The Impact of Digital Leadership on Organizational Performance: A Study in Vietnam's coal Mining Companies

Le VAN CHIEN[1)]*, Nguyen DUC THANG[1)], Pham KIEN TRUNG[1)], Nguyen THI HOAI NGA[2)]

[1)] Hanoi University of Mining and Geology, Hanoi, 100000, Vietnam; email: levanchien@humg.edu.vn
[2)] Innovations for Sustainable and Responsible Mining (ISRM) Research Group, Hanoi University of Mining and Geology, Hanoi, 100000, Vietnam

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Abstract

Under the influence of the 4th industrial revolution and the impact of the Covid-19 pandemic, digital transformation is rapidly taking place in all aspects of society. For businesses, digital transformation is an essential and objective trend for their sustainability and development. The purpose of digital transformation for businesses is to enhance operational efficiency through factors such as accelerating market speed, gaining competitive advantage, driving revenue growth, increasing labor productivity, and expanding customer attraction and retention. Numerous studies have indicated that the process of digital transformation in businesses is influenced by leadership and digital transformation strategies, and digital transformation has an impact on business performance. This study aims to identify the relationship between digital leadership and the operational efficiency of coal mining companies in Vietnam, with the mediating role of digital transformation strategies. Additionally, the study examines the moderating role of digital skills on the relationship between digital transformation strategies and the operational efficiency of the organizations. The research surveyed 111 employees and workers currently working in coal mining companies in Vietnam. Through analysis and hypothesis testing, the results showed that digital leadership does not have a direct impact on coal companies' operational efficiency. However, it indirectly affects business performance through the mediating role of digital transformation strategies. The study's findings also revealed that the digital skills of employees play a moderating role in enhancing the relationship between digital transformation strategies and the operational efficiency of the organization.

Keywords: *digital transformation, digital leadership, digital transformation strategy, digital skill, organization performance, coal mining company*

1. Introduction

In the context of the strong global trend of the 4th industrial revolution, digital transformation plays a crucial and necessary role for both nations and businesses. It helps enhance business efficiency, improve competitive capabilities, and create numerous opportunities for innovation.

In Vietnam, the Government has set the direction for "Vietnam to become a digital nation, stable and prosperous, pioneering the experimentation of new technologies and models; fundamentally and comprehensively innovating the management and operation of the Government, and the business operations of companies" (Prime Minister, 2020). To successfully accomplish the above mission, it requires active digital transformation efforts from the Government, organizations, and businesses.

Currently, the coal industry in Vietnam plays a crucial role in contributing to the country's economic development and ensuring energy security (Thang, 2023). The coal mining and supply for both the domestic and international markets in Vietnam are carried out by various entities, including the Vietnam National Coal - Mineral Industries Holding Corporation Limited (Vinacomin), Dong Bac Corporation, 319 Corporation, Vietmindo (FDI company) etc. Among these entities, the key producers and suppliers of coal are Vinacomin and Dong Bac Corporation, which together account for 95% of the domestic coal production (Chien et al., 2015). According to data from the General Statistics Office, in 2022, the coal industry in Vietnam employed over 100,000 workers, generating a total revenue of over 160 trillion VND, with coal production reaching approximately 47 million tons. With a large number of managed companies and a significant labor force, the coal industry's operations require close coordination in production. Therefore, digital transformation will help coal companies streamline intermediary processes, reduce time, and enhance the operational efficiency of production and business activities within the industry.

In recent years, Vietnam's coal companies have begun to build digital transformation programs. Vinacomin is at the forefront of this digital transformation initiative, with a goal to complete their program by 2025. The objective is to leverage the power of digital technology and data to increase operational efficiency, enhance production and business effectiveness, and improve labor productivity across the entire corporation (Vinacomin, 2022). In addition, Vinacomin has also developed the digital action program (code 612-CTr/DU), aimed at raising awareness and strengthening communication, building strategies, plans, and implementation roadmaps, focusing on resource and financial preparation, and improving infrastructure, digitization, and data standardization to serve the digital transformation process. The results obtained from the digital transformation process have been quite positive. Most of the companies have established internal network connectivity within their office and units, diseminated shared ERP software solutions throughout the company, implemented document management and workflow software, significantly reducing paperwork and approval

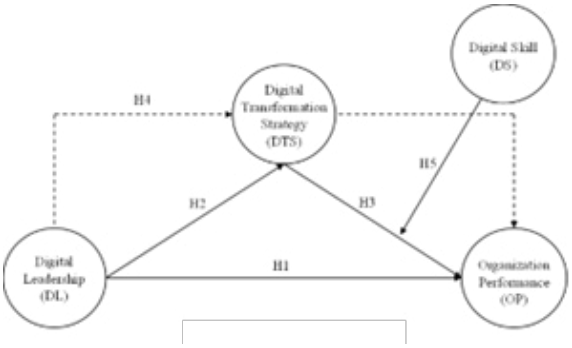

Fig. 1. Proposed Research Model

time for documents. The intelligent data reporting system collects and analyzes data from various units, providing timely support to leaders in the decision-making process.

Despite the significant improvements and active engagement of coal companies in Vietnam in the digital transformation process, the results of the digital transformation efforts still face several limitations. These include the capacity to receive, apply, and utilize digital technologies effectively. Additionally, there are shortcomings in the awareness of digital transformation among some leaders, managers, and employees within the companies, lacking comprehensive understanding and readiness for the digital transformation journey.

The practical experience of the digital transformation process in Vietnamese coal mining companies demonstrates that leadership plays a essential role in influencing digital transformation activities within these organizations. Throughout the digital transformation journey, companies have adopted modern technologies to serve various tasks, particularly in management, to keep up with the changing business environment. This has led to the emergence of new management concepts that align with the transition to digital organizations. One prominent concept is "Digital Leadership," which emphasizes the integration of technological advancements and transformative leadership to achieve the strategic objectives of the organization in an ever-changing environment (Al-Hawary, S. I., 2009; Sheninger, 2019). Digital leadership is considered as the combination of leadership skills and digital competencies to effectively leverage digital technologies and enhance business efficiency (Wasono & Furinto, 2018). It involves utilizing digital tools and strategies while leading teams and organizations through the digital transformation process to achieve maximum benefits from digital technology and improve overall business performance.

Some studies suggest that the role of digital leadership is instrumental in generating positive outcomes for businesses (Al-Husban et al., 2021; Tulungen et al., 2022). On the other hand, some other studies argue that digital leadership does not have a direct impact on business outcomes but rather exerts an indirect influence through some other factors (Amelda et al., 2021; Yopan et al., 2022).

There have been numerous studies on digital transformation and its outcomes, but none have focused on the relationship between digital leadership, digital transformation strategies, and the organizational performance, particularly in coal mining companies in Vietnam. This research aims to examine the impact of digital leadership on the operational efficiency of coal mining companies in Vietnam through the mediating role of digital transformation strategies. Additionally, it investigates the moderating effect of employees' digital skills on the relationship between digital transformation strategies and organizational operational efficiency. The study seeks to fill this gap in the literature and provide valuable insights into how digital leadership can influence the digital transformation process and overall performance of coal mining companies in Vietnam.

2. Literature review

2.1. Digital Leadership

Leaders play a crucial role in driving and promoting digital transformation efforts in today's Industry 4.0 era (Li et al., 2016). The theories of change and transformational leadership are essential in adapting organizational structures and mechanisms to cope with rapid technological advancements (Zeike et al., 2019). As a result, various concepts have emerged, integrating factors that influence organizational behavior and digitization to achieve optimal organizational outcomes. One of the recent concepts is digital leadership, which refers to the use of digital platforms to guide and influence employee behavior in achieving the organization's strategic goals (Sheninger, 2019). Digital leadership are considered a new generation of leaders who utilize digital tools and skills to motivate and guide employees towards digitization (Al-Hawary et al., 2012; Zeike et al., 2019). Artüz & Bayraktar suggest that digital leaders think and act differently from traditional leaders, interacting with the digital world based on three elements: computing, communication, and content to ensure organizational success (Artüz & Bayraktar, 2021).

2.2. Digital transformation strategies

Digital transformation impacts different perspectives and serves various objectives of the organization (Nadeem et al., 2018; Reis et al., 2018). Within businesses, digital transformation involves digitizing and transforming the business model to create new opportunities and increase revenue. Therefore, companies must adopt new strategies based on digital technologies (Ross et al., 2016). Digital transformation is the best strategy for businesses and should be reflected throughout the entire process of business implementation, operation, and performance evaluation. It is no longer sufficient to maintain technical aspects; instead, all decision-making, work processes, and collaborations need to be digitized to provide the best customer experience (Teng et al., 2022). To drive the digital transformation process, organizational strategies should address the transformation of products, service processes, business models, and

Tab. 1. Survey Results. Source: Survey Results by the authors

Survey results description		Number of Votes	Percentage %
Participating units	Vinacomin	68	61,3
	Dong Bac Corporation	43	38,7
Gender	Male	65	58,6
	Female	46	41,4
Age	Under 30 years old	18	16,2
	From 30 to 45 years old	80	72,1
	Over 45 years old	13	11,7
Educational level	Intermediate, elementary	19	17,1
	University, College	86	77,5
	Above university	6	5,4
Position	Employees, Workers	89	80,2
	Lower-level Leaders	8	7,2
	Middle-level Leaders	12	10,8
	Top-level Leaders	2	1,8

Tab. 2. Scale assessment results

Symbol	Variable Name	Corrected Item-Total Correlation
DL	**Digital Leadership: α = 0,956**	
DL1	Leaders have knowledge and skills in digital technology and transformation	0,785
DL2	Leaders balance between traditional and modern trends, innovation, and integration	0,897
DL3	Leaders seek to attract digitally knowledgeable employees	0,899
DL4	Leaders serve as guides and role models in the company's digital transformation	0,910
DL5	Leaders care about the welfare of employees during the digital transformation	0,902
DST	**Digital Transformation Strategy: α = 0,946**	
DTS1	The goals of digital transformation are mentioned in the company's strategy	0,927
DTS2	The company implements the use of a common database system for the entire enterprise	0,884
DTS3	The company's strategy aims to change the operating model	0,856
OP	**Organization Performance: α = 0,942**	
OP1	Compared to other companies in the same industry, our company is more successful	0,865
OP2	Compared to companies with similar capabilities, our company has higher revenues	0,872
OP3	Compared to other companies in the same industry, our company is developing faster	0,885
OP4	Compared to other companies in the same industry, our company is more innovative	0,829
DS	**Digital Skill: α = 0,944**	
DS1	Employees have good skills in using IT applications	0,818
DS2	The company has training programs and equips employees with digital technology	0,863
DS3	Employees have a positive attitude towards new technology applications in their work	0,875
DS4	The company has a specialized IT department	0,870
DS5	We often discuss digital projects within the company	0,812

the adoption of new technologies (Matt et al., 2015).

Digital transformation strategy is not solely about setting goals for process optimization or process automation. It is a carefully designed and implemented plan to manage the sustainable integration of digital technologies (Bharadwaj et al., 2013; Matt et al., 2015). Similar to a personalized roadmap, a digital transformation strategy can bring significant value during the digital transformation journey of a business (Teng et al., 2022).

2.3. Organizational performance

The operational efficiency of an organization is a fundamental concept in management studies and has been of interest to researchers since its inception as it summarizes the performance of an organization in a specific metric. Koohang et al. suggest that the operational efficiency of a business measures the progress and development of its strategies (Koohang et al., 2017). The operational efficiency of an organization reflects its success in achieving predetermined objectives by comparing them with actual results to identify weaknesses and address them. Additionally, it is defined as the organization's ability to achieve strategic objectives efficiently and effectively by optimizing available resources (Mohammad, 2019).

The effectiveness of an organization's operations is evaluated through various indicators, such as financial metrics (Parmenter, 2015; Sawaean & Ali, 2020), employee satisfaction (Zhai & Tian, 2019), customer satisfaction (Chakraborty & Biswas, 2020; T. Wang et al., 2021), productivity (Al-Surmi et al., 2020), quality (Loukis et al., 2019), and efficiency (Vermeeren et al., 2014; Zhou et al., 2019). However, in this study, the effectiveness of the organization's operations is discussed from the perspective of the outcomes of business management activities. Thus, it is considered a comprehensive concept that reflects the results of all aspects and operations of the organization, whether financial or non-financial. Therefore, the effectiveness of the organization's operations needs to be measured based on the evaluation and perception of the employees within the organization.

2.4. Digital Skill

In the context of the 4th industrial revolution, humans have become accustomed to technology and live alongside it. Therefore, digital skills are significant for everyone. Without adequate digital skills, individuals cannot utilize and harness the new features of technology, leading to potential lagging behind in society and especially facing the risk of being replaced in organizations. Digital skills encompass all skills related to technology, from basic literacy (e.g., reading and writing) to general abilities for the workforce and specific skills for IT specialists (Motyl et al., 2017). There are four dimensions to measure digital skills, including digital literacy, digital communication, digital analysis, and digital thinking (van Deursen et al., 2016).

3. Research model and hypotheses

The qualitative research was conducted through systematization to clarify the concepts, processes, and relationships between Digital Leadership, Digital Transformation Strategy, Digital Skills, and Business Performance in mining companies. Additionally, the study explored specific information

Tab. 3. Evaluation indices of model fit with the collected data. ource: The authors analyzed the data collected from the survey

No.	Index	Result	Requirement	Basis
1	CMIN/df	1,427	< 3	Hu & Bentler, 1999
2	CFI	0,985	≥ 0,9	Hu & Bentler, 1999
3	TLI	0,981	≥ 0,9	Hu & Bentler, 1999
4	RMSEA	0,062	< 0,08	Hu & Bentler, 1999
5	GFI	0,906	≥ 0,9	Hu & Bentler, 1999
6	PCLOSE	0,256	≥ 0,05	Hu & Bentler, 1999

Tab. 4. Results of the model testing. Source: Data analysis conducted by the authors from survey data

Hypothesis	Indirect Path	Unstandardized Estimate	Critical ratio (CR)	Critical Value	P-value
H1	OP ← DL	0.151	0.086	1.762	0.078
H2	DTS ← DL	0.528	0.087	6.088	0.000
H3	OP ← DTS	0.506	0.089	5.656	0.000
H4	OP ← DTS ← DL	0.267			0.000

Tab. 5. Results of second-order regression

	Unstandardized Coefficients	Standard Error	t	P-value	LLCI	ULCI
constant	3.616	0.061	59.610	0.000	3.496	3.736
DTS	0.554	0.095	5.840	0.000	0.366	0.742
DS	0.091	0.099	0.921	0.359	-0.105	0.287
DTS * DS	0.121	0.055	2.197	0.030	0.012	0.231
Dependent variable: OP; R^2 = 0.627; ΔR^2 = 0.394 (P = 0.000)						

from coal mining companies in Vietnam, combined with expert surveys and group discussions to establish the following hypotheses:

3.1. The relationship between Digital Leadership and Organizational Performance

Although the concept of digital leadership is relatively new and has not been deeply researched, there is substantial evidence regarding the impact of digitization on organizational performance. Research by Dijkstra points out that integrating digitalization into organizational management enhances communication effectiveness across administrative levels (Dijkstra, J., 2020). As a result, productivity increases, and output is improved, leading to higher customer satisfaction and a larger market share.

Digital leadership is considered an effective leadership approach to achieving organizational sustainability through competitive advantages, emphasizing the optimal and efficient utilization of resources (Artüz & Bayraktar, 2021). Additionally, the reliance of digital leadership on technology development and business environment interaction can reduce working time due to low error rates and accurate knowledge of customer preferences (Freitas Junior et al., 2020; Sheninger, 2019). Therefore, the first research hypothesis is formulated as follows:

Hypothesis 1 (H1): Digital leadership has a positive and significant impact on the operational efficiency of organizations.

3.2. The relationship between Digital Leadership and Digital Transformation Strategy

Building and implementing a digital transformation strategy has become a major concern for organizations before undergoing digital transformation in various industries (Chanias et al., 2019). Digital leadership plays a crucial role in building the digital transformation strategy of an organization. They are the ones who create the organization's vision and implement initiatives to actualize that vision by leveraging employee enthusiasm and rationalizing the organization's operations (Cong & Thu, 2020; Mardiana, 2020). The perspectives and knowledge about digital transformation by digital leaders will be specified and incorporated into the organization's strategy, making digital leadership highly significant in the process of developing the digital transformation strategy. Based on this, the next research hypothesis is proposed:

Hypothesis 2 (H2): Digital leadership has a positive and significant impact on the digital transformation strategy of the organization.

3.3. The relationship between Digital Transformation Strategy and Organizational Performance

Digital transformation strategy is a core factor that is indispensable in the ongoing process of digital transformation. It serves as a prerequisite for successful digitalization (Teng et al., 2022). If organizations develop an effective, clear, and coherent digital transformation strategy, it will facilitate a smooth digital transformation process, thereby enhancing the operational efficiency of the organization. Previous research has shown that digital transformation at the organizational level requires attention to the alignment of strategy, vision, and investment in digital transformation; the suitability of innovative culture; intellectual property and secrets; the power of digital capabilities; and the utilization of digital technologies (Gurbaxani & Dunkle, 2019). Digital transformation strategies have a positive impact on short-term and long-term financial performance (H. Wang et al., 2020). From this, the following research hypothesis is proposed:

Hypothesis 3 (H3): Digital transformation strategy has a positive and significant impact on organizational performance.

3.4. The relationship between Digital Leadership and Organizational Performance is mediated by the role of Digital Transformation Strategy

The objective of digital transformation in businesses is to establish distinctive core competencies, develop long-term development strategies, design rational organizational structures, optimize value chain networks, and build long-term development strategies (Paschou et al., 2020). Companies need to improve

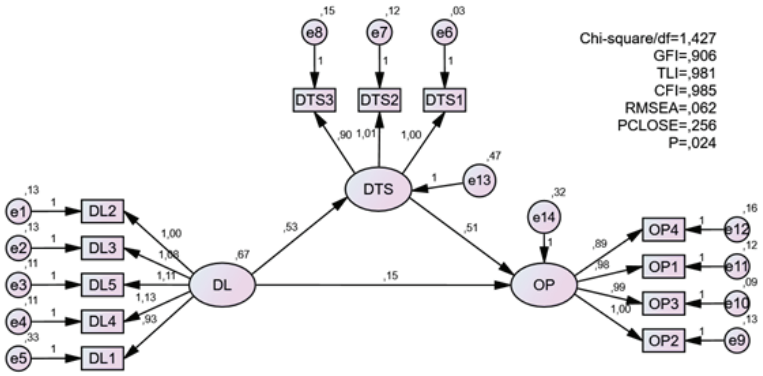

Fig. 2. Results of linear structural equation modeling (SEM) analysis

their digital skills to meet market demands by implementing digital transformation with a strategy that utilizes digital technology as a survival strategy amidst technological advancements (Chen et al., 2021; Usai et al., 2021; Zhang et al., 2021). Businesses must undergo comprehensive digital transformation in terms of strategy, operations, organization, capabilities, and activities in the digital economy (Yu & Moon, 2021).

Digital leadership plays a pivotal role in enhancing the effectiveness of businesses through digital transformation efforts. However, the leaders themselves cannot execute the digital transformation activities alone, as they need to articulate it into specific objectives and incorporate them into the strategy as a basis for implementation by employees within the organization. From this perspective, the research team believes that the digital transformation strategy acts as a mediator in the relationship between digital leadership and organizational performance. Hence, the proposed research hypothesis is as follows:

Hypothesis 4 (H4): The digital transformation strategy mediates the relationship between digital leadership and organizational performance.

3.5. The relationship between Digital Transformation Strategy and Organizational Performance is mediated by the role of Digital Skills

Some previous studies have suggested that digital skills are directly influenced by digital collaboration and indirectly influenced by digital leadership (Saputra et al., 2021), digital skills play an intermediary role in the relationship between digital leadership and organizational performance (Tulungen et al., 2022), digital leadership can achieve effectiveness through two approaches: competence and awareness of digital transformation, and the ability to implement digital strategies within the organization (Zeike et al., 2019).

To successfully implement digital transformation in businesses, besides leadership and strategy, the digital skills of employees play a crucial role. While leadership initiates the digital transformation and strategy sets the goals to be achieved, employees are the ones directly carrying out the digital transformation activities of the organization. Therefore, digital support policies must go hand in hand with enhancing digital skills (Gal et al., 2019). Based on this, the research team believes that with the same digital transformation strategy, the higher the digital skills of employees, the better they will perform the objectives of the digital transformation strategy. Consequently, the organizational performance derived from digital transformation activities will be enhanced. In other words, digital skills will moderate the impact of the digital transformation strategy on the organizational performance.

Hypothesis 5 (H5): The impact of the digital transformation strategy on the organizational performance is higher when the digital skills of employees are higher.

Based on the proposed research hypotheses, the research model includes the following factors as shown in Figure 1.

4. Research methodology

4.1. Research Scale

The variables used in this study include:

Digital leadership, which is the independent variable and measured by 5 observed variables denoted as DL1 to DL5. This scale is adopted and developed from Büyükbeşe and Tulungen's scale (Büyükbeşe et al., 2022; Tulungen et al., 2022).

Business digital transformation strategy, which is the mediating variable and measured by 3 observed variables denoted as DTS1 to DTS3. This scale is inherited and developed from the scale of the Ministry of Planning and Investment (Ministry of Planning and Investment, 2020).

Organizational performance, which is the dependent variable and measured by 4 observed variables denoted as OP1 to OP4. This scale is inherited and developed from Lee & Choi's scale (Lee & Choi, 2003).

Employee digital skills, which is the moderating variable and measured by 5 observed variables denoted as DS1 to DS5. This scale is adopted and developed from Saputra and Tulungen's scale (Saputra et al., 2021; Tulungen et al., 2022).

4.2. Research Sample

The quantitative survey was conducted from April 2023 to May 2023, targeting employees working in coal mining companies in Vietnam. The survey was carried out through online interviews using a questionnaire built on Microsoft Form. The non-random convenience sampling method was employed, and the research model consists of 17 observed variables, following the guidelines of Hair & colleagues (1998). The necessary sample size was determined to be n = 85 (17x5). The respondents were asked to answer 17 questions related to digital leadership, business digital transformation strategy, digital skills of employees, and organizational performance. Each question was measured on a 5-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree".

To achieve the required sample size, the authors distributed the survey to more than 300 individuals, resulting in 111

valid responses (some surveys were excluded due to poor survey quality). The survey results are presented in Table 1. Data was imported and analyzed using SPSS and AMOS software.

5. Results

5.1. Scale assessment

The scale was evaluated using Cronbach's Alpha reliability coefficient: The results of the Cronbach's Alpha reliability test in Table 2 show that all 17 observed variables have correlation coefficients with the total variable greater than 0.3; the Cronbach's Alpha coefficients of the 4 scales are all greater than 0.6. Thus, the constructed scales ensure acceptable reliability (According to: Cronbach, 1951; Nunnally & Bernstein, 1994).

5.2. Results of the mediation analysis of the role of Digital Transformation Strategy in the relationship between Digital Leadership and Organizational Performance

Exploratory Factor Analysis (EFA): All 12 observed variables of the model were included in the EFA. The result of the EFA yielded a Kaiser-Meyer-Olkin (KMO) measure of 0.885 (indicating the suitability of EFA), and a significance value (Sig) of 0.000 (indicating significant correlations among the observed variables overall). The total variance extracted was 86.735% (greater than 50%, indicating that the extracted factors explain 86.735% of the data variation). The EFA results were consistent with the constructed measurement scales, as all indicators were appropriately loaded onto their respective factors.

Confirmatory Factor Analysis (CFA): Confirmatory Factor Analysis was conducted to assess the model's fit with the collected data. The results of the evaluation indices for model fit are presented in Table 3.

The results in Table 3 indicate that all evaluation indices meet the criteria. Therefore, the conclusion is that the model fits the research data and achieves parsimony.

Linear Structural Equation Modeling (SEM) was conducted after the CFA analysis to evaluate the relationships between the factors. The research model was estimated using the linear structural equation modeling, and the results are presented in Figure 2. The Model Fit indices of the SEM analysis all meet the criteria, thus indicating that the linear structural equation model in this case is appropriate and reliable.

The results of the model testing in Table 4 show the detailed outcomes of hypothesis testing. The first hypothesis suggests that Digital Leadership has a direct impact on the organizational performance of the company. However, the results indicate that this hypothesis is not supported as the P-value is > 0.05. Therefore, Digital Leadership does not have a direct influence on the organizational performance, which aligns with previous research findings (Amelda et al., 2021; Tulungen et al., 2022; Yopan et al., 2022). The second hypothesis proposes that Digital Leadership affects the Digital Transformation Strategy of the company. The analysis results support this hypothesis ($\beta = 0{,}533$; CR = 0,087; $P < 0{,}05$). The third hypothesis suggests that the Digital Transformation Strategy of the company affects its Organizational Performance. The analysis results confirm this hypothesis ($\beta = 0{,}506$; CR = 0,089; $P < 0{,}05$). The fourth hypothesis posits that Digital Leadership has an impact on the Organizational Performance of the company through the mediating role of the Digital Transformation Strategy. The analysis results support this hypothesis ($\beta = 0{,}267$; $P < 0{,}05$).

5.3. Results of the analysis of the moderating role of Digital Skills in the relationship between Digital Transformation Strategy and Organizational Performance

The second-order regression method was used to test hypothesis H5. In this hypothesis, Digital Skills (W) act as the moderating variable, influencing the relationship between Digital Transformation Strategy (X) and Organizational Performance (Y). Digital Skills were hypothesized as a pure moderator, meaning that they only modify the relationship between Digital Transformation Strategy and Organizational Performance without having a direct relationship with Organizational Performance. This hypothesis is accepted when X*W has an effect on Y, meaning that the product of Digital Transformation Strategy and Digital Skills has an impact on Organizational Performance.

The results of the second-order regression estimation are presented in Table 5 and Figure 3. The results show that Digital Transformation Strategy has a significant effect on Organizational Performance ($P < 0.005$), while Digital Skills do not have a significant effect on Organizational Performance ($P > 0.005$). The regression results also demonstrate that the interaction effect between Digital Transformation Strategy and Digital Skills on Organizational Performance is statistically significant ($P < 0.005$), indicating that hypothesis H5 is supported. This result means that when employees' Digital Skills are higher, the impact of Digital Transformation Strategy on Organizational Performance is also higher.

From Figure 3, it is evident that all three lines representing the relationship between X (Digital Transformation Strategy) and Y (Organizational Performance) with W (Digital Skills) have an upward slope. This indicates that regardless of the level of digital skills, an increase in the digital transformation strategy will lead to an improvement in organizational performance. Furthermore, the varying slopes of the three lines in the graph indicate that as digital skills increase, the impact of the digital transformation strategy on organizational performance also increases.

6. Conclusion, implications, and limitations

The objective of this study was to examine the relationship between digital leadership and organizational performance through the mediating role of digital transformation strategy, as well as the moderating role of digital skills in the relationship between digital transformation strategy and organizational performance. These hypotheses were investigated in the context of coal mining companies in Vietnam. The research model comprised four variables: Digital Leadership, Digital Transformation Strategy, Digital Skills, and Organizational Performance. The results of the analysis demonstrated the validity and reliability of the proposed model. The findings from the analysis of Cronbach's Alpha, Exploratory Factor Analysis (EFA), and Confirmatory Factor Analysis (CFA) all met the required criteria, confirming the validity of the proposed model.

The results of hypothesis testing through the Structural Equation Modeling (SEM) indicate that digital leadership does not have a direct effect on organizational performance.

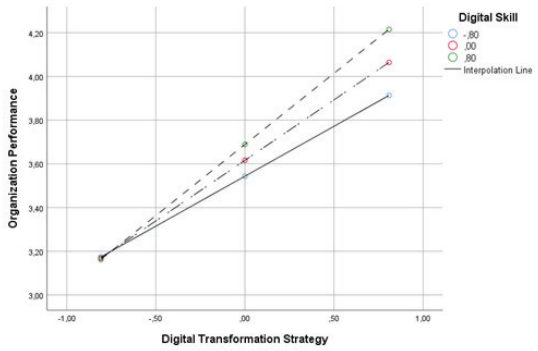

Fig. 3. Graph showing the moderating relationship

However, it does have an indirect effect through the mediation of digital transformation strategy. The estimation of higher-order regression in hypothesis testing shows that the role of employees' digital skills acts as a moderator, strengthening the relationship between digital transformation strategy and organizational performance.

In the face of technological advancements, leaders in coal mining companies in Vietnam need to be adaptable to the developments and be able to embrace new habits in technology usage. Digital leadership plays a crucial role in realizing the business strategy to enhance operational efficiency. The understanding of digital transformation by leaders in coal mining businesses should be utilized to build and achieve strategic goals. To effectively leverage the benefits of digital transformation in improving organizational performance, business leaders must also prioritize enhancing the digital skills of their employees during the implementation process.

Digital transformation also has a significant positive impact on the operational efficiency of coal mining companies in Vietnam. It is considered an important approach by both academia and business practitioners to improve the business performance of organizations (Zhang et al., 2021). Clear and feasible digital transformation goals and strategies should be identified and integrated into the core business strategy of these companies. These strategic objectives are also greatly influenced by the perspectives, perceptions, and capabilities of the leaders in the coal mining industry. Additionally, to further enhance organizational performance during the digital transformation process, attention must also be given to the digital skills of the employees.

The limitations of this study include its exploratory nature, which resulted in a limited use of variables. The survey sample may not fully represent the strategic planning level of the businesses. Additionally, due to time constraints, some of the expected participants did not respond, which could have affected the study's outcomes. To address these limitations, future research should consider expanding the range of variables, such as cooperation, digital literacy, employee satisfaction, and competitive advantage. Furthermore, involving more strategic planners, especially top-level leaders, is important for future studies. In this study, only two participants at that level were included. Another limitation is the relatively small number of valid responses, with only 111 out of 207 participants' responses being considered valid. Therefore, for future research, increasing the number of respondents and improving the survey quality are essential steps to enhance the study's validity and reliability.

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