677.

Hooi, L. W., & Chan, A. J. (2022). Innovative culture and rewards-recognition matter in linking transformational leadership to workplace digitalisation? *Leadership & Organization Development Journal*(ahead-of-print).

Keskin, S., Şahin, M., Uluç, S., & Yurdugul, H. (2023). Online learners' interactions and social anxiety: The social anxiety scale for e-learning environments (SASE). *Interactive learning environments*, *31*(1), 201-213.

Ma, Z.-R., Ma, W.-H., Idris, S., Pan, Q.-W., & Baloch, Z. (2021). COVID-19 impact on high school student's education and mental health: A cohort survey in China. *World journal of psychiatry*, *11*(6), 232.

Maia, B. R., & Dias, P. C. (2020). Anxiety, depression and stress in university students: the impact of COVID-19. *Estudos de Psicologia (Campinas)*, *37*.

McLafferty, M., Brown, N., McHugh, R., Ward, C., Stevenson, A., McBride, L., Brady, J., Bjourson, A. J., O'Neill, S. M., & Walsh, C. P. (2021). Depression, anxiety and suicidal behaviour among college students: comparisons pre-COVID-19 and during the pandemic. *Psychiatry research communications*, *1*(2), 100012.

ÖZMEN, Ö. N., Engin, E., & Pınar, Ö. (2020). DİJİTAL LİDERLİK ÇALIŞMALARINA BİR

BAKIŞ. *Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, *25*(1), 57-69.

Paek, S., Schuckert, M., Kim, T. T., & Lee, G. (2015). Why is hospitality employees' psychological capital important? The effects of psychological capital on work engagement and employee morale. *International journal of hospitality management*, *50*, 9-26.

Papa, A., Santoro, G., Tirabeni, L., & Monge, F. (2018). Social media as tool for facilitating knowledge creation and innovation in small and medium enterprises. *Baltic Journal of Management*.

Pelucio, L., Simões, P., Dourado, M. C. N., Quagliato, L. A., & Nardi, A. E. (2022). Depression and anxiety among online learning students during the COVID-19 pandemic: a cross-sectional survey in Rio de Janeiro, Brazil. *BMC psychology*, *10*(1), 1-8.

Peng, X., Liang, S., Liu, L., Cai, C., Chen, J., Huang, A., Wang, X., & Zhao, J. (2022). Prevalence and associated factors of depression, anxiety and suicidality among Chinese high school E-learning students during the COVID-19 lockdown. *Current Psychology*, 1-12.

Purwanto, A., Asbari, M., & Santoso, T. I. (2021). Analisis Data Penelitian Marketing: Perbandingan Hasil antara Amos, SmartPLS, WarpPLS, dan SPSS Untuk Jumlah Sampel Besar. *Journal of Industrial Engineering & Management Research*, *2*(4), 216-227.

Qalati, S. A., Ostic, D., Sulaiman, M. A. B. A., Gopang, A. A., & Khan, A. (2022). Social media and SMEs' performance in developing countries: Effects of technological-organizational-environmental factors on the adoption of social media. *SAGE Open*, *12*(2), 21582440221094594.

Rafique, M. A., Hou, Y., Chudhery, M. A. Z., Waheed, M., Zia, T., & Chan, F. (2022). Investigating the impact of pandemic job stress and transformational leadership on innovative work behavior: The mediating and moderating role of knowledge sharing. *Journal of Innovation & Knowledge*, *7*(3), 100214.

Santos, E., & Castanho, R. A. (2022). The impact of size on the performance of transnational corporations operating in the textile industry in Portugal during the COVID-19 pandemic. *Sustainability*, *14*(2), 717.

Schwarzmüller, T., Brosi, P., Duman, D., & Welpe, I. M. (2018). How does the digital transformation affect organizations? Key themes of change in work design and leadership. *Management Revue*, *29*(2), 114-138.

Sobaih, A. E. E., & Elshaer, I. A. (2022). Personal Traits and Digital Entrepreneurship: A Mediation Model Using SmartPLS Data Analysis. *Mathematics*, *10*(21), 3926.

Woon, L. S.-C., Leong Bin Abdullah, M. F. I., Sidi, H., Mansor, N. S., & Nik Jaafar, N. R. (2021). Depression, anxiety, and the COVID-19 pandemic: Severity of symptoms and associated factors among university students after the end of the movement lockdown. *PloS one*, *16*(5), e0252481.

Zeike, S., Bradbury, K., Lindert, L., & Pfaff, H. (2019). Digital leadership skills and associations with psychological well-being. *International journal of environmental research and public health*, *16*(14), 2628.

Zhang, Z., Zhai, A., Yang, M., Zhang, J., Zhou, H., Yang, C., Duan, S., & Zhou, C. (2020). Prevalence of depression and anxiety symptoms of high school students in shandong province during the COVID-19 epidemic. *Frontiers in Psychiatry*, *11*, 570096.