The Impact of Learning Orientation on Innovation Performance: Mediating Role of Operations Strategy and Moderating Role of Environmental Uncertainty

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Abstract

Performing well in developing production industry is an important factor for companies to survive and sustain a competitive edge in the current turbulent business environment. The purpose of this study is to explore the effect of learning orientation on innovation performance with the mediating role of operations strategy (cost, quality, flexibility, and delivery). Environmental uncertainty plays a moderator role in this model. Using a questionnaire to measure variables, data were collected from 243 UK production companies. Structural Equations Modelling used for data analysis and hypothesis testing. The results support 9 out of thirteen research hypotheses. Learning orientation influences innovation performance and two dimensions of operations strategy (delivery and quality) mediates this relationship. Also, environmental uncertainty positively moderates the relationship between quality and flexibility strategies with innovation performance.

Keywords
Learning orientation, operations strategy, innovation performance, environmental uncertainty

1. Introduction

Intense international competition, rapid technological advances, and potential customer expectations can cause terrible turbulences in the manufacturing industries therefore, production companies try to differentiate and gain competitive advantage. Previous studies proved that organizational innovation performance can have a great role in the development of competitive advantage (Urbancova, 2013). Since knowledge is an important factor in the realization of innovation (Zhou & Li, 2012), researchers try to explore resources and mechanisms of knowledge that can lead to a competitive advantage based on innovation in the production domain. Learning orientation is one of the important knowledge-related factors and capabilities (Laverie, Madhavaram, & McDonald, 2008; Yuan, Feng, Lai, & Collins, 2018) that refers to a basic organizational attitude toward learning (Gerschewski, Lew, Khan, & Park, 2018) and has a great role in creating and using knowledge (Rhee, Park, & Lee, 2010). In other words, learning orientation orients the organization in the direction of creating and using knowledge, so it can improve the organization's desire to acquire, assimilate, transform and exploit the external knowledge. By considering the fact that learning occurs through interacting knowledge with action and leads to acquiring and disseminating knowledge, it can influence innovation performance in organizations.
In today's competitive environment leadership in the industry or market is not possible without a specific strategy. By regarding the fact that operations are important components of strategic planning (Sum, Shih-Ju Kow, & Chen, 2004), though linking the organizational strategy with its operations is a challenge for many companies in order to gain competitive advantage. Operations strategy refers to the policies and plans in using organizational resources to realize the strategic goals (Qi, Huo, Wang, & Yeung, 2017). It has become an important issue in operations management due to factors such as cost, delivery, flexibility, and quality (Longoni & Cagliano, 2015). In other words, cost, delivery, flexibility, and quality are considered as the main components of operations strategy that help organizations in achieving their goals. The importance of this subject has attracted the attention of researchers to identify the factors that contribute to improving and reinforcing the operations strategy. Although various factors can be identified in this regard, the above study presented learning orientation as an important factor in triggering various dimensions of operations strategy. Previous studies highlighted the role of knowledge in some aspects of operations strategy (Gamal Aboelmaged, 2012), but none of them have investigated the impact of learning orientation on operations strategy. Also, some studies have shown that innovation can be influenced by different characteristics and initiatives at the operational level (Huang & Wang, 2011; Zeng, Phan, & Matsui, 2015), however, the strategic role of operations in the realization of innovation performance has been ignored by previous studies.

Based on the above discussion, the present research aims to investigate the direct and indirect impact of learning orientation on innovation performance with the mediating role of operations strategy (cost, delivery, flexibility, delivery) in UK production firms. Also, environmental uncertainty, which has a close relationship with organizational innovation performance (Freel, 2005), organizational strategic orientation (Swamidass & Newell, 1987) and knowledge capabilities is studied to see whether it has a moderating effect on the relationship between operations strategy and innovation performance or not. In the next parts of the paper, first a literature review about the main variables and their potential relationships is presented. Then research methodology is introduced which is followed by introducing data collection procedures and analysis. Discussion of the results and conclusion are the final parts of the paper.

2. Theory development

2.1. Learning orientation and its relationship with innovation performance

Organizational learning is a process that is achieved through the interaction of the organization with its internal and external environment (Abdulai Mahmoud & Yusif, 2012). In fact, the learning process helps organizations to improve their actions through knowledge and also it creates a better understanding of the external environment (Ojha, Struckell, Acharya, & Patel, 2018). Learning orientation, which is derived from the organizational learning theory, indicates the desire of organization to create and use knowledge (Mahmoud, Blankson, Owusu-Frimpong, Nwankwo, & Trang, 2016; Sheng & Chien, 2016; Sinkula, Baker, & Noordewier, 1997). It leads to a great increase in organizational knowledge capability and also helps organizations in searching for information and assimilating, developing and creating new knowledge (Huang & Wang, 2011; Verdonschot, 2005). So, we can conclude that learning orientation

by developing the organization's relationship with its external and internal environment plays a significant role in expanding organizational knowledge.
Innovation performance, on the other hand, is considered as an important factor that ensures the firm's long-term survival and growth (Baumol, 2002; Serrano-Bedia, Concepción López-Fernández, & García-Piqueres, 2012). Previous studies have proved that innovation performance is deeply rooted in organizational knowledge (Chiang & Hung, 2010; Z. Wang & Wang, 2012) therefore, variables associated with the creation and development of knowledge have a significant role in improving innovation performance. As mentioned earlier, learning orientation has a close relationship with the creation and use of knowledge in organizations so it can have a major role in developing innovation performance in organizations. Based on the above discussion, the following hypothesis can be proposed:

H1. Learning orientation has a positive and significant impact on innovation performance.

2.2. Operations strategy and its relationship with learning orientation and innovation performance

Organizational strategy has a significant role in the survival and growth of production companies (Levy & Powell, 2004). By regarding the fact that operations are important components of organizational strategy (Sum et al., 2004), considering certain strategies for operations is crucial for gaining competitive advantage. Operations strategy, by determining specific policies and plans in using organizational resources, helps organizations in realizing their strategic goals (Qi et al., 2017). Previous studies introduced four dimensions for operations strategy, including cost, delivery, flexibility and quality and they are considered as the main factors in creating competitive advantage (Skinner., 1969). By considering the fact that realization of the strategy is heavily dependent on organizational knowledge capabilities (Lyles & Schwenk, 1992; Tanriverdi & Venkatraman, 2005), it can be an important factor in developing operations strategy (Gamal Aboelmaged, 2012; Hult, Ketchen Jr, & Nichols Jr, 2003). The formulation process of operations strategy is the result of aligning resources comprising of information, knowledge and organizational functions (Paiva et al., 2008). So, if the amount of existing knowledge in the process of operations strategy formulation is high, better performance results can be expected (Paiva et al., 2008). By regarding the fact that organizational learning orientation has a close relationship with creation and use of knowledge (Baba, 2015; Sheng & Chien, 2016), it can facilitate the flow and creation of knowledge and improve operations strategy. Although previous studies examined the impact of knowledge mechanisms on some aspects of cost, quality, flexibility and delivery, none of them investigated the effect of learning orientation on operations strategy types. Therefore, the following hypothesis can be proposed:

H2a/b/c/d. learning orientation has a positive and significant impact on operations strategy (cost, quality, flexibility, delivery).

Strategy consists of various policies, programs and plans which orient organizations in a specific direction and organizational survival and growth are heavily dependent on it (Wheelen, Hunger, Hoffman, & Bamford, 2017). Organizational innovation performance is an important factor that is deeply rooted in choosing appropriate strategies. Therefore, previous studies examined the impact of various organizational strategies on innovation performance. For example, coopetition strategy can increase organizational innovation and market performance under high market uncertainty (Ritala, 2012) and corporate political strategy can create suitable conditions for innovation (Ozer & Markóczy, 2010).). By regarding the fact that operations are important components of organizational strategy, choosing an appropriate operations strategy can have a significant impact on achieving organizational goals. Previous studies have considered four strategies for the operations, including cost, quality, flexibility and delivery (Gamal Aboelmaged, 2012; Longoni & Cagliano, 2015) and they showed that there is a close relationship between operations strategy and innovation (Alegre-Vidal, Lapiedra-Alcamı, & Chiva-Gómez, 2004). Specifically, quality and flexibility strategies have a more important role in improving innovation performance in organizations. Miller and Roth (1994) also concluded that companies with innovative products focus on quality, flexibility, and delivery as their main operations strategy and pay less attention to cost strategies. So, these strategies can influence innovation performance in organizations and the following hypothesis can be proposed:

H3a/b/c/d. operations strategy (cost, quality, flexibility, delivery) has a positive and significant impact on innovation performance.

2.3. Moderating effect of environment uncertainty

Environmental uncertainty has a close relationship with the rate of change and the degree of instability in the environment (Dess & Beard, 1984). Technological changes, variations in customer demand, and fluctuations in product demand and/or the supply of materials can lead to develop environmental uncertainty (Wang, Yeung, & Zhang, 2011). Previous studies proved that environmental uncertainty is an important factor in choosing an appropriate organizational strategy (Swamidass & Newell, 1987). So, various operations strategy types and their effect on performance indicators can be affected by environment uncertainty. Bstieler (2005) maintains that environmental uncertainty resulted from market and technologies can affect product development and performance of new product development projects. This happens because of newly emerged information and changes in situations which influences the initial objectives of development project set with past and obsolete information. If the inherent uncertainty of environment is high, a more flexible and dynamic strategy can be of high utility than stable and rigid ones. So, regarding operations strategy, flexibility and quality strategies which have embodiments of dynamicity in plans and actions seem to work better in more dynamic and uncertain environments than cost and dependability. In other words, if cost strategy or dependability have impacts on innovation performance, this impact would be weaker in uncertain environments and for flexibility and quality strategy, the influence would be stronger in highly uncertain settings. Therefore, we can conclude that various operations strategies can operate differently under varying levels of environmental uncertainty in affecting innovation performance and the following hypothesis can be proposed:

H4a/b/c/d. Environmental uncertainty moderates the relationship between operations strategy and innovation performance.

The conceptual model of the study is depicted in Figure 1.

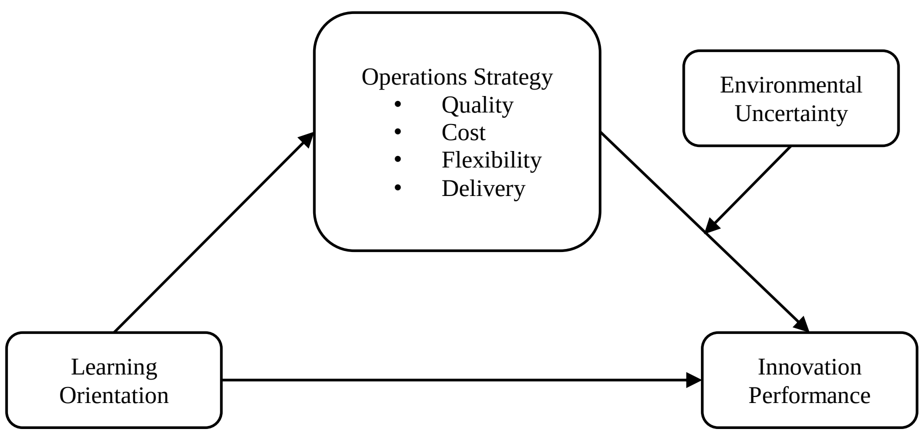

Figure 1. Conceptual model

3. Methodology

3.1. Sample and data collection

The present study used a quantitative approach, in which a conceptual model of the relationship between variables are developed and tested using data collected through structured questionnaire. 20 experts with at least ten years of work experience in the production industry and 5 academicians working on the subject were chosen in order to test and improve the questionnaire's validity and reliability. According to the opinions of these 25 people, the questionnaire was finalized. To collect data, the questionnaire was sent via email to randomly selected firms in UK manufacturing sector and in the cover letter, it is asked the questionnaire to be filled by operations and production, planet, purchasing, logistic/supply chain, or general managers. These firms were identified from FAME database and we tried to have a more distributed sample among different industry types. In order to increase the external validity of the findings, several industries in manufacturing sector were included in the study. To have a proper sample size for the study, which is between 150 to 400 in the SEM method (Hair et al., 2010) and having in the mind the average of 33% of response rate in online surveys (Nulty, 2008) in the first wave, a total of 1100 firms were contacted via email. Later, for those not responding in a four weeks period, a follow-up email was sent. In the end, 266 complete questionnaires were collected and considering the final number of 1254 firms that were contacted, a response rate of 21.2% was reached. By discarding 12 incomplete and improper questionnaires, 243 valid questionnaires were put for the analysis process. Table 1 represents the profile of the sample and the demographics of respondents. The industry classification follows the UK SIC-Standard Industry Classification (2007).

Table 1: Profile of sample

Title	Number of Respondents	Percent (%)		Percent (%)
Job title			*Years with the firm*	
Planet manager	33	13.6%	<5	24.3%
Production/operations manager	58	23.9%	5-9	38.7%
Logistics/supply chain manager	62	25.5%	10-14	21.0%
Purchasing/procurement manager	47	19.3%	15<	16.0%
Title	Number of Respondents	Percent (%)		Percent (%)
Factory director	36	14.8%	Total	100%
General manager	7	2.9%		
Total	243	100%		
Industries			*Number of employees*	
Food Products	27	11.1%	100-200	37.9%
Chemicals and chemical products	44	18.1%	200-300	16.9%
Machinery and equipment	65	26.7%	300-400	22.2%
Electrical equipment	18	7.4%	400-500	14.4%
Computer, Electronic and optical products	46	18.9%	500<	8.6%
Title	Number of Respondents	Percent (%)		Percent (%)
Motor vehicles, trailers and semi-trailers	27	11.1%		100%
Other industries	16	6.6%		
Total	243	100%		

3.2. Measurement scales

The questionnaire which was used for measuring variables consisted of two parts. The first part is about the firm's general information such as age, industry, number of employees, responder's position, and etc. The second part consists of four main constructs and their items which are adopted from the existing literature. These items were measured on a Likert scale ranging from 1 "strongly agree" to 5 "strongly disagree". These constructs were: learning orientation, environmental uncertainty, operations strategy (cost, flexibility, quality, delivery) and innovation performance. Learning orientation has been measured using eight items adopted from Calantone, Cavusgil, & Zhao (2002). Items for operations strategy were extracted from Qi et al., (2017) and Wong, Sancha, & Thomsen (2017) which consists of four parts: cost, flexibility, quality and delivery. Items for innovation performance were adopted from C. Wang & Hu (2017) and finally items for environmental uncertainty were extracted from L. Wang et al., (2011).

4. Results

4.1- Measurement model

For testing reliability of the measurement scale two commonly used measures, i.e. Cronbach's alpha and composite reliability (CR) were calculated and according to (Fornell & Larcker, 1981), 0.7 is the minimum requirement preferable for Cronbach's alpha. Internal consistency of the data was tested by composite reliability (CR) and it is suggested that 0.7 is an acceptable level for it (Yeh & Huan, 2017). For testing validity of the measurement scale, we used factor loadings and average variance extracted (AVE) and suggested criterion for AVE is 0.5 (Fornell & Larcker, 1981) and for factor loadings is greater than the proposed value of 0.7 (Fornell & Larcker, 1981). Summary of the results are shown in Table 2. All the AVE values of the constructs are greater than the threshold value of 0.5 which is a demonstration of a valid measure. Another widely used measure for validity is discriminant validity. Table 3 shows that the AVEs for all constructs were greater than the squared correlations between any pair of constructs, demonstrating that a construct does not significantly share information with the other construct, which met the requirement of discriminant validity. For example, AVE value of innovation performance (0.654) is greater than its squared correlation with other constructs at column related to it.

Table 2: Construct reliability, factor loadings, alpha and standard deviations

Variables	CR	AVE	Factor loading	Alpha	SD
Learning orientation	0.901	0.533		0.875	
Lo1			0.740		1.352
Lo2			0.658		1.372
Lo3			0.660		1.369
Lo4			0.657		1.443
Lo5			0.713		1.393
Lo6			0.690		1.396
Lo7			0.620		1.441
Lo8			0.666		1.322
Operations strategy					
Cost	0.812	0.596		0.723	
C1			0.700		1.196
C2			0.641		1.181
C3			0.711		1.166
Quality	0.886	0.722		0.807	
Q1			0.685		1.330
Q2			0.757		1.261
Q3			0.851		1.242
Flexibility	0.871	0.692		0.777	
Fl1			0.724		1.296
Fl2			0.742		1.305
Fl3			0.733		1.284
Delivery	0.840	0.637		0.715	
D1			0.701		1.197
D2			0.606		1.305
D3			0.720		1.284
Innovation performance	0.904	0.655		0.868	
INP1			0.791		1.352
INP2			0.740		1.296
INP3			0.730		1.276
INP4			0.684		1.207
INP5			0.732		1.268

Table 3: Discriminant validity

	INP	LO	Cost	Delivery	Flexibility	Quality
INP	**0.654**					
Learning orientation	0.312	**0.535**				
Cost	0.092	0.053	**0.595**			
Delivery	0.091	0.034	0.106	**0.636**		
Flexibility	0.514	0.151	0.152	0.099	**0.692**	
Quality	0.484	0.147	0.080	0.147	0.528	**0.720**

4.2- Structural model

We conducted Structural equation modeling (SEM) using AMOS 23.0 to statistically analyze the data and test the proposed conceptual model and hypotheses. To evaluate the goodness of model fit, we used chi-square and degree of freedom ($\chi 2$/df), goodness of fit index (GFI), Tucker–Lewis Index (TLI), incremental fit index (IFI), normed fit index (NFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA). The results showed an acceptable fit for our hypothesized model because based on the recommended cut-off values (Hu & Bentler, 1999), all of the fit indices were in acceptable level ($\chi 2$/df= 1.610; GFI= 0.830; TLI=0.908; IFI= 0.916; NFI= 0.805; CFI=0.915; RMSEA=0.048). The results from the data analysis are reported in Table 4.

Table 4: direct effect values and results

Hypothesis			Result	Standardized Regression Weights	P-Value
Learning Orientation	→	Innovation Performance	Confirmed	0.304	0.000
Learning Orientation	→	Cost Strategy	Confirmed	0.350	0.000
Learning Orientation	→	Quality Strategy	Confirmed	0.525	0.000
Learning Orientation	→	Flexibility Strategy	Confirmed	0.548	0.000
Learning Orientation	→	Delivery Strategy	Confirmed	0.305	0.000
Cost Strategy	→	Innovation Performance	Rejected	- 0.048	0.396
Quality Strategy	→	Innovation Performance	Confirmed	0.200	0.000
Flexibility Strategy	→	Innovation Performance	Confirmed	0.348	0.000
Delivery Strategy	→	Innovation Performance	Rejected	0.020	0.719

In order to examine the moderating effect of dynamics, the model should be implemented in both high and low dynamic modes. For each one, once it has to limit the desired regression weight to one and run it again without any limitations. If in high and low dynamic states, the difference between $\chi 2$ becomes higher than 3.84, it can be concluded that the moderator variable has a significant and meaningful impact on that relation (Awang, 2011). With high environmental uncertainty and without any restriction in regression weights the results are $\chi 2$=376.323,df=266 and with low environmental uncertainty and regression weight=1 the results are $\chi 2$=452.075,df=267. The whole results of moderator effect are depicted in Table5.

Table 5: results for moderator

regression weight=1	cost	quality	flexibility	delivery
Environmental uncertainty	High	High	High	High
$\chi 2$	377.327	381.122	381.873	377.445
df	267	267	267	267
Environmental uncertainty	Low	Low	Low	Low
$\chi 2$	453.075	457.684	459.760	453.121
df	268	268	268	268
Difference for high environmental uncertainty	1.004<3.84	4.799>3.84	5.55>3.84	1.122<3.84
Difference for low environmental uncertainty	1<3.84	5.609>3.84	7.685>3.84	1.046<3.84
Results	rejected	accepted	accepted	rejected

5. Discussion and conclusion

5.1. Theoretical contributions

Previous studies proved that knowledge related variables have significant impacts on organizational innovation performance (Darroch, 2005; Z. Wang & Wang, 2012). Learning orientation heavily dependent on creation and use of knowledge and it can also affect innovation performance. Through an extensive literature review, we found that operations strategy has a major connection with the organizational innovation performance (Gamal Aboelmaged, 2012). Gamal Aboelmaged (2012) investigated the impact of innovation performance on operations strategy and they found that innovation performance positively affects operations strategy. By reviewing the literature, we detect that choosing specific strategies can also affect innovation performance. So, the present paper investigates the impact of learning orientation on innovation performance with the mediating role of operations strategy. By regarding the fact that environmental uncertainty is a challenge for production companies in order to choose appropriate operations strategy so the moderator effect of environmental uncertainty in the relation of operations strategy and innovation performance was examined. For this purpose, data were collected from 243 U.K. production companies and the results are as follows:

Learning orientation has a positive impact on innovation performance and also quality and flexibility strategies completely mediate the impact of learning orientation on innovation performance but delivery and cost strategies don't have meaningful impacts. Environmental uncertainty moderates the relationship between operations strategy (quality and flexibility strategies) and innovation performance.

5.2. Limitations and future research

The findings of this study need to be considered by taking into account the following limitations. First, the research sample consists of UK manufacturing companies. Although we tried to have diverse industries in the sample to increase generalizability of the finding, care should be made in applying findings to other national or business settings like service. In this regard, even industry type in manufacturing may have potential to affect the relationships in different ways (i.e. industry type can be a moderator in the conceptual model). Another limitation is related to the combined effect of different operations strategy types on innovation performance. In this study, each operations strategy is included in the model as a separate variable. But in reality, firms can take more than one strategy type as their competitive priorities. Also, the moderating effect of environmental uncertainty was studied only on one relationship; but it can has moderating effect on other relationships like the one between learning orientation and innovation performance. Future researchers can test the proposed relationships in other countries or settings like service industry to ensure the consistency of the results. Another potential research proposal is related to combined effect of operations strategies on innovation performance. Furthermore, the moderating effect of environmental uncertainty on other relationships like learning orientation and innovation performance can be studied.

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