

DIGITALIZATION AND FIRM PERFORMANCE: MEDIATING ROLE OF SMART TECHNOLOGIES

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Abstract

The aim of current study is to explore the impact of digitalization on the firm performance with the help of mediating role of smart technologies. This study used a valid and well-structured questionnaire to collect the data from 150 respondents of 7 SMEs in Pakistan. This study used PLS-SEM techniques to examine the measurement and structural of the model. The empirical results of this study found that digitalization has considerably direct impact on the firm performance, thus in this condition the incorporating smart technologies play significant mediating role to develop the link between the digitalization and firm performance. Further this study explained that smart technologies is important tool to the SMEs of Pakistan for seeking new markets, establishing the novel products, getting the consumer satisfaction, achieving high level of production and to boost up overall firm performance. In the end, the policy recommendation of this study paved the way for the management of the SMEs to use sensible step for converting the traditional supply chain to digital supply chain by using digital business model.

Keywords: Digitalization, Smart technologies, Firm performance, SMEs, Pakistan

1. Introduction

The digitalization has spread its roots in all types of business world widely. This dramatically modernization in the entire field of life has not only enhance the living standard of the people but it has innovated way of production, business style and rejuvenation in supply chain management (Nasiri et al., 2020). The digital innovations have shrunken the international boundaries and all the countries are interconnected now; this interaction between the different countries is providing the novel dimensions to the market system and business manner. In this situation, the business growth has developed a tough market competition among different counties. Therefore, this competitive world is leading to the different industries to adopt the advance technologies in production process such as 3D printing, smart technologies, computer, smart wearable devices, prototyping etc (Agerwal and Narain, 2018). The digitalization has developed many countries by digitalizing their business models. To support global outlook, the context of this study is digitalization in the Pakistann SMEs.

In recent time mostly countries are changing business progression from traditional to digital way of production and service but the Pakistan at initial stage of digital transformation. There are many organizations needed to adopt this digital revolution, especially SMEs. The SMEs has great contribution in the economic development. The use of smart technologies has become the necessary for the SMEs for the growth as well as existence in the market at international level (Tripathi A., 2019). Therefore, this study is very important for Pakistan SMEs for providing the awareness to all types of firms for developing business models innovation by using the digital transformation in its production process as well as supplychain management (Alharbi,2019). There are some studies such as (Bu et al., 2020, Nasiri et al.,2020; Frank et al., 2019) tried to uncover the authentic impact of the digital supply chain management to bring the revolutionary change in production process and relationship. These studies have explained the digitization in very well manner.

However, these previous studies has leaved some research gap such as (Nasiri et al., 2020) explained the internal and external collaboration as the item of performance linking with digital supply chain management, but did not explained the relation among the digital supply chain and the market share, earning growth and sales growth, these are important endogenous variable of firm performance in context of relationship as well as in performance.

Therefore, current study has tried to inspect the dynamic effect of digital transformation and use of smart technology in firm performance in context of Pakistan. It tried to identifying the effect of digital supply on firm performance with mediating role of smart technologies in Pakistan, which never has been studied before. This study contributes to the existing literature to using neglected endogenous variable of performance such as market share, earn growth, growth of sales and revenue in return of investment (Nasiri et al., 2020).

This study has found the theoretical as well as practical foundation of digital business model innovation. Taking into consideration the dilemma mentioned above, and to resolve the flaws of earlier research, this study developed the following research questions; this question assist to explore the objectives of study.

RQ1: what is the impact of digitalization on the firm performance?

RQ2: what is the role of the smart technologies as mediator to link the digitalization with the firm performance?

RQ3: how the digital business model impact firm performance in the Pakistan?

2. Literature review

2.1 Business model innovation

A business model explains the principle that how a firm can develop, delivers its products or provides services and confines the value in social as well as economic and cultural contexts. The procedure of business model and making modification in existing model is called business model innovation.

In practical or theoretical prospective, the business model indicated the broad series of formal and informal descriptions to symbolize the central characteristics of business

such as business process, offering new strategies, administrative structure, trading practice, operational polices and process (Geissdoerfer et. al., 2017).

The business model innovation depends on the technology and its uses. The business model innovation is a novelty in arrangement that whether whole business model or just some part should be innovating. This model is very important if it adopt ad right time and from right purpose. This model plays fundamental role in the time of instabilities in the business process. This business model innovation provides the mean to break out powerful competition in the market.

In 1990's when the e-commerce was at pick. The new mechanisms of innovate revenue was introduced. In this perspective the concept of business model was initialized to communicate multifaceted ideas to motivate the investor to invest in short run (Zott et al., 2011). Therefore, the aim of this concept of business model innovation to develop symmetric analysis, communication, planning and execution of one of more organizational unites. It is necessary to adoption new model that administrative body should define resources and experiments of business model (Hamel, 2000; Afuah, 2004; Chesbrough, 2006).

2.2 Digitalization

Digital transformation is known as the innovation in organizational culture, novelty in business process and production to assemble the requirements in the market by using digital technologies. The digital transformation helps the administration for redesigning or reconstructing the business model according to advancement in the market system (Li et al., 2020; Pramanik et al., 2019). According to Verhoef et al., (2019) there are three stage of digital transformation such as digitalization, digitations and digital transformation. In the stage one, the firms usually adopt digital technologies to innovate the process. In second stage, there are some specific functions are used to affect such as decision about retailer to make it online from store channel. Third phases firms change the value creation by applying the digital technologies.

According to Hoberg et al. (2015), it is a process in which firms or industries make innovation in the production process by using digital technologies like 3D printing, big data analysis, and internet of things. In this way, the company execute the product value; increase the in traction between customer and supplier and make the internal and external collaboration strong for the sake of great margin of profit. Digital transformation is not attained by effort of one individual rather it is assortment of a programme that work together to attain the transformation. Hence, the digital supply chain management is strong transformation of the technologies that provide the abilities to the firms for changing the conventional technique of doing different procedure of supply chain management, task execution, interaction among the partners and stakeholders and developing the new business model.

The digital transformation not only increase the fundamental production process of any firm, industry or organization but it increases the capabilities to collect the data at great level for different purpose such as rising up the sales, finding new markets places, creating customers interface etc (Frank et al., 2019). Digital transformation has increased the managerial ability and work excellence; due to the important role of the digital transformation there is need of the organizations to develop the adaptability and

implication of novel technologies in business process (Frank et al 2019, Pramanik et al 2019).

Digital transformation has transformed the possibilities and prospective for the firms to handle as well as implement the internal and external activities related to collaboration in digital supply chain. This transformation has enabled the requirement of external association and lessen the rendezvous cost. It also plays a vital role in external association of the digital supply chain, because can increase thee customer service by collection the great amount of data from various sources. It also creates the powerful network among the different collaborators. The digital transformation not only makes the costumer but service provider expert in sale and purchasing (Crittenden et al., 2019)

2.2 Smart technologies

Smart technologies are related to the substantial devices or procedures that are complemented to the advanced properties of digital transformation. The use of the smart technologies brings the innovation in the supply chain management (Nasiri et al., 2020). According to Yoo et al., (2010) it has some incredible properties such as communicability, addressability, memorability, programmability, associability and sensibility in physical devices. These features enable the organization or company to remain up-to-date with current ongoing situation of market system and consumers preferences. The trend to use the smart technologies has gone at great level. Individuals use advance artificial intelligence structure as digital association and this digital association has increased the satisfaction level of the customers on the smart technologies (Munoz and Miller, 2019).

2.3 Firm performance

The success and the failure of the firm depend on its performance. In market system there are a lot of firm provides their own product or service (Rehman et al., 2019). Richad et al. (2009) explained that the achievement of firm's goals depends on its performance. The performance determines that at what extent the firm is achieving its objectives. Regarding to the objectives, the aim of each firm or organization is to get maximum profit and stay for long time in the market. The firm with high performance known as victorious in the market, on other side, the firm with weak performance can be kicked by other firms. There are many factors that affect the firm performance such as internal and external cultural issues, rewards, financial matter and creation of business model innovation, administrative matters and skills of leadership, week collaboration, environmental uncertainty and planning (Rehman et al., 2019).

In highly competitive market situation only firm's high level of performance helps it to remain in market for long time (Cania, 2014). The performance of the firm can be measure qualitatively as well as quantitatively and this performance can be attained by departmental and worker's efforts (Zehir et al., 2016).With the passage of time, the competition is increasing among the organizations or firms try to beat other and try to make its own position in the market. The organizational performance play very important role to meet the objectives, goals or targets in small and medium enterprises and big industries not only developing but developed countries.

3. Research Hypothesis

The hypotheses of this study are developed to identify the link between digital transformation and firm performance. This study has projected and weigh up the importance of digital supply chain accepted by firms and mediating role of the smart technologies in the link between digitalization and firm performance.

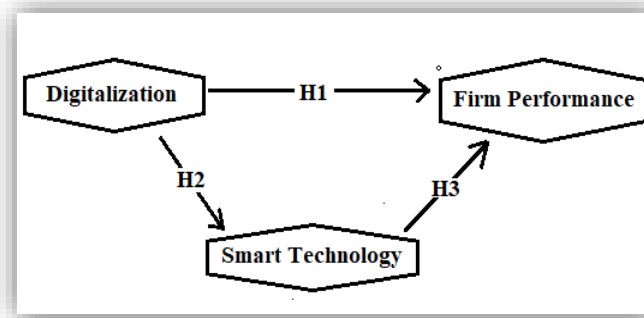


Figure 1: Proposed model of study

Source: Developed by author

3.1 Digital transformation and firm performance

The importance of digital transformation has been increasing for last twenty years. The technologies have provided the paved way to firms to not only raise its productivity but interaction with stakeholders. Digital transformation has revolutionizing the way of working, bringing the innovation in the production process. This transformation is a great phenomenon that introduces the intelligent products (Martinez-Caro et al., 2020).

Digital transformation has converted the firms supply chain to digital supply chain management for facilitating the customers with best services (Agerwal and Narain, 2018). The technologies transformation increases the firm performance significantly by providing the novel ideas and techniques in production process (Chege et al., 2020). According to Windahl (2015), the technological modernization in the firm is great diver to enhance its performance in the market and generate the revenue. It is necessary that firm should adopt the innovation and transformation of the technologies in the production process, in marketing the products (Bryjolfsson and suanders 2010; Chege et al. 2020). The digital transformation also converted the simple business model to the digital business model. The digital business model directly increases performance of the market as well as firm (Verhoef and Bijimolt, 2019). This study generated following hypothesis on the base of above argumentation in the context of Pakistann SMEs.

H1: Digital transformation has a positive impact on firm performance.

3.2 Digital transformation and smart technologies

Digital transformation is adoption of novel technologies in business process. This transformation changes the way of production, marketing, selling etc. The digital transformation uses to digitalize each and every thing that can be digitalized. Through the digital transformation the manual or non-digital processes use to convert into the

digital process with advanced technologies. The digital transformation gives the concept mature digital business process (Hagberg et al., 2016; Heinze et al., 2018).

Digital transformation along with smart technologies increases the possibilities of optimum production. The benefits from smart technologies indicate clearly that by boosting the prediction of combining software and its components across the infrastructure and production system of SMEs (Yoo et al., 2010; Nasiri et al., 2020). The SMEs are important sectors in any country and in Pakistan SMEs there is great need to transform the business model into digital business model and use of smart technologies. The Smart technologies enlarge the services connected to internet by integrating technologies for example mobile operating system, it supports the many functions such as firm's management services, customer support service, collaboration management, research and planning services (Chen et al., 2006; Chuang and Lin, 2015; Verhoef and Bijmolt, 2019). Therefore, this study generated following hypothesis on the base of above argumentation in the context of Pakistan SMEs.

H2: Digital transformation has positive impact on smart technologies.

3.3 Smart technologies and firm performance

The most important challenge of the firm is to attain the growth and development. The growth rate plays important contribution in raising the profitability of the business process. The growth rate of any firm increases the abilities to eradicate the risk and increase the possibilities to create the commercial operations, for this purpose the enterprises have to focus on the adoption and implementation of new technologies. The use of smart technologies firm can make innovative strategies, cost control marketing strategies (Pratali, 2003; Mothe and Thi, 2010).

There are two main factors such as technological innovation and market forces that are essential for firm's the business, marking of its product of service and retailing. The use of technological device increases the firm's business level (Grewal et al., 2018; Daveport et al., 2019). In other words, the use of technologies in the business make the management more practical for the bringing the innovation in their business process. In recent time, the smart technology has become very essential element. The consumers are using smart technologies to get facilities for different purpose and this act directly influences the performance of the organizations or firms (Roy and Colleagues, 2019). Therefore, this study generated following hypothesis on the base of above argumentation in the context of Pakistan SMEs.

H3: Smart technologies have a positive impact on firm performance.

4. Research methodology

4.1 Sample and data collection

This study selected 9 SME's and got response from 7 corporations. This study collected the primary data through questionnaire from Jun 6, 2021, to October 30, 2021. This study increased the rate of response by translate the questionnaire into Urdu. After getting consent from administrative authorities of enterprise, this study randomly selected participants. The participants were at good post and provide the

good information regarding to digital transformation, smart technologies and firm performance.

This study distributed 250 questionnaires and 150 questionnaires were received from these organization. The response rate was 60 percent. The table of respondent is elaborated below.

Table 1: Profile of participants

Variables	Category	Percentage
Gender	Male	65.6%
	Female	34.4%
Age	22 years old or below	16.5%
	23–30 years old	59.9%
	31–40 years old	14.7%
	Above 41 years old	9.0%
Education level	Less than bachelor	11.5%
	Bachelor	65.6%
	Masters & above	22.9%

4.2 Measurements of variables

The scale for the variables has been adopted from the previous studies.

4.2.1 Digital transformation

The digital transformation is measured by the five items. These items used to measure the ability of firm to use the digitalization in their production process for example, stronger networking between the different business processes with digital technologies, achieving information exchange with digitality, digitalize everything that can be digitized, massive volumes of data from different sources etc. The response scale for the items of digital supply chain management ranged from 1 to 7 (1 = strongly disagree to 7 = strongly agree (Frank et al., 2019, Li 2020; Parmanik, 2019; Nasiri et al., 2020).

4.2.3 Smart technologies

The smart technologies are measured by the six items for example “In our company, all the devices are programmable”, “In our company, all the devices can send and receive messages”, “In our company, all the devices can record and store all information”, “In our company, all the devices are able to be uniquely identified”, “In our company, all the devices are able to respond to changes in their environment”, “In our company, all the devices can identify with other entities”. The response scale for the items of smart technologies ranged from 1 to 7 (1 = strongly disagree to 7 = strongly agree), (Yoo et al., 2010; Nasiri et al., 2020).

4.2.4 Firms performance

There are four items of the firm's performance has been measured by this study. For example, “firm after tax returns on investment”, “the earnings growth of firm”, “sales growth”, “Market share change”. It is measured from 1= much worse to 5= much better (Chan et al., 2012; Bu et al., 2020).

5. Results

This study used PLS (Partial Least Squares) approach for making the structural equation model (SEM) by using smart PLS. The importance of this technique is affirmed by Hair et. al., (2020), by following the strategy from PLS-SEM literature, this study has used two step approach for the analysing the result. In first step of PLS-SEM techniques, this study has measured inter-item reliability, internal consistency reliability and convergence validity of the measurement model. In second step is applied for the testing the hypotheses and predictive capability the assessment of the structural model (Henseler et al., 2009).

5.1 Measurement model

For measurement of model, in the first stage study maintained the threshold level at 0.70 percent and determine the inter item reliability through the evaluation of factor loading (Hair et. al., 2016). In second step, this study examines the convergent validity through the examination of average variance extracted (AVE) at 0.50 threshold level (Hair et. al., 2016). In third step, this study calculated the internal consistency reliability by assessing the score composite reliability (CR) at the value above the 0.70 threshold level (Hair et al., 2016).

Table 3: Measurement Model

Latent variable	Items	Loadings	Alpha	AVE	CR
Digital Transformation	DT1	0.824	0.903	0.720	0.928
	DT2	0.837			
	DT3	0.873			
	DT4	0.879			
	DT5	0.826			
Firm Performance	FP1	0.877	0.905	0.778	0.934
	FP2	0.903			
	FP3	0.893			
	FP4	0.856			
Smart Technologies	ST1	0.889	0.922	0.764	0.942
	ST2	0.895			
	ST3	0.899			
	ST4	0.792			
	ST5	0.890			

The composite reliability values of the variable are explained in the table 3. This result has articulated that the composite reliability that is indicated as CR, is greater than

0.70. This value explains the reliability and a high level of consistency. In this table, the convergent validity explains the level of the projected model. According to this value, the result indicates a high level of convergent validity. Further this table indicates that overall model is a good fit.

5.2 Discriminant validity

The study used HTMT (Heterotrait-Monotrait ratio of the correction) to find out the discriminant validity. This process is used because of criticism on criterion of discriminant validity measurement by Fornell and Larcker (1981).

Table 4: Discriminant validity (HTMT)

Variables	1	2	3
Digitalization			
Firm Performance	0.353		
Smart Technologies	0.445	0.688	

5.3 Structural model

This study applied second step (path coefficient and significance) to make analysis about the hypothesis. The result of hypothesis testing is elaborated in the table 5.

Table 5: Path coefficient and significances

Hypothesis	Relationship	Beta	Standard error	T-value	P-Value	CLs	
						5.00%	95.00%
H1	DT -> FP	0.061	0.000	1.416	0.079	-0.008	0.166
H2	DT -> ST	0.32	0.075	6.344	0.000	0.289	0.500
H3	ST -> FP	0.42	0.031	13.616	0.000	0.519	0.663
H4	DT -> ST -> FP	0.31	0.0234	6.135	0.000	0.180	0.308

The first hypothesis express that the impact of digital transformation on firm performance is not significant because the $\beta = 0.061$ and $p < 0.000$ it is low the threshold level 0.05. So, this result is supporting H₁. Therefore, on the basis of this result the null hypothesis is accepted. On the contrary, the second hypothesis express that the impact of digital transformation on smart technologies is significant because $\beta = 0.35$ and $p < 0.000$. Therefore, the H₂ is supported. In the same way, the β value of the H₃ is 0.42 and $p < 0.000$. Further, the last hypothesis H₄ explains that a smart technologies play a significant mediating role between the digital transformation and firm performance ($\beta = 0.31$ and $p < 0.000$), therefore, the H₄ is supported.

5.4 Strength of mediating effect

The strength of mediating effect of the variables is measured by the comparison of the R square included with R square excluded. The value of R square included is 0.403 and R square excluded is 0.391. These values showed the small effect of the digital

transformation on the firm performance. Small effect size does not prove the insignificant moderation effect, as suggested by academic research (Henseler et al., 2007; Chin et al., 2003). “Even a small interaction effect can be meaningful under extreme moderating conditions. If the resulting beta changes are meaningful, then it is important to take these conditions into account” (Chin et al., 2003).

Table 6: Strength of mediating effects

Exogenous Latent Variables	R2- Included	R2- Excluded	F2	Effect Size
DT -> FP	0.301	0.315	0.01	Small

5.5 Measuring R²Value

This study determined the coefficient or R² to analysis the explanatory power of model. The R² of this model was calculated by the PLS algorithm in Smart-PLS. It is suggested that all the value is above the 0.10 threshold level (Falk and Miller, 1992). The R² value of smart technologies is 0.170 and firm performance is 0.403. These values are above the threshold level (0.10).

6 Discussion

According to author’s knowledge, this study is one of early effort to explore the mediating role of smart technologies between the digital transformation and firm’s performance in context of SMEs in Pakistan This study extended the previous studies on digitalization under the theory of business model innovations. The results are summarised from tables 1 to 6.

The empirical results have rejected the first null hypothesis (H1). The results show that digitalization have direct effect on the firm performance. There would be some reasons for not direct effect of digital transformation with firm performance. These results are a line with (Chen et al., 2016, Buyukozkan and Gocer,2018, Mubarak et al., 2019).

This study has accepted second the null hypothesis (H2) which explains that digital transformation has positive impact on the smart technologies. In current time of period, the world is digital transformation. Through the digitalization the manual or non-digital processes use to convert into the digital process with advanced technologies. The digital transformation gives the concept of mature digital business process and enhances the value of smart technologies. These results are a line with (Heinze et al., 2018; Agerwal and Narain, 2018).

This study has accepted third the null hypothesis (H3) and fourth hypothesis as well. the results show that smart technologies have positive impact on firm performance. As smart technologies not only stimuli the human life, but it has changed the systems, managerial activities, structures and production process of firms. When firms adopt novel technologies these digital channels change the way of marketing as well as its effects on the value of customers. Therefore, the results are a line with (Verhoef and Bijmolt, 2019; Mubarak et al., 2019; Chege et al. 2020).

The smart technologies play an important role as mediator between the digital transformation and firm performance. The smart technologies are most excellent gauge of the digital transformation in the dynamic production and sales strategies of firm. The smart technologies enhancing the firm performance expansively by providing the novel strategies based on use of the advanced techniques in production and marketing procedure. It is strong tool to connect the digital transformation with firm performance. The smart technology is crucial factor that not only digital transform the supply chain but it plays very important role to innovate the firm performance. The results are a line with (Nasiri et al., 2020; Chege et al., 2020).

6. Conclusion

This study tried to find out the impact of digital transformation on the firm performance with mediating role of the smart technologies. This study has selected the SMEs of Pakistan for the analysis. The data is collected from SMEs of three different cities which were Riyadh, Dammam and Jeddah. This study concluded that digital transformation does not has significant impact on the firm performance and the smart technologies are very effective mediator that links the digital transformation with firm performance. This study theoretical proved the importance of the digital business model and assured that digital business model helps the management to bring the innovation and encroachment in the production process; it develops the efficient way of communication between the sellers and buyers. Finally, it is stated with empirical evidence that this study is very crucial for the policy maker in order to devise suitable strategies for making the strong digital supply chain management, firm performance and to enhance the capabilities of human capital as well as their absorptive capacities in SMEs in Pakistan.

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