

The Impact of Organizational Learning on Supply Chain Resilience in the Context of Sudden Environmental Changes

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Abstract: In the context of sudden changes in the external environment, it is worthwhile to conduct in-depth theoretical research on how enterprises can enhance supply chain resilience to cope with the negative impacts brought about by external disruptions. Existing studies suggest that organizational learning can effectively improve the overall behavior of an organization; organizational improvisation is an effective measure to cope with turbulent environments; and digital platforms can effectively enhance an organization's competitiveness. Therefore, further research should be conducted to investigate whether organizational learning can effectively promote the exertion of organizational improvisation capabilities under the sudden changes in the external environment, thereby assisting the supply chain in dealing with external disruptions, and exploring the role of digital platform capabilities in this process.

Keywords: Supply chain resilience, Organizational learning, Organizational improvisation, Digital platform capacity

1 Introduction

In recent years, as market conditions have become increasingly volatile, supply chain resilience has increasingly become a significant area of research in supply chain risk management^[1]. Supply chain resilience refers to the capacity of a supply chain to survive, adapt, and evolve in a continuously changing environment^[2]. Currently, some enterprises have been eliminated during the external environmental changes due to their inability to address the vulnerability issues of the supply chain; on the other hand, enterprises with strong supply chain resilience, by adopting proactive coping strategies, have ensured the continuity of the supply chain and secured new opportunities for development. Existing research on supply chain risk management indicates that most supply chains respond to external risks using a coping mechanism of "plan first, execute later."

However, at present, we are in a world of uncertainty and complexity, with an increasing number of "black swan" events facing supply chains. Therefore, maintaining the normal operation of supply chains at this stage cannot solely rely on existing plans and strategies, but also includes the addition of response mechanisms for unknown situations. Organizational learning is aimed at enhancing core competitiveness, revolving around the continuous innovation process of individuals, groups, and the entire organization centered on the creation and acquisition of knowledge^[3]. Organizational learning is not for the sake of novelty, but

rather with the ultimate goal of improving the overall behavior of the organization^[4]. As an organizational theory that can guide organizations in sudden behaviors, organizational improvisation is considered an effective means for organizations to adapt to rapid environmental changes in the 21st century^[5]. According to the theory of organizational improvisation, in a complex and ever-changing external environment, enterprises cannot consider all unexpected situations and therefore formulate very comprehensive strategic plans, often operating in an improvised manner to synchronize planning and execution^[6]. Currently, many enterprises have recognized the importance of organizational learning and organizational improvisation for innovation, especially in the current volatile market environment that has subjected companies to repeated survival challenges. Moreover, the establishment of digital platforms provides companies with comprehensive data support and infrastructure, which helps to achieve the digitalization, automation, and intelligence of business processes. Through such platforms, companies can respond more flexibly to market demands, launching new products and services, thereby accelerating business innovation.

Can organizational learning enhance supply chain resilience through organizational improvisation? Can the capabilities of digital platforms be integrated into organizational management processes to assist organizations in navigating challenging times? In summary, within the broader context of the current volatile market environment, this study explores the impact of organizational learning on supply chain resilience through organizational improvisation, and further investigates the role of digital platform capabilities in this process.

2 Theoretical basis and research assumptions

2.1 Organizational learning and supply chain resilience

Organizational learning refers to the process of modifying an organization's original behavior by recognizing the risks and uncertainties posed by the external environment. The resilience of a supply chain is often viewed as its ability to cope with disruptions, particularly in the face of unexpected events such as terrorist attacks or natural disasters, and to restore itself to its normal operational state. This includes the capacity for absorption, adaptation, and recovery, as described in references^[7].

Through the continuous acquisition of relevant knowledge and experience, organizations can enhance their ability to apply knowledge, optimize their organizational structure, enable them to acquire new knowledge or technologies, bring about changes in organizational behavior, and thereby adapt the supply chain to new environments. Through continuous learning, organizations can rationally adjust the network layout and node relationships of the supply chain, optimize the operational processes and resource utilization efficiency of the entire supply chain, anticipate and address various uncertainties in the supply chain, quickly adjust supply chain plans, thereby stabilizing the continuity of the supply chain and enhancing its competitiveness, and are able to identify and create new business opportunities, expanding into new market spaces. Therefore, this paper proposes the following research hypotheses:

H1a-c: Organizational learning capability has a positive impact on the absorptive capacity, adaptive capacity and restorative capacity of the supply chain.

2.2 Organizational learning and organizational improvisation

Organizational improvisation refers to the flexible adaptation of pre-existing plans by an organization in response to sudden inspiration, often resulting in unanticipated outcomes, characterized by immediate and creative features.

The organization of improvisation requires the support of resources. By continuously organizing and learning to transform knowledge into resources, the reliance on resources for improvisational actions can be met. Through organizational learning, the cognitive abilities and skill levels of organizational members can be enhanced. High-skilled, experienced, and highly creative employees, who are passionate about overcoming challenges, are more likely to experience significant emotional fluctuations in response to complex and dynamic environments and unexpected events, thereby promoting the occurrence of improvisational actions. Organizational learning allows for the accumulation and sharing of more knowledge and experience, enabling organizational members to understand each other's work and approaches, thus facilitating easier collaboration in improvisational activities. Good team cohesion positively fosters the effective application of improvisation^[8]. Therefore, based on the aforementioned analysis, the following research hypotheses are proposed:

H2: Organizational learning has a positive impact on organizational improvisation.

2.3 Organizational improvisation and supply chain resilience

When the external environment undergoes sudden changes, organizations improvise to prompt swift decision-making and take actions to address unforeseen circumstances. Such rapid responsiveness can enhance organizational flexibility and agility, enabling them to promptly identify and resolve potential issues, minimizing the negative impacts brought about by sudden environmental shifts^[9]. Moreover, when supply chains are subjected to external disruptions, organizations' improvisation can boost their innovation capabilities^[10]. By leveraging the existing knowledge and information, organizations improvise a reorganization and innovation of existing strategies, generating creative approaches to assist the supply chains in handling external disturbances. This enables them to better adapt to continuously evolving market demands and competitive environments. Therefore, this study proposes the following research hypotheses:

H3a-c: Organizational improvisation has a positive impact on the absorptive capacity, adaptive capacity and restorative capacity of the supply chain.

2.4 The moderate role of digital platform capabilities

A digital platform is a digital resource platform that provides services and resources for producers and consumers, and carries out value creation^[11]. Digital platforms provide a convenient and real-time communication channel for organizational members, facilitating information dissemination and learning sharing among them. Through digital platforms, members can swiftly access the knowledge and experience of their peers, thereby enhancing their learning capabilities and improvisational responses. Digital platforms assist organizations in better navigating changes in the external environment, boosting their agility and improvisational skills. With digital platforms, organizations can swiftly access information, integrate resources, and coordinate actions, thereby better addressing various unforeseen

circumstances. Therefore, based on the aforementioned analysis, this study proposes the following research hypotheses:

H4a: The digital platform capability plays a moderating role between organizational learning and organizational improvisation. The higher the degree of digital platform capability, the stronger the positive effect of organizational learning on organizational improvisation ability.

Through digital platforms, organizations can swiftly access information, make decisions, and make adjustments. This facilitates rapid responses and problem-solving in the face of unforeseen circumstances within the supply chain. The capabilities of digital platforms aid in optimizing the resource allocation and process management of the supply chain. Digital platforms can integrate all links within the supply chain, enabling real-time information sharing, collaborative work, and efficient resource allocation. This not only enhances the efficiency of the supply chain but also strengthens its resilience and ability to handle unexpected events. Therefore, based on the aforementioned analysis, this study proposes the following research hypothesis:

H4b-d: The digital platform capability plays a moderating role between organizational improvisation and the absorptive capacity, adaptive capacity and restorative capacity of the supply chain. The higher the degree of digital platform capability, the stronger the positive effect of organizational improvisation on the absorptive capacity, adaptive capacity and restorative capacity of the supply chain.

2.5 The mediating role of organizational improvisation

Organizational improvisation, as an effective strategy for organizations to respond to sudden changes in the external environment, allows for real-time and rapid utilization of the diverse knowledge bases provided by organizational learning to address unexpected issues, pioneer new methodologies, and serve new markets. This aids organizations in maintaining flexibility and adaptability in uncertain environments. When an organization possesses a strong capacity for improvisation, it enhances its ability to adapt to various unforeseen circumstances, thereby reducing supply chain risks. Organizational improvisation represents an innovative and spontaneous approach for organizations to make decisions or manage sudden, unforeseen events. It allows for the creative capture of opportunities or resolution of problems. Based on the aforementioned analysis, the following research hypotheses are proposed in this paper:

H5a-c: Organizational improvisation plays a mediating role in the influence of organizational learning capabilities on absorptive capacity, adaptive capacity and restorative capacity of the supply chain.

Based on the aforementioned analysis, this paper proposes a theoretical model, as illustrated in Figure 1.

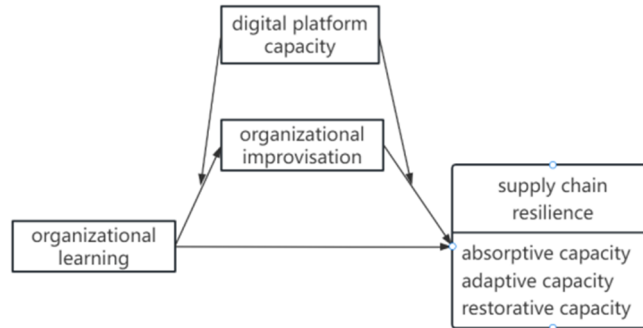


Figure 1 Model diagram

3 Research design

3.1 Test of reliability and validity

Results indicates that the Cronbach's α coefficients for all variables in this study are all greater than 0.7, thereby indicating good reliability. Confirmatory factor analysis was conducted using AMOS software. From the results in Table 2, it can be observed that the factor loadings for all variables are greater than 0.6, the CR values are all greater than 0.7, and the AVE values are all greater than 0.5. This suggests that the structural validity of the scale in this study is satisfactory. And, the root mean square error (RMSE) of each factor is greater than the correlation coefficients of each paired variable, thereby demonstrating the study's satisfactory discriminative validity.

3.2 Hypothesis testing

Test of the main effect of organizational learning on the three dimensions of supply chain resilience. Table 1 presents the results of Models 1, 2, and 3, which examine the direct effects of organizational learning on the three dimensions of supply chain resilience. The findings indicate that, with the introduction of control variables, organizational learning significantly enhances the absorptive capacity, adaptive capacity and restorative capacity of the supply chain ($\beta=0.389$, $p<0.001$; $\beta=0.398$, $p<0.001$; $\beta=0.386$, $p<0.001$), supporting the hypotheses H1a-c.

Table 1 Analysis of regression results between independent and dependent variables

Variables	Abc	Adc	Rec
	M1	M2	M3
Education	0.006	0.030	0.030
Enterprise age	0.035	0.220**	0.188*
Enterprise scale	-0.010	-0.253**	-0.175*
OI	0.389***	0.398***	0.386***
R-squared	0.151	0.175	0.158
Adjusted R-squared value.	0.145	0.168	0.151
F-value	22.284***	26.470***	23.462***

Note(s): *** $P<0.001$, ** $P<0.01$, * $P<0.05$.

Test of the mediating effect of organizational improvisation. Through the main effect test, it was found that organizational learning has a significant positive impact on the three dimensions of supply chain resilience. The regression results of models 4, 6, and 8 in Table 2 indicate that organizational improvisation also has a significant positive impact on the three dimensions of supply chain resilience ($\beta=0.351$, $p<0.001$; $\beta=0.351$, $p<0.001$; $\beta=0.359$, $p<0.001$), confirming hypotheses H3a-c. The results of model 10 in Table 2 show that organizational learning has a significant positive impact on organizational improvisation ($\beta=0.350$, $p<0.001$), confirming hypothesis H2. By comparing the results of models 1 and 5, 2 and 7, and 3 and 9, it can be observed that after the addition of organizational improvisation, organizational learning still has a significant positive impact on the three dimensions of supply chain flexibility ($\beta=0.303$, $p<0.001$; $\beta=0.314$, $p<0.001$; $\beta=0.298$, $p<0.001$), but the effect values are all somewhat reduced, indicating that organizational improvisation plays a partial mediating role between organizational learning and the three dimensions of supply chain resilience, confirming hypotheses H5a-c.

Table 2 Regression analysis of independent variables, mediating variables and dependent variables

Variables	Abc M4	Abc M5	Adc M6	Adc M7	Rec M8	Rec M9	Oi M10
Education	0.002	0.003	0.027	0.028	0.026	0.027	0.011
Enterprise age	-0.048	-0.016	0.137	0.170*	0.103	0.135	0.210*
Enterprise scale	0.071	0.044	-0.172*	-0.201*	-0.092	-0.119	-0.220**
OI		0.303***		0.314***		0.298***	0.350***
Oi	0.351***	0.244***	0.351***	0.239***	0.359***	0.254***	
R-squared	0.112	0.203	0.138	0.224	0.136	0.214	0.134
Adjusted R-squared							
R-squared value	0.115	0.195	0.131	0.217	0.130	0.206	0.127
F-value	17.374***	25.366***	19.982***	28.870***	19.753***	27.165***	19.374***

Note(s): *** $P<0.001$, ** $P<0.01$, * $P<0.05$.

Test of the Moderating Effect of Digital Platform Capabilities. The analysis results are shown in Table 3. From Model 14, it can be observed that the interaction term between organizational learning and digital platform capabilities has a significant positive impact on organizational improvisation ($\beta=0.238$, $p<0.001$), thus partially verifying Hypothesis H4a.

In Table 3, the results of Model 11, Model 12, and Model 13 indicate that the interaction term between organizational improvisation and digital platform capabilities has a significant positive impact on absorptive capacity, adaptive capacity, and resilience ($\beta=0.194$, $p<0.001$; $\beta=0.195$, $p<0.01$; $\beta=0.212$, $p<0.001$). Hypotheses H4b, H4c, and H4d are partially verified.

Table 3 Regression analysis of independent variables, mediating variables, moderating variables and dependent variables

Variables	Abc M11	Adc M12	Rec M13	Oi M14
Education	0.015	0.040	0.040	0.021
Enterprise age	-0.018	0.168*	0.135	0.207**

Enterprise scale	0.046	-0.198*	-0.119	-0.219**
Ol				0.216***
Oi	0.227***	0.222***	0.230***	
Dpc	0.227***	0.241***	0.232***	0.173***
Ol×Dpc				0.238***
Oim×Dpc	0.194***	0.195***	0.212***	
R-squared	0.216	0.239	0.241	0.228
Adjusted R-squared value	0.207	0.230	0.231	0.218
F-value	22.898***	26.055***	26.300***	24.445***

Note(s): *** P<0.001, **P<0.01, *P<0.05.

Furthermore, Figure 2 illustrates the relationship between organizational learning and organizational improvisation when digital platform capabilities vary at different levels. It can be observed that as the level of digital platform capabilities increases, the positive impact of organizational learning on organizational improvisation strengthens, thereby validating Hypothesis H4a. Figure 3, Figure 4 and Figure 5 show the relationship between organizational improvisation and the three dimensions of supply chain resilience when digital platform capabilities are at different levels. It can be observed that the higher the level of digital platform capabilities, the stronger the positive impact of organizational improvisation on the three dimensions of supply chain flexibility, and hypotheses H4b-d are confirmed.

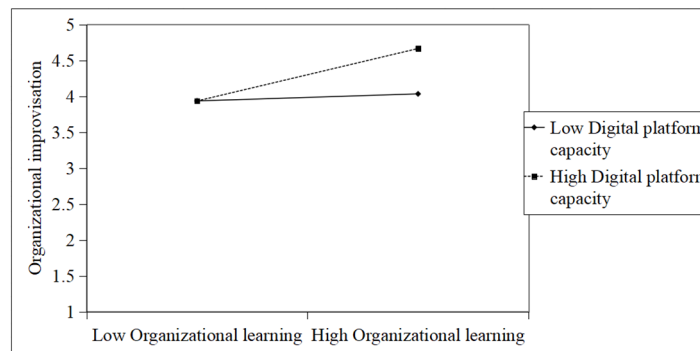


Figure 2 The moderating effect of digital platform capability on learning and organizational improvisation

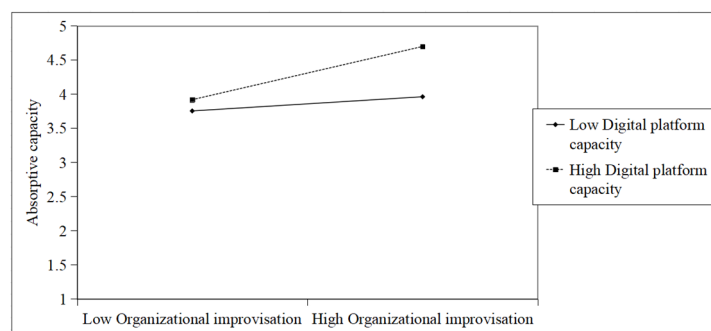


Figure 3 The moderating effect of digital platform capability on organizational improvisation and absorptive capacity

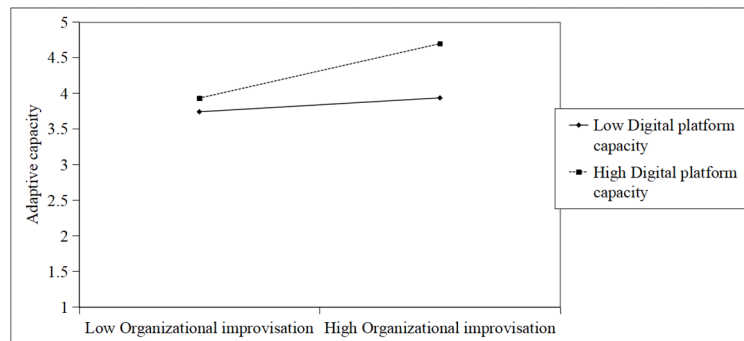


Figure 4 The moderating effect of digital platform capability on organizational improvisation and adaptive capacity

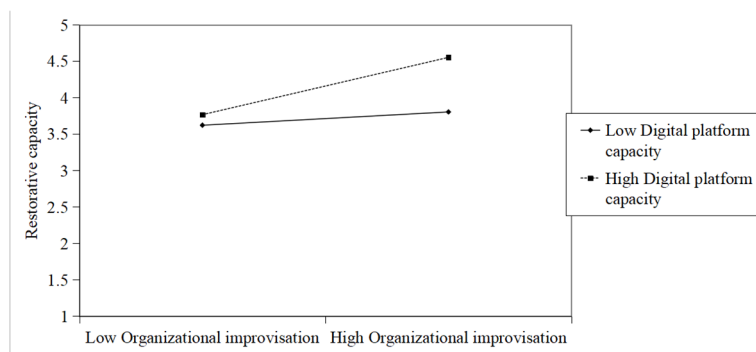


Figure 5 The moderating effect of digital platform capability on organizational improvisation and restorative capacity

4 Conclusion

In the context of sudden changes in the external environment, organizational learning can enhance the resilience of the supply chain. Through organizational learning, one can better understand the fluctuations in the external environment, grasp critical information, identify and assess potential risks, ensuring swift responses in the event of sudden changes. By effectively managing knowledge, the anti-disturbance capability of the supply chain is thereby strengthened. Organizational improvisational skills play a significant mediating role between organizational learning and supply chain resilience. By continuously acquiring, creating, and transferring knowledge within the organization, it is possible to stimulate the enthusiasm and creativity of organizational members, encouraging them to experiment with new methods and continuously introduce new products and services, thereby enhancing the supply chain's adaptability and innovation capability. In the face of sudden changes in the external environment, a high degree of digital platform capability can fully leverage network resources, helping to enhance supply chain resilience.

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