The Effect of Dual-Level Transformational Leadership on New Firm Performance: The Mediated Role of Entrepreneurial Bricolage

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ABSTRACT

In recent years, entrepreneurial bricolage has acted as an effective way to solve the problem of resource constraint in new firms, and then gradually attracted attention from related scholars in the entrepreneurship field. However, the existing literature has been obviously insufficient on the implementation and driving factors of entrepreneurial bricolage behavior. Therefore, in this paper, the authors integrate entrepreneurial bricolage theory with transformational leadership theory to construct a theory model among dual-level (i.e., individual-focused and group-focused) transformational leadership, entrepreneurial bricolage, and new firm performance by means of 194 questionnaires for empirical analysis. The results show that the entrepreneurial bricolage has the mediator role in the relationship between dual-level transformational leadership and new firm performance.

KEYWORDS

Entrepreneurial Bricolage, Group-Focused Transformational Leadership, Individual-Focused Transformational Leadership, New Firm Performance

1. INTRODUCTION

Resources are crucial to the survival and development of new firms (Hoegl et al., 2008; Peng et al 2016; Sui and Liu 2020; Yang et al 2019; Zhang et al 2018). However, entrepreneurship is often carried out in a resource-constrained environment and new firms are difficult to obtain external resources due to the lack of legitimacy (Stinchcombe, 1965; Yu et al 2019). Most firms own limited resources (e.g., human, informational, physical, etc.) they need in the initial stage of establishment and development (Aldrich, 1999; Bicen and Johnson, 2014). Because of resource scarcity, start-ups can only 'make do' with what was at hand. Bricolage may provide a different perspective to new firms for resources and restructured resources that may not be considered applicable or relevant (Senyard et al., 2010). Particularly, entrepreneurial information bricolage (Yu et al 2017) is special for new firms to solve the resource constraint problem. New firms can strategically adopt bricolage to integrate existing

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Figure 1. Theoretical Model

resources to create new opportunities and higher value for customers (Garud and Karnoe, 2003; Baker and Nelson, 2005; Stritar and Drnovšek, 2016). Therefore, entrepreneurial information bricolage has recently been considered as a critical way to solve the resource constraint problem in new firms.

Since the organizational structure and institution in new firms have not been completed, maximizing the entrepreneurial information bricolage effectiveness is driven by the innovativeness and creativity of entrepreneurs. Particularly, the role of transformational leadership is important. Transformational leadership not only reflects a strong transformational creativity but also motivates all individuals in the team. Scholars have shown that transformational leadership with dual-level can promote the creativity and the effectiveness of teams in organizations (Wang and Zhu, 2011) as well as improve employees' creative skills (Aragón-Correa and Córdón-Pozo, 2007). Thus, transformational leadership has become a key enabler of entrepreneurial information bricolage.

The research about entrepreneurial information bricolage is still in an early stage although many studies have been conducted from different perspectives such as the impact of entrepreneurial information bricolage on firm performance (West and Noel, 2009; Senyard et al., 2010) and the relationship between entrepreneurial information bricolage and innovation and creativity (Gundry et al., 2011; Senyard et al., 2014). Since there is a contingency relationship between entrepreneurial information bricolage and the growth stage of new firms, the antecedent and consequent variables of entrepreneurial information bricolage need to be investigated. When firms enter the growth stage, excessive bricolage will bring adverse effects (Senyard et al., 2010; Baker and Nelson, 2005; Senyard et al., 2014). Thus, we integrated the entrepreneurial information bricolage theory with the transformational leadership theory to construct a research model among transformational leadership, entrepreneurial information bricolage, and new firm performance from the resource constraint perspective (shown in Figure 1).

The article is organized as follows: Section 2 presents a literature review. Section 3 discusses the theory and hypotheses among transformational leadership, entrepreneurial information bricolage, and new firm performance. Section 4 presents the research methodology and measurement items. We also discuss the sample characteristics and data analysis results. Finally, we present theoretical and practical implications, contributions, limitations, and future research.

2. LITERATURE REVIEW

Initially proposed by Levi-Strauss (1967), bricolage has been applied to different research fields in terms of anthropology, law, education, and evolutionary biology (Domenico et al., 2010; Baker and Nelson, 2005; Nelson et al., 2018)). Especially, Baker and Nelson (2005) argued that "bricolage is the process of using and integrating existing resources to solve new problems and bring new

opportunities". The bricolage has three significant characteristics: "resources in hand", "making do", and "resources consolidation". Specifically, "resources in hand" includes controllable resources and cheap or free resources that are available to entrepreneurs. "Making do" refers to a preference for action, due to resource constraints. It sometimes breaks conventions and ignores conventional standards in order to achieve expected results. "Resource consolidation" applies to newly captured creative elements by constructing new combinations from existing resources. The bricolage behavior in different situations has different name such as institutional bricolage, entrepreneurial information bricolage, network bricolage, intellectual bricolage, financial bricolage, and so on (Lambotte and Meunier, 2013; Kariv and Coleman, 2015). In the entrepreneurship field, bricolage is used to study entrepreneurial activities in resource-poor situations (Baker and Nelson, 2005; Garud and Karnoe, 2003). Furthermore, Baker and Nelson (2005) divided bricolage into two types: parallel forms and selective forms. In the parallel bricolage mode, firms can engage in bricolage activities in different fields at the same time, sometimes for a long time (Senyard et al., 2014). These firms adopt many bricolage activities and even some firms use bricolage activities in all activities. However, in the selective bricolage mode, applying bricolage is more cautious, only in one or a few fields and within a limited time. This choice is made by the priority of activities, with the highest priority to the most important project.

Entrepreneurial information bricolage refers to unplanned collaborative information practices by using or recombining limited resources (French and Williamson, 2016). Informational knowledge has been considered as one of the key characteristics for the contemporary society (Danova, 2005). Alter (2013) proposed a work system theory that "work is the application of human, informational, physical, and other resources to produce products/services" (p.75). The knowledge resource derived from entrepreneurial information bricolage had an impact on new venture performance (West and Noel, 2009). Sullivan and Marvel (2011) investigated the relationship between entrepreneurs' knowledge/network and new SMEs' performance. Huvila (2015) proposed a situational appropriation of information as a part of entrepreneurial information bricolage process. Providing information and turning the information into knowledge from dashboards developed by entrepreneurial information bricolage improved SMEs' performance (Vilarinho et al., 2018).

Burns (1978) proposed that transformational leadership is a process of positive influence through which leaders pursue higher ideals and moral values to motivate employees to produce high levels of commitment and motivation. Subsequently, Bass and Avolio (1994) divided transformational leadership into four dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individual consideration. In recent years, the transformational leadership has been shown to be flexible in its analysis (Kirkman and Lowe, 2009). It is made up of behavior not only targeted at both groups and individuals but also focused on the differences, connections, and organizational effectiveness between individual and group focused transformational leadership (Wu et al., 2010).

Individual-focused transformational leadership is grounded in situational leadership theories (e.g. Fiedler, 1967; Hersey et al., 2001; Walter and Bruch, 2010). Effective leaders vary their behavior depending on their follower's individual differences (e.g. abilities) and contextual factors (e.g. resources, task structure), resulting in differentiated leadership of group members (Wu et al., 2010). The perceptions of transformational leadership refer to leadership behavior experienced and perceived as "discretionary stimuli," resulting from different relationships developed between leaders and followers (Wang et al., 2005). Group-focused transformational leadership is based on the idea of an average leadership style (Dansereau et al., 1984). At the group level, transformational leadership is conceptualized "as a climate variable that is shared among all team members" (Chen et al., 2007) and represents an ambient stimulus affecting the team (Chen and Bliese, 2002).

3. THEORY AND HYPOTHESES

According to the Behavioral Theory of Bricolage (BTB), those seemingly low-value resources need special bundles to meet new challenges in order to present new values. Bricolage is a response mechanism for asset-poor or weak firms under resource constraints (Senyard et al., 2010). The new firm has the obvious characteristics of growth disadvantage and weakness as well as lack of resources. Entrepreneurial information bricolage in new firms rely more on existing resources in hand because new firms often lack legitimacy (Stinchcombe, 1965), skills, and the necessary financial resources for additional resources (Brush et al., 2006). Additionally, bricolage can make the new firm produce more innovative management ideas (Senyard et al., 2014), thus promoting the growth of new firms and making them achieve higher performance than expected (Steffens et al., 2010).

Entrepreneurial information bricolage mainly improves new firm performance through two ways. First is through the improvisation. Although entrepreneurial information bricolage can be carried out in advance with detailed planning (Baker et al., 2003), it is more of an improvisational behavior (Miner et al., 2001) and sometimes “achieves unexpected brilliant results” (Levi-Strauss, 1967). Since improvisation often accompanies the process of bricolage, some scholars often confuse the two above. However, there is both correlation and difference between bricolage and improvisation (Baker and Nelson, 2005). Often occurring in situations of limited resources, improvisation is a process of simultaneous design and implementation which are usually associated with bricolage behavior (Miner et al., 2001). Firms engaging in bricolage activities are willing to use resources (e.g., material or conceptual, ideological or human resources) that may be considered worthless by other organizations (Garud and Karnoe, 2003). The idea of bricolage is expanded through the improvisational entrepreneurial information bricolage behavior. Thus, new products are developed in an unconventional way to promote the new firm performance. Second is through the resource reorganization. The resource reorganization of entrepreneurial information bricolage encourages innovative behavior and improves the new firm performance by creating more innovative methods. Bricolage itself is a process of reorganizing resources with cheap or free methods (Senyard et al., 2014). Creative resource reorganization can shape the unique resource advantages of new firms by making the bricolage as one of the important resource advantage sources (Steffens et al., 2010). According to the resource-based theory, firms can achieve high-level performance by developing or utilizing unique advantageous resources that are rare or valuable to other firms. Therefore, new firms can create unique advantageous resources to effectively develop opportunities through entrepreneurial information bricolage to improve the new firm performance. Based on this, we propose the following hypothesis.

Hypothesis 1: Entrepreneurial information bricolage is positively related to new firm performance.

Transformational leadership has a significant impact on the new firm performance. Compared with mature firms, new firms are characterized by short establishment time, lack of resources, and poor risk management. The gap in the quantity and structure of resources such as talents, capital, and technologies directly leads to the performance gap (Heirman and Clarysse, 2004). Therefore, new firms are particularly dependent on leaders. Moreover, the positive influence of transformational leadership behaviors on firm performance is more obvious in new firms (Agle et al., 2006).

There are two reasons why transformational leadership at the individual level can promote the new firm performance. Firstly, individual-focused transformational leadership can positively influence individual creativity and motivate leaders and employees to seek new entrepreneurial opportunities (Wang and Zhu, 2011). In new firms, individual-focused transformational leadership stimulates employees' intellectual activity, encourages them to engage in creative learning, and shapes open thinking to enhance firms' ability to identify opportunities, utilize resources, and improve the new firm performance. Secondly, individual-focused transformational leadership can promote individual

self-efficacy (Wu et al., 2010). According to the leader-members exchange theory (Walter and Bruch, 2010), individual-focused transformational leadership can provide support (e.g., personalized advice, a new problem-solving perspective) to individual employees. Consequently, employees are more inclined to establish close, direct, and unique relationship with their leaders who will provide specialized guidance and counseling services to improve their employees' work enthusiasm and initiative, ultimately improve the new firm performance.

Group-focused transformational leadership can also promote the new firm performance. On the one hand, group-focused transformational leadership can encourage employees to form an unified values by shaping example. It is beneficial for employees to share experience and knowledge with each other, promote organizational learning, improve team effectiveness, and then have a positive impact on the new firm performance. On the other hand, group-focused transformational leadership is committed to improving the degree of self-management of the whole team (Williams et al., 2010), mobilizing team members' enthusiasm for learning and working, and inspiring team members' morale to promote the group effectiveness and thus improve the new firm performance.

In summary, dual-level transformational leadership has different focuses. Individual-focused transformational leadership improves the new firm performance by promoting individual creativity and self-efficacy of employees. Group-focused transformational leadership improves the new firm performance by improving team effectiveness. Therefore, the following hypotheses are proposed.

Hypothesis 2a: Individual-focused transformational leadership is positively related to new firm performance.

Hypothesis 2b: Group-focused transformational leadership is positively related to new firm performance.

Both individual-focused and group-focused transformational leadership can promote entrepreneurial information bricolage in new firms. The former can promote individual entrepreneurial information bricolage behaviors of employees, while the latter is more conducive to promoting team entrepreneurial information bricolage behaviors. The individual-focused transformational leadership positively affects entrepreneurial information bricolage via two paths. First, the individual-focused transformational leadership can improve the individuals' work flexibility and creativity through the motivation and communication means (Ahmad and Schroeder, 2004; Wang and Zhu, 2011). Since bricolage is associated with the creation process (Baker, 2003), individual-focused transformational leadership can promote employees' creative bricolage of existing resources in order to develop new uses of resources. Second, the individual-focused transformational leadership can identify and utilize differentiated resources and reasonably allocate resources by different employees and working environments (Wu et al., 2010). It is consistent with the essence of bricolage behavior. The bricolage process is essentially a dynamic collection of ongoing transformations and reconfigurations of resources (Lanzara and Patriotta, 2001). Therefore, employees may find or create new opportunities to improve the use efficiency of existing resources in the reconfiguration process of the existing resources. Therefore, individual-focused transformational leadership can realize the value recreation of existing resources by promoting employees' individual creativity and differentiating resource utilization to encourage employees in new firms to carry out more effective entrepreneurial information bricolage activities.

Group-focused transformational leadership can also drive entrepreneurial information bricolage via two paths. First, group-focused transformational leadership views the team as a unity of team members and team goals that is the premise to maximize the effectiveness of entrepreneurial information bricolage. Since group-focused transformational leadership pays more attention to the overall efficiency (Lawrence and Lorsch, 1967), leaders will require employees to execute orders according to set standards to improve the overall consistency and team efficiency when team members carry out entrepreneurial information bricolage (Dust et al., 2014). Second, group-focused

transformational leadership can promote the sharing and cooperation between team members for different aspects in terms of cognition, attitude, emotion, and behavioral perception (Chen et al., 2007; Kozlowski and Klein, 2000). The sharing between team members is conducive to improving team creativity and innovation consciousness (Wang and Zhu, 2011). Moreover, diverse knowledge, experience, and skills among team members will provide a more comprehensive perspective for the team's entrepreneurial information bricolage behavior. Thus, leaders will combine existing resources from multiple perspectives and discover new attributes of different resource combinations to improve the decision-making quality and performance. To sum up, group-focused transformational leadership enables team members to devote themselves to the development and utilization of existing resources, promote the team's entrepreneurial information bricolage, and improve the bricolage effectiveness. Based on this, we propose the following hypotheses.

Hypothesis 3a: Individual-focused transformational leadership is positively related to entrepreneurial information bricolage.

Hypothesis 3b: Group-focused transformational leadership is positively related to entrepreneurial information bricolage.

Most new firms will face significant resource constraints (Li 2012; Li and Warfield 2011; Shepherd et al., 2000). Resources include tangible resources (i.e., material resources, financial resources, etc.) and intangible resources (i.e., knowledge, technology, capability, etc.) (Lei et al 2019; Li 2013, 2018; Yu et al 2014; Xu 2015; Xu et al 2006; Xu, Xu and Li 2018). Firms can implement the effective resource strategy to improve resource utilization efficiency and effectiveness (Barney, 1997; Yu et al 2018). Entrepreneurial information bricolage is an important resource strategy for the survival and development of new firms whose managers have a decisive role on the effects of entrepreneurial information bricolage. Penrose (1959) stated that different firms starting with similar resources may have different utilization of these resources. The difference in cognitive ability of firm managers may lead to their integration and utilization of resources in different ways. Moreover, the differences in talent and experience of different managers will lead to significant differences in the resource utilization, resulting in the heterogeneity of resource among competing firms (Steffens et al., 2010). Managers of new firms with transformational leadership style can quickly adapt to the external environment change, break through resource constraints through entrepreneurial information bricolage, and then effectively develop entrepreneurial opportunities. Thus, new firms implementing transformational leadership are more conducive to the maximization of entrepreneurial information bricolage effect.

Entrepreneurial information bricolage plays a mediating role in the relationship between individual-focused transformational leadership and new firm performance. Individual-focused transformational leadership stimulates individual employees' creativity (Wang and Zhu, 2011) by implementing differentiated leadership on employees (Wu et al., 2010). Entrepreneurial information bricolage can be used to develop new uses of existing resources. Additionally, it breaks the inherent conventions, improves the resource utilization efficiency, and improves the new firm performance. Meanwhile, entrepreneurial information bricolage plays a mediating role in the relationship between group-focused transformational leadership and new firm performance. Group-focused transformational leadership can promote the innovative communication among team members by cultivating the innovative consciousness (Wang and Zhu, 2011). Entrepreneurial information bricolage has a positive impact on the new firm performance (Senyard et al., 2010) by discovering different innovative combinations and generating new business concepts (Senyard et al., 2014). In conclusion, entrepreneurial information bricolage can play a mediating role in the relationship between individual-focused and group-focused transformational leadership and new firm performance. Based on this, we propose the following hypotheses.

Table 1. Sample Profile

Position	Frequency	Percentage	Size	Frequency	Percentage
Top management	14	7.2%	£20	74	38.1%
Middle management	20	10.3%	21-50	31	16.0%
First-level manager	43	22.2%	51-100	43	22.2%
Employees	117	60.3%	>100	46	23.7%
Total	194	100%	Total	194	100%
Industry	Frequency	Percentage	Education	Frequency	Percentage
Finance	32	16.5%	Junior high school	2	1.0%
Automobile and parts manufacturing	24	12.4%	Senior high school	8	4.1%
Other Manufacturing	60	30.9%	College degree	19	9.8%
Retailing	19	9.8%	Undergraduate Education	107	55.2%
Computer software	13	6.7%	Postgraduate degree or above	58	29.9%
Others	46	23.7%			
Total	194	100%	Total	194	100%

Hypothesis 4a: Entrepreneurial information bricolage plays a mediating role in the relationship between individual-focused transformational leadership and new firm performance.

Hypothesis 4b: Entrepreneurial information bricolage plays a mediating role in the relationship between group-focused transformational leadership and new firm performance.

4. METHODOLOGY AND MEASUREMENT

4.1 Sample

Based on McDougall and Robinson's (1990) and Zahra's (1993) definitions, we selected new firms (less than or equal to eight years) for our questionnaire survey. Considering the perspective of individual-focused and group-focused transformational leadership, the teams with three to eight members were selected. The survey samples were mainly from new firms located in Beijing, Guangdong, Liaoning, and Jilin province in China. We distributed questionnaires by E-mail and paper version. After sorting out and eliminating questionnaires with missing data, 36 teams with 194 valid questionnaires were collected. The samples came from diverse industries, including manufacturing, financial industry, retailing, computer software services, food processing industry and so on. Table 1 presented the characteristics of the sample firms.

4.2 Measures

4.2.1 Transformational leadership

Individual-focused transformational leadership was measured using eight items from the Multifactor Leadership Questionnaire (Bass and Avolio, 1997) which measure the individual components of individual consideration and intellectual stimulation. Sample items include "My group leader helps me to develop my strengths" and "My group leader challenges me to reexamine critical assumptions to question whether they are appropriate", etc. Group-focused transformational leadership was

assessed by twelve items from the Multifactor Leadership Questionnaire (Bass and Avolio, 1997). It measures the group components of attributive idealized influence, behavioral idealized influence, and inspirational motivation. Sample items include “Our group leader emphasizes the importance of having a collective sense of mission when working in the group as a whole,” “Our group leader acts in ways that build my respect for him,” and “Our group leader talks optimistically about the future,” etc. A 7-point Likert scale was used, ranging from 1 (strongly disagree) to 7 (strongly agree).

4.2.2 Entrepreneurial Information Bricolage

We either adopted or adapted eight items to measure entrepreneurial information bricolage from Senyard et al. (2009). Sample items include “We use any existing information resource that seems useful to responding to a new problem or opportunity”, “We are confident of our ability to find workable solutions to new challenges by using our existing information resources,” etc. A 7-point Likert scale was used, ranging from 1 (strongly disagree) to 7 (strongly agree).

4.2.3 New Firm Performance

We adopted ten items to measure the new firm performance from Cameron (1978), including sales growth, revenue growth, and growth in the number of employees, net profit margin, product/service innovation, process innovation, adoption of new technology, product/service quality, product/service variety, and customer satisfaction. The response scale ranged from 1 (much lower) to 7 (much higher).

4.2.4 Control Variables

Respondents’ position, education level, firm age, and firm size are control variables. The number of employees is used to measure firm size. Different positions and education levels of employees will lead to differences in the way and efficiency of resource bricolage. However, the difference in age and size of firm will lead to the difference in resource level and quantity. Therefore, the position, education level, firm age and firm size of respondents were selected as control variables in this study.

4.3 Data Analysis

First, SPSS 16.0 was used to assess reliability and validity. The exploratory factor analysis and reliability analysis are shown in Table 2. Cronbach proposed in 1971 that reliability coefficients of 0.70 or higher are considered adequate. Thus, Cronbach’s alpha was estimated to assess internal consistency (all above 0.70). Good internal consistency, high reliability, and high validity, were shown in Table 2.

Second, descriptive statistics and correlation analysis were conducted among variables in this study. Mean value, standard deviation and correlation coefficient were shown in Table 3.

Finally, we tested the hypotheses by hierarchical regression. The results were shown in Table 4. Model 1 and Model 5 are the unrestricted baseline models with the control variables only. The results of Model 2 indicated that entrepreneurial information bricolage was significantly related to new firm performance ($\beta=0.306$, $p<0.001$). Hence, Hypothesis 1 was supported. Model 3 revealed that individual-focused transformational leadership ($\beta=0.274$, $p<0.001$) and group-focused transformational leadership ($\beta=0.310$, $p<0.001$) were significantly related to new firm performance. Thus, both individual-focused and group-focused transformational leadership had a positive effect on new firm performance, which supported Hypothesis 2a and Hypothesis 2b. Model 6 indicated that individual-focused transformational leadership ($\beta=0.185$, $p<0.05$) and group-focused transformational leadership ($\beta=0.198$, $p<0.01$) were positively correlated with entrepreneurial information bricolage. Therefore, Hypothesis 3a and Hypothesis 3b were supported. Based on Model 3, we introduced the entrepreneurial information bricolage to construct Model 4 whose regression coefficient decreased from 0.274 to 0.242 and 0.310 to 0.276 and the significance level also decreased from $P < 0.001$ to $P < 0.01$. Meanwhile, entrepreneurial information bricolage had a positive effect on new firm performance ($\beta=0.169$, $p<0.05$). Therefore, it can be proved that entrepreneurial information bricolage plays a

Table 2. Factor analysis and reliability analysis

Variable		Indicator	1	2	3	4	5	6	7	Cumulative%	Cronbach's α
Group-focused TFL	attributive idealized influence	GTL1	.218	.087	.054	.259	.124	.772	.021	28.251	0.884
		GTL2	.193	.140	.023	.228	.084	.839	-.013		
		GTL3	.125	.149	.108	.271	.058	.797	.098		
		GTL4	.139	.150	.085	.250	.243	.769	.086		
	behavioral idealized influence	GTL5	.089	.032	-.034	.845	.069	.262	.093	39.470	
		GTL6	.049	.052	-.003	.874	.014	.179	-.009		
		GTL7	.151	.132	-.021	.804	.081	.209	-.031		
		GTL8	.081	.097	-.095	.808	.094	.200	.022		
	inspirational motivation	GTL9	.135	-.017	.151	.150	.798	.037	.220	48.466	
		GTL10	.146	.099	.249	.012	.747	.270	.119		
		GTL11	.184	.048	.258	.071	.831	.096	.125		
		GTL12	.231	.040	.232	.058	.811	.134	.175		
Individual- focused TFL	individual consideration	ITL1	.087	.129	.803	-.008	.223	.048	.280	56.853	0.902
		ITL2	.146	.124	.830	-.053	.214	.012	.134		
		ITL3	.071	.095	.830	-.095	.182	.115	.243		
		ITL4	.200	.085	.800	-.021	.233	.089	.189		
	ntellectual stimulation	ITL5	.065	.104	.233	.018	.159	.039	.815	61.263	
		ITL6	.237	.115	.269	.058	.150	.084	.785		
		ITL7	.256	.074	.114	-.008	.174	.075	.822		
		ITL8	.297	.129	.300	.021	.152	-.028	.657		
Entrepreneurial information bricolage		EIB1	.112	.721	.210	.011	.007	.085	-.059	64.983	0.878
		EIB2	.124	.707	.112	.096	.041	.094	.104		
		EIB3	.047	.716	-.039	.129	-.106	.110	.134		
		EIB4	.131	.681	.066	.017	.105	.130	.127		
		EIB5	.097	.716	-.101	-.066	.054	-.007	.123		
		EIB6	.085	.752	.048	.094	.041	.027	-.038		
		EIB7	.193	.739	.013	-.065	.076	.170	.042		
		EIB8	.144	.687	.208	.178	-.015	-.067	.003		
New firm performance		P1	.740	.172	.085	.108	-.033	.070	.013	68.516	0.915
		P2	.700	.143	.231	.074	.111	.141	.060		
		P3	.670	.052	.065	.080	.073	.132	.033		
		P4	.757	.175	-.021	.157	-.011	.082	.088		
		P5	.766	.172	.147	.037	.132	.097	.144		
		P6	.766	.012	.135	.015	.109	.002	.141		
		P7	.785	.113	.114	-.015	.064	.082	.028		
		P8	.624	.157	.017	.039	.179	.096	.305		
		P9	.737	.038	-.077	-.034	.077	.110	.115		
		P10	.652	.115	.024	.088	.207	.022	.124		

Table 3. Correlations

Variables	Mean	SD	1	2	3	4	5	6	7	8
Position	3.36	0.93	1							
Education	4.09	0.81	-0.193**	1						
Firm age	3.32	1.39	-0.166*	0.053	1					
Firm size	3.47	1.82	-0.059	0.198**	0.418**	1				
Group-focused TFL	4.99	0.92	-0.067	0.140	0.026	0.101	1			
Individual-focused TFL	5.28	0.94	-0.128	0.242**	0.023	0.186**	0.396**	1		
Entrepreneurial information bricolage	5.30	0.93	-0.207**	0.095	-0.054	0.069	0.284**	0.291**	1	
New firm performance	5.32	0.92	-0.160*	0.120	-0.005	0.125	0.428**	0.417**	0.340**	1

Note: * $p < 0.05$; ** $p < 0.01$.

mediating role in both relationships between individual-focused transformational leadership and new firm performance, between group-focused transformational leadership and new firm performance. These results supported Hypothesis 4a and Hypothesis 4b.

5. DISCUSSION

5.1 Potential Application to IT

Information resource has become vital to firm performance due to the emergence of AI, IoT, big data, blockchain, and industrial information integration (Abbasian et al 2018; Chen, 2016, 2017; Chen et al 2016; Furtado, et al 2018; Haenlein et al 2019; Hassani et al 2018; Jiang et al 2014; Kuo and Nagasawa 2019; Li, Li and Zhao 2014; Li, Xu and Zhao 2018; Lu 2018a, 2018b; Lu 2019a, b; Lu and Xu 2019; Viriyasitavat et al 2019; Viriyasitavat, Xu, Bi, Hoonsoon 2019; Xu, He and Li 2014; Xu and Viriyasitavat 2019). Specifically, entrepreneurial information bricolage facilitated the synergy of planned and contingency approaches to design complex information systems (Patel et al., 2010). Data and knowledge mining techniques have been utilized to improve firm performance in terms of smart production, smart scheduling, and disruptive innovations (Duan and Xu 2012; Ghobakhloo and Ng 2019; Hämmäläinen and Inkienb, 2019; Molka-Danielsen et al 2018; Rossit et al., 2019; Xu and Duan 2019). Researchers have also shed light on the impact of knowledge-based process and data integration on firm performance (e.g., Pokojski et al., 2019; Gürdür et al., 2019). Researchers studied how IoT can be successfully used in business firms (Bi et al 2014; Cai et al 2014; Viriyasitavat, Xu, Bi, Pungpapong 2019; Xu 2011).

Information has become as one of the major resources for firm performance. Since competitions have been becoming fierce because of information technology development, entrepreneurs will have to adjust their leadership to accommodate entrepreneurial information bricolage. Therefore, information technology is an important enabler to carry out entrepreneurial information bricolage effectively, resulting in improved firm performance.

5.2 Theoretical Implications

First, entrepreneurship bricolage is an important resource strategy for new firms to break through existing resource constraints. Entrepreneurial information bricolage may deal with the constraints

Table 4. Regression analysis

Variables	New firm performance				Entrepreneurial information bricolage	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Position	-0.155* (0.036)	-0.089 (0.216)	-0.116 (0.076)	-0.084 (0.201)	-0.215** (0.003)	-0.189** (0.007)
Education	0.067 (0.367)	0.054 (0.441)	-0.022 (0.738)	-0.019 (0.771)	0.040 (0.585)	-0.019 (0.792)
Firm age	-0.094 (0.236)	-0.053 (0.491)	-0.066 (0.346)	-0.046 (0.506)	-0.136 (0.086)	-0.117 (0.121)
Firm size	0.142 (0.075)	0.110 (0.151)	0.068 (0.338)	0.059 (0.404)	0.105 (0.185)	0.056 (0.463)
Individual-focused TFL			0.274*** (0.000)	0.242** (0.001)		0.185* (0.015)
Group-focused TFL			0.310*** (0.000)	0.276*** (0.000)		0.198** (0.007)
Entrepreneurial information bricolage		0.306*** (0.000)		0.169* (0.013)		
R2	0.051	0.139	0.271	0.295	0.063	0.158
Adjusted R2	0.031	0.116	0.248	0.269	0.043	0.131
F	2.546*	6.073***	11.611***	11.145***	3.176*	5.850***

Note: * p < 0.05; **p< 0.01; ***p< 0.001.

of new firm resources and demonstrate the wisdom and adaptability of leaders (Halme et al., 2012; Domenico et al., 2010). The bricolage makes new firms more likely to develop innovative business ideas for creating more competitive advantage (Steffens et al., 2010; Senyard et al., 2014). Therefore, the entrepreneurial information bricolage strategy can effectively solve the resource scarcity problem in new firms and achieve high performance by reasonable combination and utilization of resources in hand.

Second, we analyzed the promotion effect of transformational leadership on performance from a dual perspective. Dual-level transformational leadership is rarely utilized from the dual perspective at the same time, especially for new firms. Considered as two ways to promote the new firm performance, both individual-focused and group-focused transformational leadership have significant impact on the growth of new firms. Consequently, this paper expanded and enriched the research about the dual transformational leadership of new firms.

Third, we examined and tested the mediating role of entrepreneurship bricolage in the relationship between dual-level transformational leadership and new firm performance. As an important enabler, dual-level transformational leadership can maximize the effects of entrepreneurship bricolage to improve the new firm performance. Individual-focused transformational leadership can effectively promote entrepreneurial information bricolage of employees. Meanwhile, group-focused transformational leadership has a positive impact on the entrepreneurial information bricolage of teams. Additionally, entrepreneurial information bricolage plays a mediating role in the relationship between individual-focused and group-focused transformational leadership and new firm performance.

5.3 Practical Implications

Case studies were mainly used in the early studies of entrepreneurship bricolage to solve enterprises' resource constraints. If resource allocation involves creating and allocating the appropriate resources,

then bricolage is the optimal use of those limited resources. These case studies believed that bricolage can provide creative solutions, but there will be some limitations and shortcomings if excessive bricolage (Senyard et al., 2010; Baker and Nelson, 2005; Senyard et al., 2014). Although bricolage sometimes may “achieve brilliant unforeseen results” (Levi-strauss, 1967), the positive effects are produced under certain circumstances. The negative effects will be produced when firms overuse bricolage. Consequently, it is a waste of human resources and financial resources to constantly tinkering and experimenting with different resource combinations (Ciborra, 2002). New firms with limited resources may not be able to afford such waste. Since bricolage can be favorable or unfavorable to new firm performance, managers should bring more benefits to the firm in the early stage of new firms by an appropriate use of entrepreneurial information bricolage. Furthermore, adopting transformational leadership can effectively promote employees’ individual and team creativity, thereby maximizing the bricolage effect. Finally, bricolage will creatively explore and utilize existing resources in hand to break through the resources constraints for future growth and development of new firms.

5.4 Limitations and Future Research

This study also has some limitations. First, we studied new firms only. One future research could be conducted to discuss and compare the influence of bricolage at different stages of firms. Second, although we discuss the important role of entrepreneurial information bricolage in solving resource constraints for new firms, future study can explore and compare the effect of different bricolage patterns, such as parallel bricolage, selective bricolage, and continuous bricolage. Last, scholars have proposed the negative effects of bricolage (Senyard et al., 2010; Senyard et al., 2014). Future research may explore how to maximize the use of bricolage to improve performance as well as reduce the negative impact of bricolage.

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REFERENCES

- Abbasian, N., Salajegheh, A., Gaspar, H., & Brett, P. (2018). Improving early OSV design robustness by applying 'Multivariate Big Data Analytics' on a ship's life cycle. *Journal of Industrial Information Integration*, 10, 29–38. doi:10.1016/j.jii.2018.02.002
- Agle, B. R., Nagarajan, N. J., Sonnenfeld, J. A., & Srinivasan, D. (2006). Does ceo charisma matter? An empirical analysis of the relationships among organizational performance, environmental uncertainty, and top management team perceptions of CEO charisma. *Academy of Management Journal*, 49(1), 161–174. doi:10.5465/amj.2006.20785800
- Ahmad, S., & Schroeder, R. G. (2004). The impact of human resource management practices on operational performance: Recognizing country and industry differences. *Journal of Operations Management*, 21(1), 19–43. doi:10.1016/S0272-6963(02)00056-6
- Aldrich, H. E. (1999). *Organizations Evolving*. Sage Publications.
- Alter, S. (2013). Work system theory: Overview of core concepts, extensions, and challenges for the future. *Journal of the Association for Information Systems*, 14(2), 72–121. doi:10.17705/1jais.00323
- Aragón-Correa, J. A., & Córdón-Pozo, E. (2007). Leadership and organizational learning's role on innovation and performance: Lessons from Spain. *Industrial Marketing Management*, 36(3), 349–359. doi:10.1016/j.indmarman.2005.09.006
- Baker, T., Miner, A. S., & Easley, D. T. (2003). Improvising firms: Bricolage, account giving and improvisational competencies in the founding process. *Research Policy*, 32(2), 255–276. doi:10.1016/S0048-7333(02)00099-9
- Baker, T., & Nelson, R. E. (2005). Creating something from nothing: Resource construction through entrepreneurial bricolage. *Administrative Science Quarterly*, 50(3), 329–366. doi:10.2189/asqu.2005.50.3.329
- Barney, J. B. (1997). *Gaining and sustaining competitive advantage*. Addison-Wesley.
- Bass, B. M., & Avolio, B. J. (1994). *Improving Organizational Effectiveness through Transformational Leadership*. Sage.
- Bass, B. M., & Avolio, B. J. (1997). *Full range leadership development: Manual for the Multifactor Leadership Questionnaire*. Mind Garden.
- Bi, Z., Xu, L., & Wang, C. (2014). Internet of Things for Enterprise Systems of Modern Manufacturing. *IEEE Transactions on Industrial Informatics*, 10(2), 1537–1546. doi:10.1109/TII.2014.2300338
- Bicen, P., & Johnson, W. H. A. (2014). How do firms innovate with limited resources in turbulent markets? *Innovation (North Sydney, N.S.W.)*, 16(3), 430–444. doi:10.1080/14479338.2014.11081998
- Brush, C. G., Carter, N., Gatewood, E., Greene, P., & Hart, M. (2006). The use of bootstrapping by women entrepreneurs in positioning for growth. *Venture Capital*, 8(1), 15–31. doi:10.1080/13691060500433975
- Burns, J. M. (1978). *Leadership*. Harper and Row.
- Cai, H., Xu, L., Xu, B., Xie, C., Qin, S., & Jiang, L. (2014). IoT-based Configurable Information Service Platform for Product Lifecycle Management. *IEEE Transactions on Industrial Informatics*, 10(2), 1558–1567. doi:10.1109/TII.2014.2306391
- Cameron, K. (1978). Measuring organizational effectiveness in institutions of higher education. *Molecular Biology of Human Hepatitis Viruses*, 23(4), 604–632. doi:10.2307/2392582
- Chen, G., & Bliese, P. D. (2002). The role of different levels of leadership in predicting self- and collective efficacy: Evidence for discontinuity. *The Journal of Applied Psychology*, 87(3), 549–556. doi:10.1037/0021-9010.87.3.549 PMID:12090612
- Chen, G., Kirkman, B. L., Kanfer, R., Allen, D., & Rosen, B. (2007). A multilevel study of leadership, empowerment, and performance in teams. *The Journal of Applied Psychology*, 92(2), 331–346. doi:10.1037/0021-9010.92.2.331 PMID:17371082

- Chen, H. (2017). Applications of Cyber-Physical System: A Literature Review. *Journal of Industrial Integration and Management*, 2(3), 1750012. doi:10.1142/S2424862217500129
- Chen, Y. (2016). Industrial information integration-A literature review 2006–2015. *Journal of Industrial Information Integration*, 2, 30–64. doi:10.1016/j.jii.2016.04.004
- Chen, Y., Chen, H., Gorkhalic, A., Lu, Y., Ma, Y., & Li, L. (2016). Big data analysis and big data science: A survey. *Journal of Management Analytics*, 3(1), 1–41. doi:10.1080/23270012.2016.1141332
- Ciborra, C. U. (2002). *The labyrinths of information*. Oxford University Press.
- Danova, M. (2005). Hybrid identities in the information age: The glocal in the world of literature. *Managerial Law*, 47(3/4), 153–159. doi:10.1108/03090550510771421
- Dansereau, F., Alutto, J. A., & Yammarino, F. J. (1984). *Theory testing in organizational behavior: The variant approach*. Prentice Hall.
- Domenico, M. L. D., Haugh, H., & Tracey, P. (2010). Social bricolage: Theorizing social value creation in social firms. *Entrepreneurship Theory and Practice*, 34(4), 681–703. doi:10.1111/j.1540-6520.2010.00370.x
- Duan, L., & Xu, L. (2012). Business Intelligence for Enterprise Systems: A Survey. *IEEE Transactions on Industrial Informatics*, 8(3), 679–687. doi:10.1109/TII.2012.2188804
- Dust, S. B., Resick, C. J., & Mawritz, M. B. (2014). Transformational leadership, psychological empowerment, and the moderating role of mechanistic–organic contexts. *Journal of Organizational Behavior*, 35(3), 413–433. doi:10.1002/job.1904
- Fiedler, F. E. (1967). *A Theory of Leadership Effectiveness*. McGraw-Hill.
- French, R. L., & Williamson, K. (2016). The information practices of welfare workers: Conceptualising and modelling information bricolage. *The Journal of Documentation*, 72(4), 737–754. doi:10.1108/JDOC-08-2015-0100
- Furtado, L., Dutra, M., & Macedo, D. (2017). Value Creation in Big Data Scenarios: A Literature Survey. *Journal of Industrial Integration and Management*, 2(1), 1750002. doi:10.1142/S2424862217500026
- Garud, R., & Karnoe, P. (2003). Bricolage versus breakthrough: Distributed and embedded agency in technology entrepreneurship. *Research Policy*, 32(2), 277–300. doi:10.1016/S0048-7333(02)00100-2
- Ghobakhloo, M., & Ng, T. (2019). Adoption of digital technologies of smart manufacturing in SMEs. *Journal of Industrial Information Integration*, 16, 100107. doi:10.1016/j.jii.2019.100107
- Gundry, L. K., Kickul, J. R., Griffiths, M. D., & Bacq, S. C. (2011). Entrepreneurial bricolageEntrepreneurial information bricolage and innovation ecology: Precursors to social innovation? *Frontiers of Entrepreneurship Research*, 31(19), 659–673.
- Gürdür, D., El-khoury, J., & Nyberg, M. (2019). Methodology for linked enterprise data quality assessment through information visualizations. *Journal of Industrial Information Integration*, 15, 191–200. doi:10.1016/j.jii.2018.11.002
- Haenlein, M., Kaplan, A., Tan, C., & Zhang, P. (2019). Artificial intelligence (AI) and management analytics. *Journal of Management Analytics*, 6(4), 341–343. doi:10.1080/23270012.2019.1699876
- Halme, M., Lindeman, S., & Linna, P. (2012). Innovation for inclusive business: Intrapreneurial bricolage in multinational corporations. *Journal of Management Studies*, 49(4), 743–784. doi:10.1111/j.1467-6486.2012.01045.x
- Hämäläinen, E., & Inkienb, T. (2019). Industrial applications of big data in disruptive innovations supporting environmental reporting. *Journal of Industrial Information Integration*, 16, 100105. doi:10.1016/j.jii.2019.100105
- Hassani, H., Huang, X., & Silva, E. (2018). Banking with blockchain-ed big data. *Journal of Management Analytics*, 5(4), 256–275. doi:10.1080/23270012.2018.1528900
- Heirman, A., & Clarysse, B. (2004). How and why do research-based start-ups differ at founding? A resource-based configurational perspective. *The Journal of Technology Transfer*, 29(3-4), 247–268. doi:10.1023/B:JOTT.0000034122.88495.0d

- Hoegl, M., Gibbert, M., & Mazursky, D. (2008). Financial constraints in innovation projects: When is less more? *Research Policy*, 37(8), 1382–1391. doi:10.1016/j.respol.2008.04.018
- Huвила, I. (2015). Situational appropriation of information. *Aslib Journal of Information Management*, 67(5), 492–504. doi:10.1108/AJIM-02-2015-0033
- Jiang, L., Xu, L., Cai, H., Jiang, Z., Bu, F., & Xu, B. (2014). An IoT Oriented Data Storage Framework in Cloud Computing Platform. *IEEE Transactions on Industrial Informatics*, 10(2), 1443–1451. doi:10.1109/TII.2014.2306384
- Kariv, D., & Coleman, S. (2015). Toward a theory of financial bricolage: The impact of small loans on new businesses. *Journal of Small Business and Enterprise Development*, 22(2), 196–224. doi:10.1108/JSBED-02-2013-0020
- Kirkman, B. L., & Lowe, K. B. (2009). Individual power distance orientation and follower reactions to transformational leaders: A cross-level, cross-cultural examination. *Academy of Management Journal*, 52(4), 744–764. doi:10.5465/amj.2009.43669971
- Kozlowski, S. W. J., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In *Multilevel Theory, Research, & Methods in Organizations: Foundations, Extensions, & New Directions*. Academic Press.
- Kuo, C., & Nagasawa, S. (2019). Applying machine learning to market analysis: Knowing your luxury consumer. *Journal of Management Analytics*, 6(4), 404–419. doi:10.1080/23270012.2019.1692254
- Lambotte, F., & Meunier, D. (2013). From bricolage to thickness: Making the most of the messiness of research narratives. *Qualitative Research in Organizations and Management*, 8(1), 85–100. doi:10.1108/17465641311327531
- Lanzara, G. F., & Patriotta, G. (2001). Technology and the courtroom: An inquiry into knowledge making in organizations. *Journal of Management Studies*, 38(7), 943–971. doi:10.1111/1467-6486.00267
- Lawrence, P. R., & Lorsch, J. W. (1967). Differentiation and integration in complex organizations. *Administrative Science Quarterly*, 12(1), 1–47. doi:10.2307/2391211
- Lei, J., Liu, Y., Qi, Y., & Zhang, Q. (2019). 40 Years of Technological Innovation in China: A Review of the Four-Stage Climbing Track. *Journal of Industrial Integration and Management*, 4(3), 1950008. doi:10.1142/S2424862219500088
- Levi-Strauss, C. (1967). *The Savage Mind*. University of Chicago Press.
- Li, L. (2012). Effects of enterprise technology on supply chain collaboration: Analysis of China-linked supply chain. *Enterprise Information Systems*, 6(1), 55–77. doi:10.1080/17517575.2011.639904
- Li, L. (2013). The path to made-in-China: How it was done and future prospects. *International Journal of Production Economics*, 146(1), 4–13. doi:10.1016/j.ijpe.2013.05.022
- Li, L. (2018). China's manufacturing locus in 2025: With a comparison of “Made-in-China 2025” and “Industry 4.0”. *Technological Forecasting and Social Change*, 135, 66–74. doi:10.1016/j.techfore.2017.05.028
- Li, L., Li, S., & Zhao, S. (2014). QoS-aware scheduling of services-oriented Internet of Things. *IEEE Transactions on Industrial Informatics*, 10(2), 1497–1505. doi:10.1109/TII.2014.2306782
- Li, L., & Warfield, J. (2011). Perspectives on quality coordination and assurance in global supply chains. *International Journal of Production Research*, 49(1), 1–4. doi:10.1080/00207543.2010.508932
- Li, S., Xu, L., & Zhao, S. (2018). 5G Internet of Things: A Survey. *Journal of Industrial Information Integration*, 10, 1–9. doi:10.1016/j.jii.2018.01.005
- Lu, Y. (2018a). Blockchain: A Survey on Functions, Applications and Open Issues. *Journal of Industrial Integration and Management*, 3(4), 1850015. doi:10.1142/S242486221850015X
- Lu, Y. (2018b). Blockchain and the related issues: A review of current research Topics. *Journal of Management Analytics*, 5(4), 231–255. doi:10.1080/23270012.2018.1516523
- Lu, Y. (2019a). The blockchain: State-of-the-art and research challenges. *Journal of Industrial Information Integration*, 15, 80–90. doi:10.1016/j.jii.2019.04.002

- Lu, Y. (2019b). Artificial intelligence: A survey on evolution, models, applications and future trends. *Journal of Management Analytics*, 6(1), 1–29. doi:10.1080/23270012.2019.1570365
- Lu, Y., & Xu, L. (2019). Internet of Things (IoT) Cybersecurity Research: A Review of Current Research Topics. *IEEE Internet of Things Journal*, 6(2), 2103–2115. doi:10.1109/JIOT.2018.2869847
- McDougall, P., & Robinson, R. B. (1990). New venture strategies: An empirical identification of eight ‘archetypes’ of competitive strategies for entry. *Strategic Management Journal*, 11(6), 447–467. doi:10.1002/smj.4250110604
- Miner, A. S., Bassoff, P., & Moorman, C. (2001). Organizational improvisation and learning: A field study. *Administrative Science Quarterly*, 46(2), 304–337. doi:10.2307/2667089
- Molka-Danielsen, J., Engelseth, P., & Wang, H. (2018). Large scale integration of wireless sensor network technologies for air quality monitoring at a logistics shipping base. *Journal of Industrial Information Integration*, 10, 20–28. doi:10.1016/j.jii.2018.02.001
- Nelson, R. E., Rodriguez-Lluesma, C., Yosem, E. C., & Stinchfield, B. T. (2018). Contextualizing the subjectivist-objectivist debate in entrepreneurship using engineering, art, craft, and bricolage. *The International Entrepreneurship and Management Journal*, 14(4), 999–1021. doi:10.1007/s11365-017-0471-6
- Patel, N. V., Eldabi, T., & Khan, T. M. (2010). Theory of deferred action: Agent-based simulation model for designing complex adaptive systems. *Journal of Enterprise Information Management*, 23(4), 521–537. doi:10.1108/17410391011061799
- Peng, X., Cai, L., Lu, S., Cai, Y., & Gao, Y. (2016). Antecedent and Dimension of Symbiotic Relationship in the Hub-Based Entrepreneurial Ecosystem: Case Study of Alibaba. *Journal of Industrial Integration and Management*, 1(4), 1650011. doi:10.1142/S2424862216500111
- Penrose, E. (1959). *The Theory of the Growth of the Firm*. Oxford University Press.
- Pokojski, J., Oleksiński, K., & Pruszyński, J. (2019). Knowledge based processes in the context of conceptual design. *Journal of Industrial Information Integration*, 15, 219–238. doi:10.1016/j.jii.2018.07.002
- Rossit, D. A., Tohmé, F., & Frutos, M. (2019). A data-driven scheduling approach to smart manufacturing. *Journal of Industrial Information Integration*, 15, 69–79. doi:10.1016/j.jii.2019.04.003
- Senyard, J., Baker, T., Steffens, P., & Davidsson, P. (2014). Bricolage as a path to innovativeness for resource-constrained new firms. *Journal of Product Innovation Management*, 31(2), 211–230. doi:10.1111/jpim.12091
- Senyard, J. M., Baker, T., & Davidsson, P. (2009). Entrepreneurial bricolageEntrepreneurial information bricolage: Towards systematic empirical testing. *Thin-walled Structures*, 49(4), 502–512.
- Senyard, J. M., Baker, T., & Steffens, P. R. (2010). Entrepreneurial bricolageEntrepreneurial information bricolage and firm performance: moderating effects of firm change and innovativeness. *2010 Annual Meeting of the Academy of Management*, Montreal, Canada.
- Shepherd, D. A., Douglas, E. J., & Shanley, M. (2000). New venture survival: Ignorance, external shocks, and risk reduction strategies. *Journal of Business Venturing*, 15(5-6), 393–410. doi:10.1016/S0883-9026(98)00032-9
- Steffens, P. R., Baker, T., & Senyard, J. M. (2010). Betting on the underdog: bricolage as an engine of resource advantage. *Proceedings of Annual Meeting of the Academy of Management*.
- Stinchcombe, A. L. (1965). Social structure and organizations. In J. G. March (Ed.), *Handbook of Organizations*. Rand McNally.
- Stritar, R., & Drnovšek, M. (2016). What entrepreneurs discover when creating opportunities? Insights from Skype and YouTube ventures. *The International Entrepreneurship and Management Journal*, 12(3), 659–679. doi:10.1007/s11365-015-0362-7
- Sui, J., & Liu, Y. (2020). Co-evolution of Technology and Institutions in Emerging Industries: Case from Electric Vehicles in China. *Journal of Industrial Integration and Management*. 10.1142/S2424862219500143
- Sullivan, D., & Marvel, M. (2011). How entrepreneurs’ knowledge and network ties relate to the number of employees in new SMEs. *Journal of Small Business Management*, 49(2), 185–206. doi:10.1111/j.1540-627X.2011.00321.x

- Vilarinho, S., Lopes, I., & Sousa, S. (2018). Developing dashboards for SMEs to improve performance of productive equipment and processes. *Journal of Industrial Information Integration*, 12, 13–22. doi:10.1016/j.jii.2018.02.003
- Viriyasitavat, W., Xu, L., Bi, Z., & Pungpapong, V. (2019). Blockchain and Internet of Things for Modern Business Process in Digital Economy? The State of The Art. *IEEE Transactions on Computational Social Systems*, 6(6), 1420–1432. doi:10.1109/TCSS.2019.2919325
- Viriyasitavat, W., Xu, L., Bi, Z., & Sapsomboon, A. (2019). New Blockchain-Based Architecture for Service Interoperations in Internet of Things. *IEEE Transactions on Computational Social Systems*, 6(4), 739–748. doi:10.1109/TCSS.2019.2924442
- Viriyasitavat, X., Xu, L., Bi, Z., & Hoonsoopon, D. (2019). Blockchain Technology for Applications in Internet of Things-Mapping from System Design Perspective. *IEEE Internet of Things Journal*, 6(5), 8155–8168. doi:10.1109/JIOT.2019.2925825
- Walter, F., & Bruch, H. (2010). Structural impacts on the occurrence and effectiveness of transformational leadership: An empirical study at the organizational level of analysis. *The Leadership Quarterly*, 21(5), 765–782. doi:10.1016/j.leaqua.2010.07.006
- Wang, P., & Zhu, W. (2011). Mediating role of creative identity in the influence of transformational leadership on creativity: Is there a multilevel effect? *Journal of Leadership & Organizational Studies*, 18(1), 25–39. doi:10.1177/1548051810368549
- West, G. P. III, & Noel, T. W. (2009). The impact of knowledge resources on new venture performance. *Journal of Small Business Management*, 47(1), 1–22. doi:10.1111/j.1540-627X.2008.00259.x
- Williams, H. M., Parker, S. K., & Turner, N. (2010). Proactively performing teams: The role of work design, transformational leadership, and team composition. *Journal of Occupational and Organizational Psychology*, 83(2), 301–324. doi:10.1348/096317910X502494
- Wu, J. B., Tsui, A. S., & Kinicki, A. J. (2010). Consequences of differentiated leadership in groups. *Academy of Management Journal*, 53(1), 90–106. doi:10.5465/amj.2010.48037079
- Xu, L. (2011). Enterprise Systems: State-of-the-Art and Future Trends. *IEEE Transactions on Industrial Informatics*, 7(4), 630–640. doi:10.1109/TII.2011.2167156
- Xu, L. (2015). *Enterprise Integration and Information Architectures*. CRC Press, Taylor & Francis.
- Xu, L., & Duan, L. (2019). Big Data for Cyber Physical Systems in Industry 4.0: A Survey. *Enterprise Information Systems*, 13(2), 148–169. doi:10.1080/17517575.2018.1442934
- Xu, L., He, W., & Li, S. (2014). Internet of Things in Industries: A Survey. *IEEE Transactions on Industrial Informatics*, 10(4), 2233–2248. doi:10.1109/TII.2014.2300753
- Xu, L., & Viriyasitavat, W. (2019). Application of Blockchain in Collaborative Internet of Things Services. *IEEE Transactions on Computational Social Systems*, 6(6), 1295–1305. doi:10.1109/TCSS.2019.2913165
- Xu, L., Wang, C., Luo, X., & Shi, Z. (2006). Integrating Knowledge Management and ERP in Enterprise Information Systems. *Systems Research and Behavioral Science*, 23(2), 147–156. doi:10.1002/sres.750
- Xu, L., Xu, E., & Li, L. (2018). Industry 4.0: State of the art and future trends. *International Journal of Production Research*, 56(8), 2941–2962. doi:10.1080/00207543.2018.1444806
- Yang, Z., Kong, P., Li, B., & Chao, B. (2019). A compartment model and numerical analysis of circulatory economy. *Journal of Management Analytics*, 6(1), 88–105. doi:10.1080/23270012.2019.1566032
- Yu, X., Chen, Y., & Nguyen, B. (2014). Knowledge Management, Learning Behavior from Failure and New Product Development of New Technology Ventures. *Systems Research and Behavioral Science*, 31(3), 405–423. doi:10.1002/sres.2273
- Yu, X., Li, Y., Chen, D., Meng, X., Nguyen, B., & Tao, X. (2019). Entrepreneurial Bricolage and Online Store Performance in Emerging Economies. *Electronic Markets*, 29(2), 167–185. doi:10.1007/s12525-018-0302-9

- Yu, X., Roy, S. K., Quazi, A., Nguyen, B., & Han, Y. (2017). Internet entrepreneurship and 'the sharing of information' in an Internet-of-Things context. *Internet Research*, 27(1), 74–96. doi:10.1108/IntR-02-2015-0060
- Yu, X., Tao, Y., Tao, X., Xia, F., & Li, Y. (2018). Managing Uncertainty in Emerging Economies: The Interaction Effects between Causation and Effectuation on Firm Performance. *Technological Forecasting and Social Change*, 135(10), 121–131. doi:10.1016/j.techfore.2017.11.017
- Zahra, Z. A. (1993). A conceptual model of entrepreneurship as firm behavior: A critique and extension. *Entrepreneurship Theory and Practice*, 17(4), 5–21. doi:10.1177/104225879301700401
- Zhang, Q., Yang, Y., Qi, Y., & Lei, J. (2018). Science-Based Innovation in China: A Case Study of Artemisinin from Laboratory to the Market. *Journal of Industrial Integration and Management*, 3(2), 1850011. doi:10.1142/S2424862218500112

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