



“Adaptive resilience in a post-pandemic era: A case of Vietnamese organizations”

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ARTICLE INFO	Ha Thi Phuong Minh and Nguyen Ngoc Long (2023). Adaptive resilience in a post-pandemic era: A case of Vietnamese organizations. <i>Problems and Perspectives in Management</i> , 21(3), 219-229. doi: 10.21511/ppm.21(3).2023.17
DOI	http://dx.doi.org/10.21511/ppm.21(3).2023.17
RELEASED ON	Tuesday, 01 August 2023
RECEIVED ON	Thursday, 16 March 2023
ACCEPTED ON	Friday, 14 July 2023
LICENSE	 This work is licensed under a Creative Commons Attribution 4.0 International License
JOURNAL	"Problems and Perspectives in Management"
ISSN PRINT	1727-7051
ISSN ONLINE	1810-5467
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

59



NUMBER OF FIGURES

1



NUMBER OF TABLES

4

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BUSINESS PERSPECTIVES



LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine
www.businessperspectives.org

Received on: 16th of March, 2023

Accepted on: 14th of July, 2023

Published on: 1st of August, 2023

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Conflict of interest statement:

Author(s) reported no conflict of interest

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ADAPTIVE RESILIENCE IN A POST-PANDEMIC ERA: A CASE OF VIETNAMESE ORGANIZATIONS

Abstract

The Covid-19 pandemic has been fading gradually, but another problematic phase has begun for organizations in the post-Covid-19 era in Vietnam. This study aims to examine the direct impact of transformational leadership on adaptive resilience, the indirect impact of transformational leadership on adaptive resilience via psychological and employee resilience, and the interactions between the levels of resilience. Quantitative research was used to analyze data from 324 employees chosen via convenient sampling in Vietnam. The findings indicated that transformational leadership directly impact adaptive resilience ($\beta = 0.559$, $p < 0.000$), psychological resilience ($\beta = 0.361$, $p < 0.000$), and employee resilience ($\beta = 0.292$, $p < 0.000$) and also indirectly impact adaptive resilience via psychological and employee resilience ($\beta = 0.135$, $p < 0.000$), and employee resilience via psychological resilience ($\beta = 0.130$, $p < 0.000$). Furthermore, there was also the direct influence of psychological resilience on adaptive resilience ($\beta = 0.135$, $p < 0.005$) and the indirect influence of psychological resilience on adaptive resilience via employee resilience ($\beta = 0.073$, $p < 0.000$). The other direct significant relations, such as between psychological resilience and employee resilience, and between employee resilience and adaptive resilience, were also confirmed ($\beta = 0.360$, $p < 0.000$; $\beta = 0.204$, $p < 0.000$).

Keywords

adaptive resilience, psychological resilience, employee resilience, transformational leadership

JEL Classification

D23, H12, J63, M12, Q54

INTRODUCTION

The Covid-19 pandemic has nearly been around for three years, posing difficulties and causing significant personal, financial, and societal losses. The pandemic's most notable effects on society and the economy included severe interruptions in health services, a shortage of funding for the protection of citizens, significant job losses, financial hardship for emerging nations, inflation, and diminished social cohesiveness and community resilience (United Nations, 2022).

One of the nations that the Covid-19 outbreak has significantly impacted is Vietnam. The majority of businesses, including service, tourism, transportation, catering, lodging, and entertainment industries, suffered significant harm due to the crisis, which disrupted trade and supply chains. It also had a significant impact on people's lives and psychological well-being. The majority of businesses, however, are currently engaged in an adaptive process (Phuc, 2021). The UN (2020) stated that methods to adapt and respond to the pandemic (i.e., protecting employment, helping small and medium-sized firms, social cohesion, and community-led resilience), which had been put into practice, resulted in notable resilient socio-economic indications in Vietnam. Vietnamese leaders should be able to adapt to changes in the

post-pandemic environment. However, the quantity of academic works connected to resilience has not yet been exposed proportionally to both the meso and micro levels. Only a few research on resilience have been conducted in Vietnam (Ngoc Su et al., 2021; Waibel et al., 2020; Hoang et al., 2021).

Prior research on the post-crisis resilience of other nations was local in scope and concentrated on the resilience of specific industries, particularly tourism (Calgaro & Lloyd, 2008; Ghaderi et al., 2015; Blackmon et al., 2017; Mann et al., 2018; Prayag et al., 2020; Bietsch et al., 2020). According to Corbazz-Kurth et al. (2022), resilient procedures depended on professional sectors, occupied positions, and the perceived severity of the problematic instances. What has transpired demonstrates that the Covid-19 pandemic has not been a personal or regional emergency. This indicates that it has had an unprecedented global impact, affecting all organizations, industries, and people globally. However, there is still a lack of empirical data to provide a complete picture of the adaptive resilience of companies in many sectors during the Covid-19 pandemic, particularly in Vietnam.

1. LITERATURE REVIEW AND HYPOTHESES

Numerous studies have been conducted to investigate organizational resilience during a crisis. However, studies examining leadership's impact on adaptive resilience are rare, especially the role of transformational leadership in organizational adaptive resilience after a considerable crisis similar to the Covid-19 pandemic.

Barasa et al. (2018, p. 491) noted that "Resilience was generally taken to mean a system's ability to continue to perform and meet its objectives in the face of challenges; furthermore, resilience is not just a system's capacity to withstand shocks, but also to adapt and transform." Luthans (2002) pinpointed that resilience is a positive capacity in organizational behavior. Kimhi (2016) indicated the three distinct levels of resilience (individual, community, and national), all of which were interconnected and dealt with the consequences of adversity.

Psychological resilience manifests that individuals can advance emotional endowments to better respond to adverse conditions (Williams et al., 2017). Employee resilience is also an important individual resource (Näswall et al., 2019). It is the behavioral capabilities of individuals to react better to adverse events (Kuntz et al., 2016; Williams et al., 2017). Employee resilience, however, differed from psychological resilience (Prayag, 2018). It is "the capacity of employees to utilize resources in order to continually adapt and flourish at work, even when faced with adversity" (Kuntz et al., 2016, p.

460). Organizational resilience is "the ability of an organization to maintain functions and recover fast from adversity by mobilizing and accessing the resources needed" (Hillmann & Guenther, 2021, p. 25). Organizational resilience is measured from two dimensions: planned resilience and adaptive resilience (Lee et al., 2013; Whitman et al., 2013; Gonçalves et al., 2019). According to Barasa et al. (2018), planned resilience is the previously programmed plans of organizations to evade or minimize the damages of a negative event in the future. On the contrary, adaptive resilience emerges during the post-crisis interval via new capacities that organizations flourish to respond to emergent cases. Linnenluecke et al. (2012) stated that adaptive resilience is a process of organizational adaptation to adverse events that experienced five stages: pre-adaptation, exposure, recovery and restoration, post-impact determination of the organization's overall resilience, and future adaptation.

According to Holmberg et al. (2016), strong leadership is a key component of a resilient organization. In addition to financial restrictions, organizational culture, and the organization's vision and goal, leadership is a business management aspect of organizational resilience regarding human resource practices (Ngoc Su et al., 2021). According to Miles et al.'s (1978) theory of adaptive organization, leaders can achieve an effective balance between their organizations and their environments by maintaining operational efficiency, utilizing environmental change to look for new opportunities, attempting to minimize harms while maximizing benefits, and adjudicating conflicts as they arise (Miles et al., 1978; Burgelman, 1991;

Jennings & Seaman, 1994). These adaptive strategies, called adaptive resilience, help organizations cope with adverse situations such as the Covid-19 pandemic. However, since the study of Valero et al. (2015) in the field of emergency management established empirical evidence on the influence of a transformative leader on a resilient organization, no similar research was conducted (Shuja & Abbasi, 2016; Madi Odeh et al., 2021; Abd-EL Aliem & Hashish, 2021).

According to Teo et al. (2017), leaders formed a relational network (i.e., based on social, emotional, and cognitive resources to make cohesion and interdependence between individuals) to activate resilience during the crisis. Thus, leadership must relate to individual resilience. On the resilient evidence, transformational leadership is positively related to positive psychological traits (e.g., hope, optimism, and resiliency) (Peterson et al., 2009; Gooty et al., 2009; McMurray et al., 2010). Transformational leaders also influence employees' psychological capital (self-efficacy, optimism, hope, and resilience) (Schuckert et al., 2018).

Surveys showed that different leadership styles affect employee resilience. Li and Tong (2021) proved the impact of narcissistic leadership on employee resilience through the mediating and moderating role of goal-directed energy and psychological availability. Ahmad et al. (2021) explored employee resilience as a mediator between servant leadership and workplace bullying. Zhu et al. (2019) investigated the relationship between humble leadership and employee resilience by mediating work-related promotion focus and perceived insider identity. Harland et al. (2005) confirmed that transformational leadership dimensions significantly influence subordinate resilience.

Luthans (2002) indicated that resilience was an individual's positive psychological state, which was necessary and meaningful for a positive approach to organizational behavior. Positive organizational behaviors are positive traits, states, and employee behaviors in the workplace (Bakker & Schaufeli, 2008). Furthermore, an emotional capacity is one of the personal resources (Williams et al., 2017) that employees use to adapt and prosper at work in adversity situations. Therefore, it implies that em-

ployee resilience and psychological resilience are related. In the tourist industry, empirical support exists for a significant and favorable association between psychological and staff resilience (Prayag et al., 2020).

Hillmann and Guenther (2021) proposed the conceptual integrative model, in which resilient behavior, resilience resources, and resilience capabilities lead to organizational resilience. Based on this perspective, psychological resilience and employee resilience are two resilient capabilities, so they could predict organizational resilient capability. Prayag (2018, p. 3) stated that "resilient individuals are also resilient employees, and these traits or behaviors contribute to organizational resilience." Psychological or employee resilience could be one of the human capital contributing to resilient organizations (Barasa et al., 2018). Tannera et al. (2022), Pathak and Joshi (2021), and Fang et al. (2020) conducted empirical studies relating psychological capital and organizational resilience. Prayag et al. (2020) confirmed the role of fully mediating employee resilience between psychological and organizational resilience. Prayag and Dassanayakem (2022) investigated the interaction between employee and organizational resilience.

According to Barasa et al. (2018), leadership styles and human resources impact an organization's resilience. According to Ma et al. (2018), organizational resilience is a unique ability; the levels of resilience can join and reinforce each other in parallel with a positive transformation from cognitive to behavioral and contextual resilience. Resilience is also integrated across individual employee, team, and organizational levels (Borg et al., 2022).

The literature review suggested the impact of transformational leadership, psychological resilience, and employee resilience on the adaptive resilience of organizations. Besides, there are indirect influences of psychological and employee resilience between the established relationships and, simultaneously, the interactions of the levels of resilience. Thus, the following hypotheses are proposed:

H1: Transformational leadership significantly and positively influences adaptive resilience.

- H1.1: Transformational leadership significantly and positively influences adaptive resilience via psychological and employee resilience.
- H2: Transformational leadership significantly and positively influences psychological resilience.
- H3: Transformational leadership significantly and positively influences employee resilience.
- H3.1: Transformational leadership significantly and positively influences employee resilience via psychological resilience.
- H4: Psychological resilience significantly and positively influences employee resilience.
- H5: Psychological resilience significantly and positively influences adaptive resilience.
- H5.1: Psychological resilience significantly and positively influences adaptive resilience via employee resilience.
- H6: Employee resilience significantly and positively influences adaptive resilience.

2. METHOD

Following the literature review, a quantitative research method was used to test the research model shown in Figure 1.

The first step is to run a pilot study to determine the most appropriate scale, verify that the language is

unambiguous, that no emotional or leading questions are asked, and how long the questionnaire should take. The study removed three duplicate items after matching the Benchmark Resilience Tool-13B (BRT-13B) (Whitman et al., 2013) and the Global Transformational Leadership Scale (GTL) (Carless et al., 2000). Then, 400 questionnaires were distributed, of which 324 completed questionnaires were used for quantitative analysis via convenient sampling. Respondents belong to different positions (employees, group leaders, departmental leaders, and organization leaders), tenures (below 5 years, from 5 to below 15 years, from 15 years to below 30 years, and above 30 years), and different forms of ownership (private, public, and foreign). All the respondents graduated from university and are studying another major, the second bachelor's degree.

The Brief Resilience Scale (BRS) (Smith et al., 2008) was used to measure psychological resilience. The BRS is a reliable tool to assess resilience as the ability to bounce back from stress or adversity. The BRS is a unitary construct with six items, of which three are positively phrased and three are negatively phrased. The BRS showed that internal consistency reliability ranged from 0.80 to 0.91. Employee resilience was measured by the Employee Resilience Scale (EmpRes) (Näswall et al., 2015). The EmpRes included nine items to monitor the resilient behaviors of employees in adversity, with Cronbach's alpha of 0.91. A short-form version of the Benchmark Resilience Tool-53 (BRT-53) with 13 items, namely the BRT-13B, of which eight items were adaptive resilience, was used to measure organizational resilience within the impacts and effects of diversity (Whitman

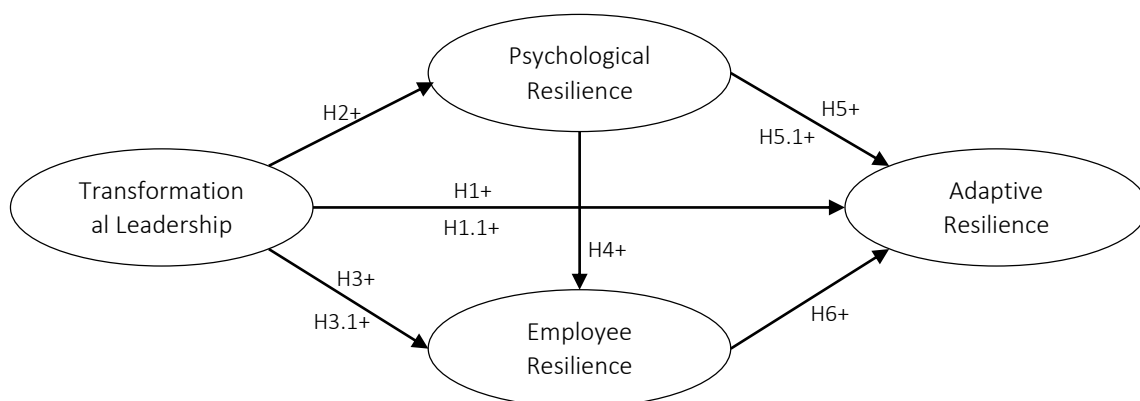


Figure 1. Conceptual model and hypotheses

et al., 2013). Cronbach's value of this dimension was above 0.80. The Global Transformational Leadership Scale (GTL) (Carless et al., 2000) measures transformational leadership with seven items. The GTL had satisfactory reliability (Cronbach's value of 0.93) to measure a single leadership construct. Consistently, the survey used Likert-type scales with responses from 1 (strongly disagree) to 5 (strongly agree).

3. RESULTS

Descriptive statistics (Table 1) indicate that most females had responded to the survey (73.1%). A high proportion of respondents were aged below 30 years old (77.2%). The percentage of positions occupied as an employee was 89.5%. Nearly three-quarters of respondents had tenure between 1 and 5 years. Significantly, 64.5% of respondents have been working in private organizations, and these percentages in public and foreign organizations were 14.5% and 21%, respectively. Similarly, the proportion of respondents working in the education, manufacturing, and commercial business sectors is 23.8%, 19.8%, and 14.8%, respectively, and the others account for 41.6%. These characteristics of the sample are representative and meet the research objectives.

Table 1. Characteristics of respondents

Item	Percentage (%)
Gender	
Female	73.1
Male	26.9
Age	
Below 30 years old	77.2
Between 30 years old and 45 years old	22.5
Above 45 years old	0.3
Tenure	
Below 5 years	72.5
Between 5 years and 15 years	26.2
Between 15 years and 30 years	1.2
Above 30 years	0.0
Position occupied	
Employee	89.5
Group Leader	7.1
Departmental Leader	3.1
Organization Leader	0.3
Ownership	
Private	64.5
Public	14.5
Foreign	21.0

Item	Percentage (%)
Career categories	
Education	23.8
Production	19.8
Commercial Business	14.8
Fiscal Monetary	9.0
Services	6.8
Health Care	5.2
Transport/Logistics	3.7
Real Estate	3.4
Advisory/Design/Building	3.1
Tourism/Restaurant/Hotel	2.5
Law	2.5
Media/Marketing/Advertising	2.5
Technology/Engineering	1.9
Others	1.2

The preliminary assessment was conducted by SPSS 22, including Cronbach's values to fulfill exploration factor analysis 1 (EFA1), which was to develop and refine scales (Reio & Shuck, 2015) and exploration factor analysis 2 (EFA2), which was to check common method bias (Podsakoff et al., 2003). Preliminary assessment results of the EmpRes with nine items had three excluded items (i.e., two items with corrected item-total correlation < 0.3 and one item with factor loading < 0.5). Besides, the BRT-13B consisted of seven items, and the GTL was five items through a varimax rotation. The EFA2 was undertaken on 24 representative items (Table 2) of the study, with the results indicating that the single factor explained only 39.7% of the total variance, which is below the threshold of 50% (Podsakoff et al., 2003). Smart PLS4 was applied to assess the measurement and structural model proposed through the PLS algorithm and bootstrapping (5000 subsamples) (Hair et al., 2016). The reliability and validity scores of the constructs are revealed in Table 2. The value of Cronbach's Alpha and factor loadings for all constructs were higher than 0.7, exception for factor loadings of two items of adaptive resilience. However, all AVE values of the constructs were above the 0.50 threshold (from 0.576 to 0.715), and the CR of measures ranged from 0.891 to 0.937, thus not removing any of the items. Furthermore, the rho-a values also ranged from 0.853 to 0.921, so all constructs are internally consistent and fulfill the condition of convergent validity (Fornell & Larcker, 1981; Hair et al., 2016).

The discriminant validity was considered by comparing the square root of each AVE in

the diagonal with the correlation coefficients (off-diagonal) for each construct in the relevant rows and columns. Table 3 indicated that the discriminant validity of constructs satisfied the conditions that all the inter-correlations between the constructs were lower than the square root of AVE. Besides, the values of HTMT ratios for all the constructs are below 0.9, implying no multicollinearity among the latent constructs. Table 3 shows that the highest value of the HTMT ratio did not embrace the 0.85 threshold (i.e., 0.762 is the highest), so the study's discriminant validity has been established (Fornell & Larcker, 1981; Henseler et al., 2015).

The R-square values showed that transformational leadership, psychological resilience, and employee resilience explained 54.8% of the variance in adaptive resilience. Transformational leadership and psychological resilience explained 29.1% of the variance in employee resilience, while transformational leadership explained 13.1% of the variance in psychological resilience. The path coefficients in Table 4 showed that psychological resilience has a significant and positive relationship with employee resilience ($H4, \beta = 0.360, p < 0.000$) and adaptive resilience ($H5, \beta = 0.135, p < 0.005$). Employee resilience also has a significant and positive relationship with adaptive resilience ($H6, \beta =$

Table 2. Construct reliability and validity

Items	Loading	Cronbach's Alpha	Composite reliability (rho_a)	Average variance extracted (AVE)	CR
Psychological resilience (PsyRes)		0.920	0.921	0.714	0.937
BRS11	0.832				
BRS22	0.855				
BRS33	0.815				
BRS44	0.857				
BRS55	0.863				
BRS66	0.847				
Adaptive resilience (AdaRes)		0.897	0.906	0.622	0.919
BRT-13B116	0.685				
BRT-13B217	0.686				
BRT-13B318	0.862				
BRT-13B419	0.842				
BRT-13B520	0.821				
BRT-13B621	0.838				
BRT-13B722	0.763				
Employee resilience (EmpRes)		0.853	0.853	0.576	0.891
EmpRes17	0.722				
EmpRes28	0.806				
EmpRes39	0.767				
EmpRes410	0.754				
EmpRes511	0.742				
EmpRes612	0.761				
Transformational leadership (TraLea)		0.892	0.894	0.699	0.921
GTL023	0.814				
GTL124	0.827				
GTL225	0.858				
GTL326	0.857				
GTL427	0.824				

Table 3. Fornell-Larcker criterion and HTMT ratios

	(1)	(2)	(3)	(4)
(1) Psychological resilience (PsyRes)	0.845	0.475	0.522	0.397
(2) Adaptive resilience (AdaRes)	0.432	0.788	0.572	0.762
(3) Employee resilience (EmpRes)	0.466	0.502	0.759	0.476
(4) Transformational leadership (TraLea)	0.361	0.693	0.422	0.836

0.204, $p < 0.000$). Likewise, transformational leadership has a significant and positive influence on psychological resilience ($H2$, $\beta = 0.361$, $p < 0.000$), adaptive resilience ($H1$, $\beta = 0.559$, $p < 0.000$), and employee resilience ($H3$, $\beta = 0.292$, $p < 0.000$). Thus, all hypotheses are supported.

The f^2 values indicated the contribution of predictor variables toward dependent variables. All effect sizes (f^2) were positive. Transformational leadership ($f^2 = 0.544$) has the largest effect size on adaptive resilience. Transformational leadership has a medium effect ($f^2 = 0.150$) on predicting psychological resilience, and psychological resilience has a medium effect ($f^2 = 0.159$) on employee resilience. The others were small ($0.02 < f^2 < 0.15$) (Cohen, 2013).

According to Zhao et al. (2010), if the bootstrapped indirect effect is significant and the confidence interval does not include zero, mediation is supported. An examination of the total indirect effects revealed that employee resilience partially mediates the relationship between psychological and adaptive resilience ($H5.1$, $\beta = 0.073$, $p = 0.000$; BcaCI: 0.036–0.117), psychological resilience has a partial mediating effect between transformational leadership and employee resilience ($H3.1$, $\beta = 0.130$, $p = 0.000$; BcaCI: 0.083–0.188), and psychological and employee resilience partially mediate the relationship between transformational leadership and adaptive resilience ($H1.1$, $\beta = 0.135$, $p = 0.000$; BcaCI: 0.087–0.191).

4. DISCUSSION

This study was done to determine how transformational leadership affects psychological, employee, and adaptive resilience; how psychological re-

silience affects employee and adaptive resilience; and how employee resilience affects adaptive resilience.

Findings confirm that transformational leadership has a direct impact on adaptive resilience with the highest weights ($H1$, $\beta = 0.559$, $p < 0.000$), and transformational leadership also has a partial, significant, and positive impact on adaptive resilience via psychological and employee resilience ($H1.1$, $\beta = 0.135$, $p < 0.000$). Adaptive resilience is also directly or indirectly impacted by psychological resilience via employee resilience with the lowest weights ($H5$, $\beta = 0.135$, $p < 0.005$; $H5.1$, $\beta = 0.073$, $p < 0.000$). Besides, employee resilience directly affects adaptive resilience ($H6$, $\beta = 0.204$, $p < 0.000$).

The results of the investigation confirmed the five different significant impacts on adaptive resilience. This is different from previous studies, which only investigated the impact of each separate item on organizational resilience. The resilience of organizations in the post-Covid-19 context is not only the role of transformational leadership but also psychological resilience and job stability as employee resilience, which is consistent with reality. Research results stress the critical role of leadership in organizational resilience, especially adaptive resilience in the post-pandemic context. However, the number of previous studies on the impact of transformational leadership, psychological resilience, and employee resilience on organizational resilience could be higher. For example, there are similar studies on the direct impact of transformational leadership on organizational resilience (Shuja & Abbasi, 2016; Madi Odeh et al., 2021; Abd-EL Aliem & Hashish, 2021), psychologi-

Table 4. Structural path results

	Path coefficients	Bca intervals	p-value	f2	Supported
Direct paths					
<i>H1</i> : TraLea → AdaRes	0.559	0.460–0.649	0.000	0.544	Yes
<i>H2</i> : TraLea → PsyRes	0.361	0.253–0.459	0.000	0.150	Yes
<i>H3</i> : TraLea → EmpRes	0.292	0.197–0.386	0.000	0.104	Yes
<i>H4</i> : PsyRes → EmpRes	0.360	0.253–0.454	0.000	0.159	Yes
<i>H5</i> : PsyRes → AdaRes	0.135	0.044–0.232	0.005	0.030	Yes
<i>H6</i> : EmpRes → AdaRes	0.204	0.094–0.304	0.000	0.065	Yes
Indirect paths					
<i>H1.1</i> : TraLea → AdaRes	0.135	0.087–0.191	0.000		Yes
<i>H3.1</i> : TraLea → EmpRes	0.130	0.083–0.188	0.000		Yes
<i>H5.1</i> : PsyRes → AdaRes	0.073	0.036–0.117	0.000		Yes

cal resilience on adaptive resilience (Tannera et al., 2022; Pathak & Joshi, 2021; Fang et al., 2020), and employee resilience on adaptive resilience (Prayag et al., 2020; Prayag & Dassanayakem, 2022).

Besides the impact of transformational leadership on adaptive resilience, transformational leadership also directly activates psychological resilience and resilience of employees with weights (β) of 0.361 ($H2$, $p < 0.000$) and 0.292 ($H3$, $p < 0.000$), respectively. Previous studies on the effect of transformational leadership on psychological resilience are consistent with this study, including Peterson et al. (2009), Gooty et al. (2009), McMurray et al. (2010), and Schuckert et al. (2018). Servant and transformational leadership directly affect employee resilience (Ahmad et al., 2021; Harland et al., 2005). The result

indicates the mediating influence between transformational leadership and employee resilience via psychological resilience ($H3.1$, $\beta = 0.130$, $p < 0.000$). Zhu et al. (2019) and Li and Tong (2021) found similar results researching narcissistic or humble leadership on employee resilience via different factors without psychological resilience.

The direct relationship between psychological and employee resilience has a positive significance with a weight (β) of 0.360 ($H4$, $p < 0.000$), supporting Prayag et al. (2020). Besides, psychological resilience directly influences adaptive resilience ($H5$), and employee resilience also directly affects adaptive resilience ($H6$). All findings support Ma et al. (2018)'s perspective on interactions of different levels of resilience.

CONCLUSION

This study had given evidence about the effects of transformational leadership on psychological resilience, employee resilience and adaptive resilience of organizations; simultaneously, it confirmed the interaction of the resilience levels in a post-pandemic era in Vietnamese organizations. The study also clarified the theoretical background of organizational adaptation resilience. Findings of the study demonstrated the direct and indirect relationships, degree of influences, and impacting trends of the effects of transformational leadership on adaptive resilience, transformational leadership on employee resilience, and psychological resilience on adaptive resilience. Besides, the direct relationships of transformational leadership on psychological resilience, psychological resilience on employee resilience and employee resilience on adaptive resilience were confirmed with degree of impacts, relevant directions.

The study's findings align with the findings of earlier research. However, the discovery that psychological resilience (as a mediator) is responsible for the association between transformational leadership and employee resilience has demonstrated why this study is unique as previous research ignored the mediation function of psychological resilience.

Future research must be attentive in looking for other mediators and moderators of analyzed relationships. Future studies should also focus on the impact of various leadership philosophies on organizational resilience. The findings support this study's essential contribution to research and practice.

AUTHOR CONTRIBUTIONS

Conceptualization: Nguyen Ngoc Long.

Data curation: Ha Thi Phuong Minh.

Formal analysis: Ha Thi Phuong Minh.

Funding acquisition: Ha Thi Phuong Minh.

Investigation: Ha Thi Phuong Minh.

Methodology: Nguyen Ngoc Long.

Project administration: Ha Thi Phuong Minh.

Resources: Ha Thi Phuong Minh.

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 Supervision: Nguyen Ngoc Long.
 Validation: Ha Thi Phuong Minh.
 Visualization: Ha Thi Phuong Minh.
 Writing – original draft: Ha Thi Phuong Minh.
 Writing – review & editing: Nguyen Ngoc Long.

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