



# Routine Replication and Innovation Performance: Mediating Role of Organizational Flexibility and Moderating Role of Temporal Leadership

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**Abstract.** Based on the dynamic capability theory, this study empirically examines the relationship between routine replication and innovation performance through questionnaire data from manufacturing enterprises, and explores the mediating role of organizational flexibility and the moderating role of temporal leadership. The empirical results show that: routine replication has a significant positive effect on innovation performance; organizational flexibility partially mediates the relationship between routine replication and innovation performance; temporal leadership negatively moderates the relationship between routine replication and organizational flexibility; temporal leadership negatively moderates the mediating role of organizational flexibility in the relationship between routine replication and innovation performance. The findings of the study not only reveal the mechanism and boundary conditions of routine replication affecting innovation performance, but also provide important theoretical and practical insights for manufacturing enterprises to effectively utilize routine replication to improve innovation performance.

**Keywords:** Routine Replication, Innovation Performance, Organizational Flexibility, Temporal Leadership

## 1 INTRODUCTION

Innovation is a key driver for enhancing firm performance, promoting economic growth, improves the welfare of country, and achieving competitive advantage<sup>[1]</sup>. Due to its close link with economic growth, innovation has long been an interest topic in various research fields.

Some scholars propose that organizational routines are the driving force and fundamental analytical unit of organizational innovation, breaking the traditional view that organizational routines are merely stable and obstructive to innovation. Gupta et al. (2015)<sup>[2]</sup> argues that extracting value from organizational routines requires their replication. Routine replication, as a value-creation strategy<sup>[3]</sup>, can extend organizational boundaries and improve operational efficiency. Replicating best routines in new organizational contexts also positively promotes innovation<sup>[4, 5]</sup>.

Previous studies have explored potential pathways through which routine replication might influence organizational innovation<sup>[6]</sup>. However, this is insufficient to reveal the “black box” of their interaction, as organizational routines embed a significant amount of tacit knowledge, making them non-transparent. This implies that even the most accurate replication inevitably involves dynamic reconstruction of the routine template in new organizations. The restructuring and adjustment of replicated routines can help firms to cope with changing market environments and enhance organizational flexibility<sup>[5]</sup>, whereas existing research has yet to clarify the role of organizational flexibility in the relationship between routine replication and innovation performance.

Additionally, urgency is a characteristic of routine replication, as its value diminishes over time<sup>[3]</sup>, and the speed of replication of routines determines the value created through organizational flexibility<sup>[5]</sup>. Recent studies have also called for attention to the issue of time management in routine replication<sup>[3]</sup>. Temporal leadership, as a management approach, refers to leaders' behaviors in constructing, coordinating, and managing the pace of task completion<sup>[7]</sup>, leading us to believe that temporal leadership could be a potential moderating factor between routine replication and organizational flexibility. However, how temporal leadership affects the relationship between the two remains unknown.

To fill these research gaps, we integrate routine replication, organizational flexibility, temporal leadership and innovation performance into a research model. This study contributes to the existing literature both theoretically and empirically, enhancing our understanding of why some firms successfully improve innovation performance through routine replication strategies and achieving corporate development.

## **2 THEORETICAL BASIS AND RESEARCH HYPOTHESES**

### **2.1 Routine Replication and Innovation Performance**

Routine replication is defined as creating new routines similar to the original ones in important aspects in a new organizational context<sup>[8]</sup>. By deconstructing and reassembling excellent routines, applying them to new organizational context can alter the current development trajectory and achieve innovative catch-up<sup>[6]</sup>. Routine replication can facilitate the accumulation of organizational knowledge, thereby increasing the possibility of generating new ideas<sup>[9]</sup>. Additionally, the introduction of new routines can enhance organizational coordination and decision-making, and also ensures that rational decisions are taken and innovation activities are carried out smoothly. Thus, we hypothesize the following:

H1: Routine replication has a positive impact on innovation performance.

### **2.2 Routine Replication, Organizational Flexibility and Innovation Performance**

Organizational flexibility refers to the organization capability that enables an organization to respond quickly to changes in the environment<sup>[10]</sup>, maintains organizational agility and competitive advantage, and promotes innovation and performance. Yang et al.

(2022)<sup>[11]</sup>conducted a more comprehensive study of organizational flexibility, dividing it into three dimensions: resource flexibility, capability flexibility, and cultural flexibility.

Routine replication can maintain organizational flexibility. Firstly, routine replication can help organizations obtain new behavior patterns, forming new resource allocation and combination methods, and greatly improving efficiency, speed, and flexibility in problem-solving. Secondly, the replicated routines are embedded in the existing system as a result of proactive selection by organizational members. This leads to more consistent actions within the organization, which will help to stimulate the interest of the organization members in learning new knowledge and technology. Finally, routine replication facilitates the transfer of diverse knowledge within the organization, which can enhance understanding of resources, reduce the difficulty and time of resource conversion.

H2: Routine replication is positively related to organizational flexibility.

The view that organizational flexibility is a crucial driver of innovation has been supported by many empirical studies. Firstly, companies with resource flexibility can more quickly and easily apply resources to innovative activities<sup>[12]</sup>. Thirdly, companies with capability flexibility can more quickly identify the applicability of new and existing resources to meet innovation needs. Finally, cultural flexibility can shape an open, inclusive, and innovative cultural mindset and atmosphere, which can facilitate the understanding of new ideas and procedures<sup>[13]</sup>and improve innovation performance. Thus, we propose the following hypotheses:

H3: Organizational flexibility is positively related to innovation performance.

Furthermore, we argue that organizational flexibility plays a mediating role between routine replication and innovation performance and propose the following series of hypotheses.

H4: Organizational flexibility mediates the relationship between routine replication and innovation performance.

### 2.3 Moderating Effects of Temporal Leadership

Temporal leadership is a management approach where leaders schedule key activities, allocate time resources, synchronize organizational members' behaviors, and resolve conflicts<sup>[7]</sup>. Temporal leadership plays a crucial role in coordinating organizational members' behaviors and task execution rhythms<sup>[7]</sup>, which helps to save the time spent on trial and error of routines in the organization and increases the likelihood of efficient application of routines. Secondly, routine replication involves transferring knowledge embedded in routines to a new organizational context. Temporal leadership behaviors can create a unified time perception and norms within the organization, helping to resolve communication and collaboration issues<sup>[14]</sup>, thereby speeding up the knowledge transferring process and contributing to the improvement of organizational flexibility. Thus, we predict that:

H5: The higher the temporal leadership, the higher is the effect of routine replication on innovation performance.

Building on the previous discussion, this study further proposes a moderated mediation model and we hypothesize the following:

H6: Temporal leadership positively moderates the indirect effect of routine replication on innovation performance via organizational flexibility.

Based on the above arguments, the research framework of this study is shown in Fig. 1

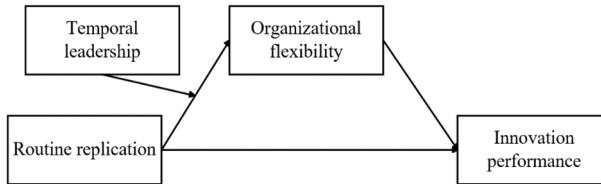


Fig. 1. The research framework.

### 3 RESEARCH METHODOLOGY

#### 3.1 Sample and Data Collection

In order to test the above hypotheses, this study collects and analyzes data by questionnaire from manufacturing enterprises in several regions such as Shandong Province, Shanxi Province and Jiangsu Province. The research method is mainly through a combination of online and offline surveys to collect questionnaires. A total of 247 questionnaires were recovered in this research activity, excluding invalid questionnaires such as filling out questionnaires for too short a period of time, missing answers, regular answers, and the final valid questionnaires used for data analysis were 154.

Among the recovered valid questionnaires, the enterprises age are mainly 10-20 years and 20-30 years, accounting for 56.5% and 26.6% of the valid samples respectively, while enterprises less than 10 years and more than 30 years both account for 8.4%. The sizes of enterprises with less than 200, 200-500, 500-1000, and more than 1,000 employees accounted for 7.1%, 27.9%, 34.4%, and 30.5%. State-owned enterprises, private enterprises, and foreign-funded enterprises accounted for 22.1%, 66.9%, and 11% of the valid sample.

#### 3.2 Measures

The Likert five-point rating scale was used in this study, ranging from 1 (strongly disagree) to 5 (strongly agree)

For measuring the company's innovation performance (IP), we scale draws on Liu et al. (2016)<sup>[15]</sup> with five items, "We are often the first in our industry to introduce new products/services compared to our competitors", "We are often the first in our industry to utilize new technologies compared to our competitors", "Our product improvements and innovations have a very good market response compared to our competitors", "We

have a very high success rate in new product development compared to our competitors”, “Our products contain advanced technologies and processes compared to our competitors” ( $\alpha=0.815$ ).

The study measures for routine replication was adapted from Levitt and March (1988)<sup>[16]</sup>, Teece (2014)<sup>[17]</sup>, Feldman et al. (2016)<sup>[18]</sup>, Wei et al. (2023)<sup>[6]</sup>. The six items for assessing routine replication are “The enterprise operates a continuous process recording and reporting program that mimics and draws on continuous process recording and reporting programs to enable the storage and compilation of documentation” “The enterprise operates a clear information handling guideline that mimics and draws on clear information handling guidelines”, “The enterprise has clear plans to refer to” “The enterprise's employees draw on and mimic technical operating manuals and instructions as they perform tasks”, “The enterprise draws on and mimics established procedures and practices to accomplish tasks”, “Employee behavior while performing tasks can be imitated and represented” ( $\alpha=0.780$ ).

We used an nine-item scale adapted from Yang et al. (2022)<sup>[11]</sup> to measure the level of organizational flexibility (OF). Measurement items such as: “management is able to ensure the implementation of the organization's strategy and the achievement of its strategic objectives through consistent and sound decision-making”, “management is able to manage the organization and control the strategic direction and implementation process”, “the same resources are used to a high degree in the development, manufacture and sale of different products or services”, “the same resources are used in a short period of time to change from one use to another”( $\alpha=0.830$ ).

Temporal leadership (TL) was measured through a scale borrowed from Mohammed and Nadkarni (2011)<sup>[7]</sup>, which consists of four items, including “firm leaders remind members of important deadlines”, “firm leaders prioritize tasks and allocate time for each task”, “firm leaders urge members to finish subtasks on time”, “firm leaders effective in coordinating the members to meet client deadlines” ( $\alpha=0.806$ ).

Firm age, firm size and firm ownership have all been found to be factors relevant to innovation <sup>[19]</sup>. We thus included these as control variables.

### 3.3 Validity and Reliability Assessment

In this study, the reliability test was conducted using SPSS software and the Cronbach's alpha coefficients for all variables were greater than 0.7, so the scales in this study had good consistency and good reliability. Additionally, AMOS software was used in this study for confirmatory factor analyses (CFA). CFA results show that the four-factor model ( $\chi^2/df=1.466$ , IFI=0.918, TLI=0.906, CFI=0.916, RMR=0.031, RMESA=0.055) had a better fit compared to the other factor models, which indicated that the model had good discriminant validity, the specific results are shown in Table 1.

**Table 1.** Confirmatory factor analyses.

Model	Factor	$\chi^2/df$	TLI	CFI	RMR	RMESA
Four-factor model	RR, OF, IP, TL	1.466	0.906	0.916	0.031	0.055
Three-factor model 3	RR+ TL, OF, IP	1.780	0.842	0.857	0.037	0.071

Three-factor model 2	RR+ IP, OF, TL	1.614	0.876	0.888	0.034	0.063
Three-factor model 1	RR+ OF, IP, TL	1.545	0.880	0.900	0.032	0.060
Two-factor model	RR+ OF, IP + TL	2.072	0.783	0.803	0.040	0.084
One-factor model	RR+ OF + IP + TL	2.064	0.784	0.803	0.040	0.083

### 3.4 Common Method Bias (CMB) Tests.

Since all the variables in this study were taken from the same questionnaire, there may be a problem of common method bias (CMB) in the data collected in this study. Therefore, we employ Harman's single-factor test and unmeasured latent common method factor (ULCMF) to examine CMB. First, the maximum variance explained by one factor is 36.127%, which is less than the critical value of 40%. Secondly, after the addition of the unmeasured latent common method factor, the five-factor model fits the data ( $\chi^2/df = 1.263$ , IFI = 0.959, TLI = 0.947, CFI = 0.957, RMR = 0.025, RMESA = 0.041) did not become significantly better. Therefore, this study does not have a serious CMB problem.

## 4 RESULTS

### 4.1 Descriptive Statistics and the Correlation Matrix

The means, standard deviations and correlation coefficients of the variables of this study are shown in Table 2. The results indicate significant correlation between all of the core variables of this study, and the results provide preliminary evidence to support the verification of some of the relevant hypotheses.

**Table 2.** Descriptive statistics and the correlation matrix.

Variables	M	SD	1	2	3	4	5	6	7	8
Firm age	2.351	0.754	1							
Firm size	2.883	0.928	0.320**	1						
Private firm	0.669	0.472	0.241**	-0.104	1					
Foreign-funded firm	0.110	0.314	0.029	0.022	-0.501**	1				
RR	4.169	0.463	0.282**	0.181*	-0.072	-0.009	1			
OF	4.151	0.465	0.144	0.105	-0.078	-0.031	0.672**	1		
IP	4.075	0.568	0.216**	0.161*	-0.062	0.019	0.645**	0.760**	1	
TL	4.244	0.557	0.126	0.087	-0.114	0.135	0.499**	0.519**	0.328**	1

Notes: \*  $P < 0.050$ , \*\*  $P < 0.010$ , \*\*\*  $P < 0.001$

### 4.2 Multiple Regression Analysis and Hypotheses Test

**Main Effects of Routine Replication on Innovation Performance.** This paper uses multiple linear regression and process procedures to test the research hypothesis between routine replication and innovation performance, as shown in Table 3, Table 4, and Table 5. As shown in Table 3 Model 6 shows that, considering the control variables,

routine replication has a significant positive impact on innovation performance ( $\beta=0.631, p<0.001$ ). Thus, H1 is verified.

**Table 3.** Results of regression analyses.

Variable name	OF				IP			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Firm age	0.105	-0.064	-0.058	-0.044	0.182*	0.026	0.104	0.065
Firm size	0.065	-0.005	-0.004	-0.009	0.102	0.038	0.054	0.041
Private firm	-0.085	-0.074	-0.070	-0.103	-0.003	0.006	0.060	0.052
Foreign-funded firm	-0.078	-0.060	-0.093	-0.121	0.010	0.026	0.068	0.063
RR		0.685***	0.557** *	0.520***		0.631** *		0.215* *
OF							0.746***	0.607** **
TL			0.253** *	0.256***				
RR×TL				-0.157**				
R <sup>2</sup>	0.031	0.458	0.505	0.528	0.056	0.419	0.595	0.619
F	1.186	25.036** *	24.993* **	23.290** *	2.207	21.326* **	43.497** *	39.740 ***

Notes: \*  $p<0.050$ , \*\*  $p<0.010$ , \*\*\*  $p<0.001$

**Mediating Effects of Organizational Flexibility.** As shown in Table 3 Model 2, routine replication has a significant positive impact on organizational flexibility ( $\beta=0.685, p<0.001$ ), thus H2 is verified. As shown in Table 3 Model 7, organizational flexibility has a significant positive impact on innovation performance ( $\beta=0.746, p<0.001$ ), thus H3 is verified. As shown in Table 3 Model 8, when both routine replication and organizational flexibility are included in the regression equation, routine replication still has a significant positive impact on innovation performance ( $\beta=0.215, p<0.001$ ), but the impact is significantly reduced. This indicates that organizational flexibility partially mediates the relationship between routine replication and innovation performance, thus confirming H4.

**Moderating Effect of Temporal Leadership.** As shown in Table 3. Model 4 shows that the interaction term of routine replication and temporal leadership has a significant negative impact on organizational flexibility ( $\beta=-0.157, p<0.01$ ), thus H5 is inversely confirmed.

Then, we use process procedures to test the moderated mediation effect of temporal leadership. The high levels of temporal leadership ( $\pm 1SD$ ), the indirect effect of temporal leadership on innovation performance through organizational flexibility is significant ( $\beta=0.261, SE=0.112, CI=[0.0622, 0.4935]$ ). At low levels of temporal leadership ( $\pm 1SD$ ), the indirect effect of temporal leadership on innovation performance through organizational flexibility is also significant ( $\beta=0.515, SE=0.102, CI=[0.3056, 0.7052]$ ). The lower the level of temporal leadership, the stronger the indirect effect, the

difference between the two levels is significant ( $\beta = -0.228$ ,  $SE = 0.111$ ,  $CI = [-0.4395, -0.0051]$ ). Thus, H6 is inversely confirmed.

## 5 DISCUSSION

### 5.1 Findings

The specific research conclusions are as follows: first, routine replication can positively affect innovation performance. Second, organizational flexibility mediates the relationship between routine replication and innovation performance. Third, temporal leadership significantly negatively moderates the relationship between routine replication and organizational flexibility, and also negatively moderates the mediating role of organizational flexibility between routine replication and innovation performance. The empirical results contradict the hypothesis, possibly due to the following reasons: although high levels of temporal leadership can align members on time, it may disturb the rhythm of the members' tasks, which in turn interferes with the entire process of routine replication adjustment and modification<sup>[20]</sup>. In addition, routine replication requires a collective effort from the organization to better embed into the new context. High levels of temporal leadership may cause members to focus solely on task completion speed, neglecting quality, and in the compulsion to complete tasks quickly, the sharing and integration of problem-solving methods may be hindered<sup>[21]</sup>, preventing routines from aligning with new contexts.

### 5.2 Theoretical Contributions

The theoretical contributions of this study are mainly reflected in the following aspects: first, most previous studies have confirmed that routine replication promotes innovation [3, 5, 6], but some studies argue it creates path dependence and hinders organizational innovation. This study further clarifies that routine replication benefits innovation performance through empirical tests on manufacturing enterprises.

Second, empirical tests validate the intrinsic connection between routine replication, organizational flexibility, and innovation performance, revealing the impact mechanism between routine replication and innovation performance, and enriching the research outcomes of dynamic capability theory.

Third, existing research focuses on temporal leadership as a moderating variable, but its role between time-constrained routine replication and organizational flexibility has been rarely explored. Therefore, this paper validates the moderating role of temporal leadership between them and also identifies its potential negative effects, expanding and enriching the theoretical research on temporal leadership as a moderating variable.

### 5.3 Managerial Implications

This study also provides some insights for firm practice: first, in the face of fierce external competition, manufacturing enterprises should fully utilize the value-creation



role of routine replication and maintain continuous innovation through “transplanting and introducing” excellent routines, promoting sustainable development. Second, in the process of enhancing innovation performance through routine replication, firms should focus on the positive role of routine replication in organizational flexibility. This will enable the firm to respond quickly to environmental changes and guide internal innovative behaviors, gaining higher innovation performance and competitive advantage. Finally, manufacturing enterprises should develop the time management skills of their managers to prevent organizational members from wasting work time and ensure that members are in an optimal working state, guaranteeing the speed and quality of routine replication, and supporting the achievement of organizational flexibility and improved innovation performance.

#### 5.4 Limitations and Future Research

This study also has certain limitations: first, this study verifies that organizational flexibility partially mediates the relationship between routine replication and innovation performance. However, it may still not fully explain the pathways of routine replication's impact on innovation performance. Future research could further explore the mechanisms between them. This paper only examines the boundary conditions for the effect of temporal leadership between routine replication and organizational flexibility. Future research could further investigate other moderating variables affecting routine replication, enriching the related boundary conditions.

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