

The Effect of Organizational Learning Capability on Firm Performance: Mediated by Technological Innovation Capability

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Abstract

Researchers claimed that technological innovation and organizational learning capabilities are key for building sustainable competitive advantages and improving firm performance in the vibrant business arena. However, the significance of technological innovation capability as mediating variable between the organizational learning capability and firm performance is not well explored. This paper aims to fill the gap by developing a conceptual framework and testing hypotheses on the relationships using a survey data from 243 small and medium manufacturing firms in Ethiopia. SEM and PCA approaches were used to study the relationships. The study result discovered that technological innovation capability has a mediating role on the relationship between organizational learning capability and firm performance. Moreover it has a direct positive effect on firm performance. It also showed that organizational learning capability has strong positive effect on both technological innovation capability and firm performance.

Keywords: Organizational learning, technological innovation, firm performance, SMEs, Competitive advantage, Mediation, Dynamics.

1. Introduction

The new and ever changing business environment filled by uncertainty, dynamism and volatility has Paradoxical prospects to firms. It is scary environment for some firms, but granted with several product-market mix growth opportunities for firms which have high degrees of learning and technological innovation capabilities (Hailekiros & Renyong, 2015). The survival and prosperity of firms in this era hence depends on building capabilities that minimize the negative effects and at same time creating vigorous core competencies that feat the opportunities (Hitt, et al., 2000).

In the face of increased changes in markets, technologies, products and multiple competitors, the timely creation of new knowledge (Hitt, et al., 2000) and renewal of technological innovativeness (Barney, et al., 2001) are the fundamental principles for the success of companies. Inline to this point, previous studies disclosed the positive effects of both organizational learning capability (Jerez-Gomez, et al., 2005; Chiva, et al., 2007; Alegrea & Chiva, 2008; Kocoglu, et al., 2011; Onađ, et al., 2014) and technological innovation capability (Jonker, et al., 2006; Wang, et al., 2006; Ortega, 2010; Camisón & Villar-López, 2014) on firm performance.

Researchers contemplate that technological innovation capability (TIC) (Barney, et al., 2001) and organizational learning capability (OLC) (Martínez-Costa & Jiménez-Jiménez, 2009) are the bases for creating sustainable competitive advantages and superior firm performances (FP) in the vibrant business environment. However, the impact of technological innovation capability as the mediating role between the organizational learning capability and firm performance is not well investigated (Hailekiros & Renyong, 2015). Hence, this study was conducted to discover the mediation role of TIC and the effect of OLC on the innovative, production and financial performances of small and medium manufacturing enterprises from less developing country's perspective. Therefore the main aim of this study is to analyze the three variables based on survey data, which not only revealed the positive effects of organizational learning and technological innovation capabilities on firm performance but also yielded relationship paths among these variables. It also fills the gap by developing a mediation model and testing hypotheses about the relationship among the organizational learning, technological innovation capabilities and firm performance using structural equation model approach.

The remaining part of the paper is organized as follows. The research background and hypotheses are briefly presented in Section two. Section three, covers the research methodology. The research analysis and findings are presented in section four. Finally, the conclusions and final remarks are given in section five

2. Research Background and Hypotheses

2.1. Organizational Learning Capability

Organizational learning capability is described as the organizational features, practices and issues that enable the learning processes. These include generating, acquiring, disseminating and integrating of knowledge and modifying its behavior (Jerez-Gomez, et al., 2005) to reflect the new cognitive situation in view of improved performance. It is also the ability to adapt new ideas from others and past experiences, converting them into viable action before competitors (Yeung, et al., 1999). Some scholars emphasize that competition is becoming more knowledge based and contend that sources of competitive advantages are shifting from the physical

resources to the intellectual capabilities view (Subramaniam & Venkatraman, 1999). Thus, the power to create, nurture and use the competitive advantages depend on the firm's capacity to make, diffuse and utilize the appropriate knowledge in the company. Hence learning capability empowers firms to cultivate, maintain vibrant core competencies (Hitt, et al., 2000).

2.2. The Effect of Organizational Learning Capability on Technological Innovation Capability

In this ever changing business milieu, it is widely recognized that innovation is a principal instrument for firms' long-term success and survival (Santos-Vijande & Álvarez-gonzález, 2007). Organizations survive the dynamic and complex technology and the market changes by adapting, diversifying, and rejuvenating through innovations (Santos-Vijande & Álvarez-gonzález, 2007). In this regard the technological learning capability of firms provides a base of knowledge upon which new innovations can be developed and implemented (Zahra, et al., 2000). Furthermore, learning promotes the accumulation of knowledge and its applications (Weihong, et al., 2008), creates a medium of communication and interaction for knowledge sharing within the organization (Jerez-Gomez, et al., 2005), and aids the accurate and timely information collection from external sources (Akgün, et al., 2013). The OLC is also claimed as an asset that enables firms to transform and use their resources appropriately (Amara, et al., 2008) towards technological innovations and its application. Besides, the breadth, depth and speed of technological learning leverages the ability to integrate firm specific technologies and skills that provide firms better technological learning process for the quick adaptation of the complex environment (Lin, 2003). Additionally, a comprehensive investigation on the relationship between learning and technological innovation capability confirmed that commitment to learning pays a lot. It enhances dedication to innovation, gives the opportunity to own state-of-the-art technology, improves the knowledge and ability to comprehend and project customer requirements, and builds the capability of learning from success, failure and competitors (Calantone, et al., 2002). Studies by (Alegrea & Chiva, 2008; Onağ, et al., 2014) also stated that organizational learning capability promotes the positive effect on firm's technological innovation capability. Hence,
Hypothesis 1: Organizational learning capability has a significantly positive effect on technological innovation capability.

2.3. The Effect of Technological Innovation Capability on Firm Performance

The (OECD, 2005) innovation classification scheme differentiates innovation in to product, process, marketing, and organizational innovations. This approach further classifies the innovation in to technological innovation which includes the process and product innovations, and the non-technological innovation is assigned to represent the organizational and marketing innovations. While the product innovation encompasses the introduction of new or significantly improved products (Damanpour & Gopalakrishnan, 2001; Wang & Ahmed, 2004; OECD, 2005), the process innovation deals with introduction of new production methods, new management approaches, and new technology that can be used to improve the management and production processes (Wang & Ahmed, 2004; OECD, 2005; Onağ, et al., 2014). With this sense, the technological innovation capability is pronounced as the ability to perform any relevant technical or volume activities within the firm, including the ability to develop new processes, products and effectively operate facilities (Teece, et al., 1997).

The objective of product innovation has a dual orientations: responding to customers' request for new products and fulfilling the executives' desire to capture new markets (OECD, 2005; Damanpour, 2010). Innately, it enables the organization to differentiate its products (Porter, 1985) and modify the offers to the customers (Bessant, et al., 2005) which is difficult to be copied or produced by other organizations (González - Alvarez & Nieto - Antolín, 2005). In contrast, the process innovation is internally focused (Martínez-Costa & Jiménez-Jiménez, 2009) and orientated towards reduction of the delivery lead-time and operational costs (Damanpour, 2010). It enables firms to benefit from cost leadership strategy (Ortega, 2010). The cohesive interrelationship between the product and process innovation capabilities allows firms to achieve competitive advantages both from differentiation and cost leadership schemes. Therefore the technological innovation capabilities are the core resources to create and sustain the competitive advantages of the firms (Barney, et al., 2001). This in turn results in superior firm performance (Camisón & Villar-López, 2014). Considering the above concepts in to account we argue that technological innovation capability, combined effect of product and process innovation capabilities, would contribute to flourish superior performance. Therefore we hypothesize that:

Hypothesis 2: Technological innovation capability has significantly positive effect on firm performance.

2.4. The Impact of Organizational Learning Capability on Firm Performance

Organizational learning, as the source of knowledge creation and knowledge as a unique, inimitable and infinite resource (Kocoglu, et al., 2011), is emphasized as an important factor for realizing firm's competitive advantages. It is also considered as a key factor for gaining a sustainable competitive advantage and enhanced firm performance (Martínez-Costa & Jiménez-Jiménez, 2009). Previous study that examined the effects of

collaboration and team learning, continuous learning, inquiry and dialogue, empowerment of people, connection of organization to its environment and the support of leadership on the financial measurement of performance demonstrated that the relationship between organizational learning practices and firm's financial performance are positively linked (Ellinger, et al., 2002).

Furthermore, it is stated that knowledge creation through generative learning that creates core competency, develops flexible strategy by questioning the ineffective strategy, realizes the innovative disruptions as customer satisfaction maximization tool rather than customer feedback are some of direct and positive influences of learning (Baker & Sinkula, 1999). The impact of organizational learning on firm performance is further indicated by (Martínez-Costa & Jiménez-Jiménez, 2009). It is argued that firms better at learning get a better chance of sensing events and trends in marketplace which will in turn lead to better sales and increased market share, flexible and responsive structure that responds new challenges faster than the competitors, and fast improvement of market information processing activities. Consistent with this (Chaveerug & Ussahawanitchakit, 2008) claimed that the greater commitment to learning, the more likely that firms will achieve higher organizational performance. Similarly, studies by (Jerez-Gomez, et al., 2005; Chiva, et al., 2007; Kocoglu, et al., 2011; Onağ, et al., 2014) consolidated that organizational learning capability enhances firm performance. Therefore, the hypothesis 3 follows

Hypothesis 3: Organizational learning capability has significantly positive effect on firm performance.

2.5. *The mediating effect of technological innovation capability*

Technological innovation capability enables firms to develop unique new product (González - Alvarez & Nieto - Antolín, 2005) at low cost (Damanpour, 2010) facilitating toward the differentiation and cost leadership approaches. Similarly Organizational learning capability is the source of unique, inimitable and infinite knowledge creation (Kocoglu, et al., 2011) aiding firms to develop, maintain and use the dynamic core proficiencies (Hitt, et al., 2000). Based on the resource based view (RBV) both organizational learning capabilities (Hitt, et al., 2000) and technological innovation capabilities (Barney, et al., 2001) are core resources for sustainable competitive advantages which lead to superior firm performances. On the other hand, Organizational learning capability puts a foundation of knowledge upon which technological innovations are nurtured (Zahra, et al., 2000; Lin, 2003; Amara, et al., 2008). Therefore, organizational learning capability could have both direct and indirect effect through the enhancement of technological innovation capability on improving firm performance. Hence the assumption

Hypothesis 4: Technological innovation capability mediates the positive effect of organizational learning capability on firm performance

Based on the above discussions and the hypotheses forwarded a study frame work was developed and presented (See Figure 3).

[Figure 4, here]

3. Research Methodology

3.1. *Sample and Data Collection*

This study developed questionnaire to collect data that was used to investigate the effect of organizational learning and technological innovation capabilities on firm performance and the mediating role of TIC on the relationship between OLC and performance of small and medium manufacturing firms. Then a survey with 88 individual questions designed to assess characteristics, organizational learning capability, technological innovation capability, performance of the firms was conducted in 2016 within a period of 6 months (from February to July). The initial survey draft was discussed with the firms' owners/managers and the SMEs agent representatives. To confirm understandability of the wording, clarity and sequencing of the questions, 20 pilot interviews were made for pre-test. Firms for the survey were then selected randomly from the database of micro and small enterprises agent office with the help of representatives from the agent. The sample contains manufacturing firms drawn from five main manufacturing sectors in Northern Ethiopia: metalwork, woodwork, textile and garment, leather, and metal and woodwork enterprises. These manufacturing sectors are identified as the major driving force for the economic development, source of employment and innovational activities in less developed countries like Ethiopia. A total of 500 firms were selected randomly considering the representativeness of the sector and zones covered in the study. Then, the questionnaires were applied face-to-face interviews to the sample. The questionnaire was first given to each interviewee and the survey questions were asked in the same order as on the questionnaire. From the 500 enterprises selected 243 interviews were correctly and successfully performed, resulting in a response rate of 46.8%.

The respondents were mostly the owner and manager of the firms (92.6%) and managers but not owners (7.4%). They were also distributed among the sectors (metalwork =26.5%, woodwork =23%, textile and garment =26.5%, leather =2%, metal and woodwork=23.5%). Furthermore, the firm's operational duration ranges from 4

to 23 years.

After the data collection and screening stages, SPSS V20 and Amos V20 software packages were used to conduct the principal factor and second order analyses, validate the research framework, test relationships and the mediating role of technological innovation capability.

3.2. *Measurement the constructs*

3.2.1. Technological Innovation capability

Based on the definition of (OECD, 2005) technological innovation combines the product and process innovations. Thus the technological innovation capability construct is operationalized in to two dimensions as product and process innovation capabilities. The constructs are measured with multiple item scales based on validated measures reported in previous researches. Product IC is measured using five item measurement scaled adopted from (Tuominen & Hyvönen, 2004; Menguc & Auh, 2010; Camisón & Villar-López, 2014). Similarly eleven reflective items measurement scale adopted from (Tuominen & Hyvönen, 2004; Camisón & Villar-López, 2014) is used to measure the process innovation capability. Respondents were requested to assess the contribution of product and process innovation capability to create a specific strength for their firms compared with the competitors on 5-point Likert- scale, ranging from 1; much worse to 5; much better.

3.2.2. Firm performance

Based on previous study by (Gunday, et al., 2011) the firm performance is conceptualized in to product innovation, innovative, financial and Production performance indicators. Product innovation performance which includes innovation efficacy (the level of success of an innovation) and innovation efficiency (the effort made to achieve that level of success) is measured with twelve criteria based on the scale adapted from (Alegre, et al., 2006). A Seven (Gunday, et al., 2011) item measurement scales is used to gauge innovative performance. The financial and production performance were gauged with four variables each based on scale adopted from (Hornsby, et al., 2002; Yilmaz, et al., 2005; Gunday, et al., 2011). The questions about firm performance were asked using a 5-point Likert scale ranging from 1(much worse performance than competitors) to 5 (much better performance).

3.2.3. OLC measurement

The OLC construct is conceptualized in to seven dimensions that represent the essential factors to determine organizational learning capability based on previous studies (Jerez-Gomez, et al., 2005; Chiva, et al., 2007; Alegrea & Chiva, 2008; Onağ, et al., 2014). These factors are knowledge sharing, Dialogue, participative decision making, management commitment, experimentation and openness, knowledge transfer and risk taking. The OLC measurement scale was applied using a 5-point Likert scale, from 1 representing total disagreement to 5 with total agreement.

4. **Research Analysis and Findings**

The study uses the multi- variate data analysis and structure model analysis to assess the measurement and test the hypotheses respectively.

4.1. *Assessment of Measurement*

PCA with varimax rotation, was used to define the underlying dimensions of organizational learning capability, technological innovation capability and firm performance items. The values of the Keiser–Meyer–Olkin (Table 1) which measures the overall sampling adequacy for all the constructs is well above 0.930 ($p < .001$) which supports the factor analysis. In addition the Cronbach's coefficient (Table 1) of all factors under the three constructs (organizational learning capability, technological innovation capability and firm performance) are all greater than the minimum requirement 0.7 (Hair, et al., 1998) showing that the measurement of the study is reliable. The convergent and discriminant validities for all the constructs are also scrutinized and verified using the average-variance extracted (AVE) test.

[Table 1, here]

While the convergent validity requires all constructs to have a value of AVE above 0.5, the discriminant validity requires the AVE square root to be greater than the correlation value between the constructs (Camisón & Villar-López, 2014). Table 2 shows that these condition are met in all cases demonstrating convergent and discriminant validities.

[Table 2, here]

4.2. *Testing the Relationships and structural model*

4.2.1. Evaluating the structural model

The structural model of the relationship among the study constructs is evaluated based on the goodness-of-fit indices. SEM analysis based on maximum likelihood estimation, which compares the variance-covariance matrix of sample and the model (Bollen, 1986), was performed using AMOS V20 software and compared against the

commonly used goodness-of-fit indices values. The χ^2/df ratio which shows the appropriateness of the model (within the range of 0-5, where lower values for a better fit) (Wheaton, et al., 1977) and the comparative fit index (CFI) (Bentler, 1990.), the Tucker–Lewis coefficient (TLI) and normed fit index (NFI) (Bentler & Bonett, 1980), the relative fit index (RFI) (Bollen, 1986) and the incremental fit index (IFI) (Bollen, 1989) are used indices to test the goodness-of-fit of the study model.

All these indices except the χ^2/df ratio indicate a very good fit when they are close to 1. Furthermore, the root mean square error of approximation (RMSEA) with value of 0.08 or less is reasonable indicator for the error of approximation (MacCallum, et al., 1996). Apart from this, for continuous data, RMSEA <0.06, TLI>0.95, CFI>0.95 are suggested as necessary values for the model fit (Hu & Bentler, 1999). The goodness-of-fit indices shown in Table 3 (with χ^2/df =1.50, RMSEA=0.05, CFI=0.96, TLI=0.96) reveals a very good fit of the proposed research model.

[Table 3, here]

4.2.2. Relationship Analysis

The proposed direct paths of relationships among the organizational learning capability, technological innovation capability and firm performance were also investigated using SEM analysis approach. The result of the second order component analysis presented in Table 4 indicates that the direct relationships have high path estimates with significance of p-value less than 0.001. These results confirmed that hypotheses 1, 2 and 3 are all supported

[Table 4, here]

4.2.3. Testing the Mediation Role

Although there are many approaches for testing the mediation, the distribution of the product (bootstrapping) approach is recommended for better performance in terms of type-I error and power (Mackinnon, et al., 2004). Accordingly, this approach was adopted to test the mediation effect of technological innovation capability on the relationship between organizational learning capability and firm performance. The only requirement for mediation in this approach is the significance of the indirect effect (Preacher & Hayes, 2004; Hair, et al., 2013).

The result of the bootstrapping shows that the estimated weight of the indirect effect is 0.5 and high significant ($p < 0.001$) at 95% confidence level. Thus mediation role of technological innovation capability is supported (hypothesis 4).

5. Conclusion and Remarks

This paper studied the direct impact of organizational learning on technological innovation capability and performance and its indirect effect on firm performance when mediated by technological innovation capability on Ethiopian small and medium manufacturing enterprises, based on a sample of 243 firms. A theoretical framework has been tested using the SEM approach which validates the inter connection of the three constructs. The study result showed that OLC has a significant positive effect on both TIC and firm performance. It also revealed that apart from significantly positive effect on firm performance, TIC mediates the relationship between OLC and firm performance.

Some critical contributions can be derived from the analysis results. First, the results obtained augments the understanding of the positive effect of OLC on both the technological innovation capability and firm performance. Second, the empirical evidence of this paper sheds light on the mediation role of TIC on the relationship between OLC and firm performance which is not yet well studied (Hailekiros & Renyong, 2015). Finally, the interrelationship found among OLC, TIC and FP also consolidates the positive effect of OLC and TIC on firm performances which support the resource based view that OLC and TIC are valuable and inimitable sources of competitive advantages for superior performance. Hence managers and supporting organization should not only focus exclusively on either TIC or OLC, but should give due emphasis on the combined and synergetic approach to get the maximum firm performances benefits from these capabilities.

Albeit to the contributions, the study has some limitations. The study was focused on small and medium manufacturing industry and from specific national context, generalizing the results to all industry and different nations need further investigation from the perspective of other sectors and nations. The study was also conducted based on cross-sectional data, which does not show the differences on OLC and TIC and their effects at different growth stages of the firms, additional study based on longitudinal data may augment the findings.

Acknowledgements

This work was supported by the Mekelle University, Ethiopia, under the project grant CRPO/EITM/PhD/001/08. The first author is grateful for the financial support provided.

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Appendix: Tables and Figures

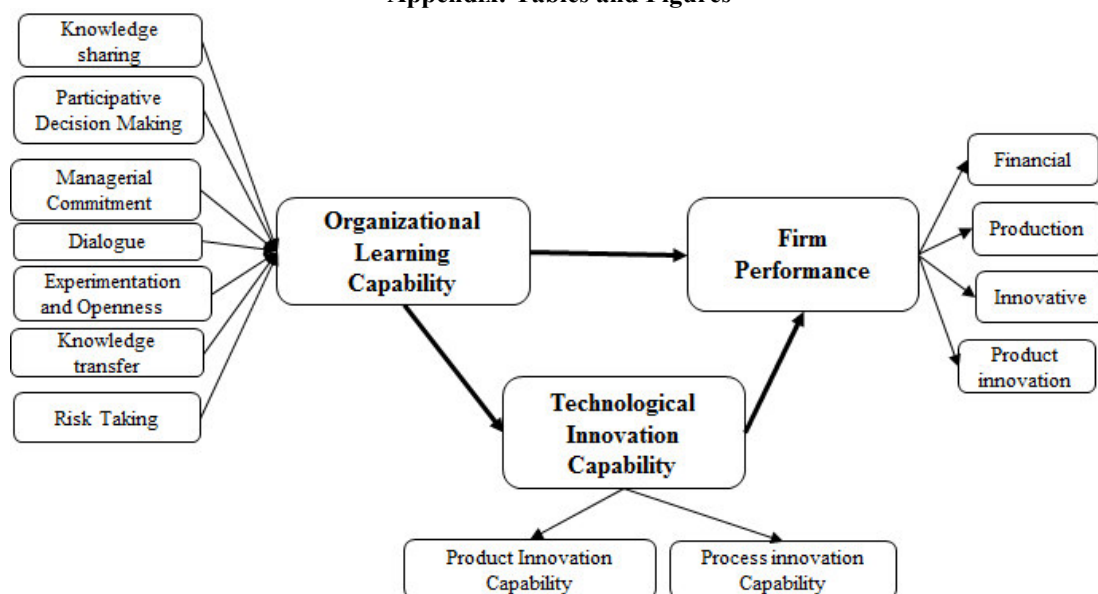


Figure 1. Research Study framework

Table 7. Principal Component Analysis of constructs

Factor Analysis	Eigenvalue	Cum. %vari.Explained	Cronbach α
Technological Innovation Capability (K-O-M=0.934; Bartlett's Test Sig. P<0.001)			
Factor 1: Product Innovation Capability	3.11	62.11	0.846
Factor 2: Process Innovation Capability	6.2	56.37	0.921
Firm Performance (K-O-M =0.930; Bartlett's Test Sig. P<0.001)			
Factor 1: Innovation Performance	4.16	59.46	0.885
Factor 2:			
1. Product Innovation Performance (efficacy)	3.92	56.12	0.867
2. Product Innovation Performance (efficiency)	3.01	75.21	0.88
Factor 3: Production Performance	2.78	69.5	0.854
Factor 4: Financial Performance	2.17	67.71	0.839
Organization Learning Capability (K-O-M =0.943; Bartlett's Test Sig. P<0.001)			
Factor 1: Knowledge Sharing	4.3	53.8	0.868
Factor 2: Dialogue	3.7	61.65	0.899
Factor 3: Participative Decision Making	2.95	73.83	0.881
Factor 4: Managerial Commitment	2.14	53.44	0.767
Factor 5: Experimentation and Openness	3.65	60.84	0.868
Factor 6: Knowledge transfer	2.29	76.21	0.842
Factor 7: Risk Taking	2.15	71.68	0.801

Table 8. Correlation matrix and discriminant validity (Discriminant validity is in bold)

Construct	AVE	Organiz.Learning.Cap	Firm.Perf	Techno.Inno.Cap
Organiz.Learning.Cap	0.86	0.928		
Firm.Perf	0.853	0.833	0.924	
Techno.Inno.Cap	0.939	0.826	0.836	0.969

Note: Organiz(organization), Perf(performance), Cap(capability), Techno(Technology)

Table 9. Goodness-of-Fit Indices

Goodness-of-fit indices	Construct	Reference value
$\chi^2/\text{degree of freedom}$ ($p < 0.001$)	1.5	$1 < \chi^2/\text{df} < 5$
Comparative Fit Index (CFI)	1.0	$0.95 < \text{CFI} < 1$
Normed Fit Index (NFI)	0.93	$0.90 < \text{NFI} < 1$
Relative Fit Index (RFI)	0.94	$0.9 < \text{RFI} < 1$
Incremental Fit Index (IFI)	1.0	$0.95 < \text{IFI} < 1$
Tucker–Lewis Fit Index (TLI)	1.0	$0.95 < \text{TLI} < 1$
Root Mean Square Error Approximation	0.05	$\text{RMSEA} < 0.08$

Table 10. Structural model path coefficients

Hypothesis	Path	Standardized Path Estimate	p-value	Result
Hypothesis 1	OLC-TIC	0.82	***	Supported
Hypothesis 2	TIC-FP	0.60	***	Supported
Hypothesis 3	OLC-FP	0.35	***	Supported

*** $P < 0.001$