



The Dynamics of Innovation on Firm Performance: Empirical Analysis of Pharmaceutical Manufacturing Firms in Sindh Pakistan

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ARTICLE INFO

Article History:

Received: April 07, 2023

Revised: June 02, 2023

Accepted: June 04, 2023

Available Online: June 04, 2023

Keywords:

Dynamics

Innovation

Firm Performance

PLS

SPSS

Funding:

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ABSTRACT

Innovation is defined as the process of producing developing new products and services for significant positive change, innovation is a crucial driver of economic growth and societal progress. Aim of this paper is to analyse the direct, indirect, and total effects of exogenous variables product innovation, process innovation, and organizational innovation, with the mediating effects of organizational innovation capability and dynamic capability on endogenous variable firm performance. In the context of Resource Based view theory organizational achievement is defined with reference to utilization resources, proficiencies to achieve competitive advantage, sustainable and viable. In the framework of this concepts, innovation which leads to shape resources capabilities for better performance in pharmaceutical manufacturing firms of Sindh. Path analysis approach is incorporated for analysing multivariate causal effect, a five-point Likert scale, and a pretested, closed ended questionnaire was used for feedback of responses. Cluster sampling technique is incorporated for compilation of data, by using SPSS 25 version software for demographic statistics, and PLS 3.5.V for inferential statistics. Direct, indirect, and total effects is significantly positive, except PI > to DC > is insignificantly associated with firm performance. Partial mediation is established by the, product innovation, and organizational innovation through organization innovation capability and dynamic capability with firm performance. The limitation only covers the pharmaceutical manufacturing firms al so limitations are expelled various variables of firm performance because of limited time. Beside these limitations, this study provides direction to top management and policymakers for enhancing of performance of manufacturing firms of Sindh.

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1. Introduction

Empirical analysis in between innovation as well as the firm performance particularly in the pharmaceutical manufacturing firms, we explore the key factors that drive innovation and to enhance the performance of the firm. The product, process and organizational innovation are critical drivers for firm performance in the pharmaceutical manufacturing firms. Firms that invest more in research and development, to build capabilities, and cultivate a market-oriented and highly skilled workforce tends to be more innovative. Various factors that contribute to innovation and performance include, industry attentiveness, government support, technology adoption, intellectual property protection, and collaboration. Firms in the pharmaceutical manufacturing industry can benefit from developing effective strategies for innovation and growth that take into account these various factors and the complex interactions between them. The paper highlights the significance of the pharmaceutical manufacturing industry in Sindh Pakistan, which is one of the largest and fastest-growing industries in the country. This industry is critical for providing affordable and accessible healthcare products to people of Pakistan and supporting the country's

economic development. Pharmaceutical manufacturing industry in Pakistan faces a range of challenges, including intense competition, changing consumer demands, and a rapidly evolving regulatory environment. Firms in this sector must navigate these challenges while also investing in innovation and maintaining high levels of performance. According to a report by McKinsey & Company, pharmaceutical firms that invest in innovative manufacturing processes can achieve up to a 30% reduction in manufacturing costs and a 50% reduction in time (Bughin, Deakin, & O'Beirne, 2019). In a study conducted by the University of Cambridge, it was found that pharmaceutical companies that adopt innovative manufacturing technologies such as continuous manufacturing can increase their production efficiency by up to 50%, resulting in significant cost savings (Bughin et al., 2019).

The Pharmaceutical Research and Manufacturers of America (Bjornsson et al., 2003), notes that innovation in manufacturing can also improve product quality and reduce the risk of drug shortages, which is particularly important while Covid pandemic in 2019 (Ferreira, Cardim, & Coelho, 2021). A report by the International Federation of Pharmaceutical Manufacturers and Associations (Siewert et al., 2003) (IFPMA) highlights the role of innovation in enabling pharmaceutical companies to address unmet medical needs and improve patient outcomes, ultimately contributing to global health and well-being (Siewert et al., 2003). In summary, innovation in pharmaceutical manufacturing has significant benefits for companies and society as a whole, including cost savings, increased efficiency, improved product quality, and better patient outcomes. A study by PwC found that companies that prioritize innovation in their manufacturing processes have a higher return on investment (ROI) compared to those that do not, with an average ROI of 11.3% versus 7.3% (Domokos, Nagy, Szilagyi, Marosi, & Nagy, 2021). According to the International Society for Pharmaceutical Engineering (ISPE), innovative manufacturing technologies such as continuous manufacturing and digital manufacturing can enable pharmaceutical companies to produce personalized medicines and small-batch drugs more efficiently and cost-effectively (Schuirmann, 1987). World Economic Forum highlighting the role of digital technologies in enabling more sustainable manufacturing processes (Mathematics, 2016), (World Economic Forum, 2020), (Evans et al., 2019). The COVID-19 pandemic has further highlighted the importance of innovation in pharmaceutical manufacturing, with companies racing to develop and produce vaccines and treatments at an unprecedented pace. The use of innovative manufacturing methods such as mRNA vaccines has also revolutionized the way vaccines are produced (Baptista, Carapito, Laroui, Pichon, & Sousa, 2021). While there are examples of innovative manufacturing processes being adopted by some pharmaceutical companies in Pakistan, such as the use of continuous manufacturing by a local manufacturer of generic drugs (Tauqeer, Myhr, & Gopinathan, 2019).

One of the main challenges is no investment particularly in research and development R&D by many pharmaceutical companies in Sind Pakistan, which limits their ability to innovate (Kremer, 2002; Sarwar, Waheed, Sarwar, & Khan, 2020). Furthermore, there are regulatory and infrastructure challenges that hinder the adoption of innovative manufacturing technologies in Pakistan (Musaheb & Ibrahim, 2022) (The News, 2019). Additionally, there are infrastructure challenges, such as the lack of reliable electricity supply, which can disrupt manufacturing operations and increase costs (Pakistan Today, 2019). Despite these challenges, there are initiatives underway to promote innovation in the pharmaceutical manufacturing sector. Pakistan's first continuous drug manufacturing unit launched" (Hussain, Hassali, Hashmi, & Farooqui, 2018). Due to the global prevalence of this contentious issue there is need to conduct an adequate research with the view to inspire businesses to adopt new practices. Some recent studies indicate that because the financial crisis has had an impact on them, the results are not particularly conclusive (Psomas, Wang, & Assad & Alshurideh, 2020).

1.1. Innovation

Innovation is defined as the process of introducing new ideas, products, services, or ways of doing things that bring about significant positive change (Bigliardi & Filippelli, 2022). Innovation is a crucial driver of economic growth and societal progress. In the context of innovation, citations are important because they allow innovators to build on the work of others and to avoid repeating previous mistakes or reinventing the wheel (Jotabá, Fernandes, Gunkel, & Kraus, 2022). By citing previous research, innovators can acknowledge the contributions of others and situate their own work within the broader context of existing knowledge. Moreover, citing previous work can also help innovators to identify gaps in existing knowledge and to

generate new ideas for further research or innovation (Id, 2022). By analyzing and synthesizing existing research, innovators can identify new opportunities for innovation and develop more effective and efficient ways of addressing current challenges. In summary, innovation and citation are closely linked, as the process of innovation relies on building on previous work and acknowledging the contributions of others. Citations help to ensure that innovation is grounded in a solid foundation of existing knowledge and that new ideas are developed in a context of ongoing research and development.

1.2. Variables of the study

1.2.1. Firm performance (Endogenous Variable)

Firm performance refers to the effectiveness and efficiency with which a company uses its resources to achieve its objectives. There are numerous factors that can affect firm performance, including financial measures, customer satisfaction, employee engagement, innovation, and social responsibility. Naranjo-Valencia, Jiménez-Jiménez, and Sanz-Valle (2016) analyzed the impact of organizational innovation on firm performance. The authors found that companies that were more innovative tended to have higher levels of performance across a range of measures, including profitability, productivity, and employee satisfaction. The study also found that innovation had a positive impact on customer satisfaction and loyalty. Another study by Hitt, Bierman, Shimizu, and Kochhar (2001) examined the strategic human resource management (SHRM) effect on firm's performance. Boston Consulting Group, companies that consistently invest in innovation outperform their peers in terms of revenue growth, profitability, and total shareholder returns. European Commission 2016 found that firms that engage in innovation activities have higher sales growth and are more likely to enter new markets compared to those that do not, another study found that innovative firms are more likely to report high levels of employee satisfaction and customer loyalty, as well as greater market share. It is important to note, however, that the relationship between innovation and firm performance may vary depending on the type of innovation and the industry context. However, the success of innovation initiatives may depend on various factors, and firms should consider the type of innovation and industry context when developing their innovation strategies (Mirza, Abbas, & Nawaz, 2020).

1.2.2. Process innovation (Exogenous Variable)

Process innovation is a key driver of firm performance, as it can help firms improve efficiency, reduce costs, and enhance product quality, a study by researchers at the University of Sussex found that firms that engage in process innovation tend to have higher productivity, profitability, and market share compared to those that do not (Akram, Siddiqui, Nawaz, Ghauri, & Cheema, 2011; Bocquet, Le Bas, Mothe, & Poussing, 2017). It is an important to note, however, that the success of process innovation initiatives may depend on various factors such as the complexity of the process, the firm's ability to effectively implement and manage the new process, and the availability of resources. A study by researchers at the University of Leeds found that firms that invest in process innovation and develop the necessary organizational capabilities tend to have higher financial returns (Kafouros, Love, Ganotakis, & Konara, 2020). However, the success of process innovation initiatives may depend on various factors, and companies should carefully consider the complexity of the process and their own capabilities when developing their process innovation strategies.

1.2.3. Product innovation (Exogenous Variable)

A key element of firm performance, as it can help firms stay competitive, increase market share, and generate higher profits. According to a study by the European Commission, firms that introduce new or significantly improved products tend to have higher sales growth and are more likely to enter new markets than those that do not engage in product innovation European Commission, 2016. The University of Sussex found that firms that introduce new products tend to have higher productivity, sales growth, and market share compared to those that do not (Bocquet et al., 2017). According to Boston Consulting Group (BCG) companies that consistently launch new products generate higher revenue growth and profitability compared to those that do not (Kafouros et al., 2020). It is pertinent to know that the success of product innovation initiatives may depend on various factors such as market conditions, customer preferences, and the company's ability to effectively bring new products to market.

1.2.4. Organizational innovation (Exogenous Variable)

The performance of a company may be significantly improved via organizational innovation. Organizational innovation is positively correlated with company performance, both in

terms of financial indicators and non-financial variables, such as market share, customer happiness, and staff satisfaction, according to a research by (Jiménez-Jiménez & Sanz-Valle, 2011). Furthermore, another study by (Saunila, 2017) and (Shouyu, 2017) discovered that organizational innovation improves businesses' competitive advantage, which in turn has a positive impact on company performance. The study also revealed that characteristics such as market dynamism, technical uncertainty, and competitive intensity function as moderators in the association between organizational innovation and company success. Overall, these studies indicate that there is a positive nexus between innovation of the firm and its performance, particularly when firms are working in a competitive and dynamic context.

1.2.5. Innovation Capabilities of the Organization (Mediator)

Organizational innovation capability has been found to have a positive relationship with firm performance. According to a study by (Su, Cheng, Chung, & Chen, 2018) organizational innovation capability is positively related to firm performance, both in terms of financial indicators and non-financial measures, such as productivity, market share, and customer satisfaction. Similarly, another study by (Al-kalouti et al., 2020) investigate that organizational innovation capability is a critical determinant of a firm's performance. The study suggested that firms that have a high level of organizational innovation capability are more likely to generate innovative products and services, improve their competitive advantage, and achieve superior operational performance. Overall, these studies suggest that developing and maintaining a strong organizational innovation capability can have a positive impact on firm performance, especially in terms of generating new products and services, improving productivity, and enhancing the firm's competitive advantage.

1.2.6. Dynamic capability (Mediating Variable)

Dynamic capability has been found to have a positive relationship with firm performance. Teece, Pisano, and Shuen (1997) assert that "dynamic capability is positively related to firm performance, both in terms of financial indicators and non-financial measures, such as market share, customer satisfaction, and employee satisfaction" (p. 516). In a similar vein, Ambrosini and Bowman (2009) showed that dynamic capacity is a key factor in determining a firm's performance in another research. According to the survey, businesses with a high level of dynamic capacity are better able to adjust to shifting market conditions, take advantage of fresh possibilities, and manage risks. As a result, the businesses are able to perform financially better. Additionally, a different research by Zahra and George (2002) revealed that dynamic capacity has a positive impact on the performance of innovation, which in turn has a positive impact on financial performance. According to the report, businesses with a high level of dynamic capability are better equipped to create and put into practice cutting-edge strategies, which boosts financial success. These studies demonstrate that dynamic capacity can enhance company performance, particularly when it comes to adjusting to shifting market conditions, seizing new opportunities, controlling risks, and coming up with creative business ideas.

1.3. Problem statement

Pharmaceutical firms have no dynamic superiority in the area of research and development, to innovate drugs which is a crucial role in alleviating diseases and to improve the health and expectancy life human being. Pharmaceutical companies in Sindh are in need of energy, knowledge, and people resources to manufacture a revolutionary drugs (Tomanna, Gerbi, Hossin, & Zhang, 2018). The effectiveness and performance of businesses are determined by how effectively they produce innovative drugs, including innovative processes, organizational innovation, and innovative capability within their own organizations, all while focusing on the current era of rigorous research. In fact, current research indicates that one of the top examination concerns for the science of services is assessing the methods in which manufacturing and service firms innovate (Ostrom et al., 2010). There is a significant gap in our understanding of how to gauge a firm's capacity for innovation (Saunila & Ukko, 2012), and there is proof that the idea of innovation, which is well established in the manufacturing sector, cannot be easily applied to the service and manufacturing sectors. How businesses will fulfil their obligations when the government does not invest in R&D. The pharmaceutical manufacturing industry is struggling with a variety of problems as a result of its rapid growth, but the worst of these are the constant laws promoting drugs, which attract the government's attention due to its ignorance and prevent pharmaceutical manufacturing companies from supporting one another and exchanging ideas.

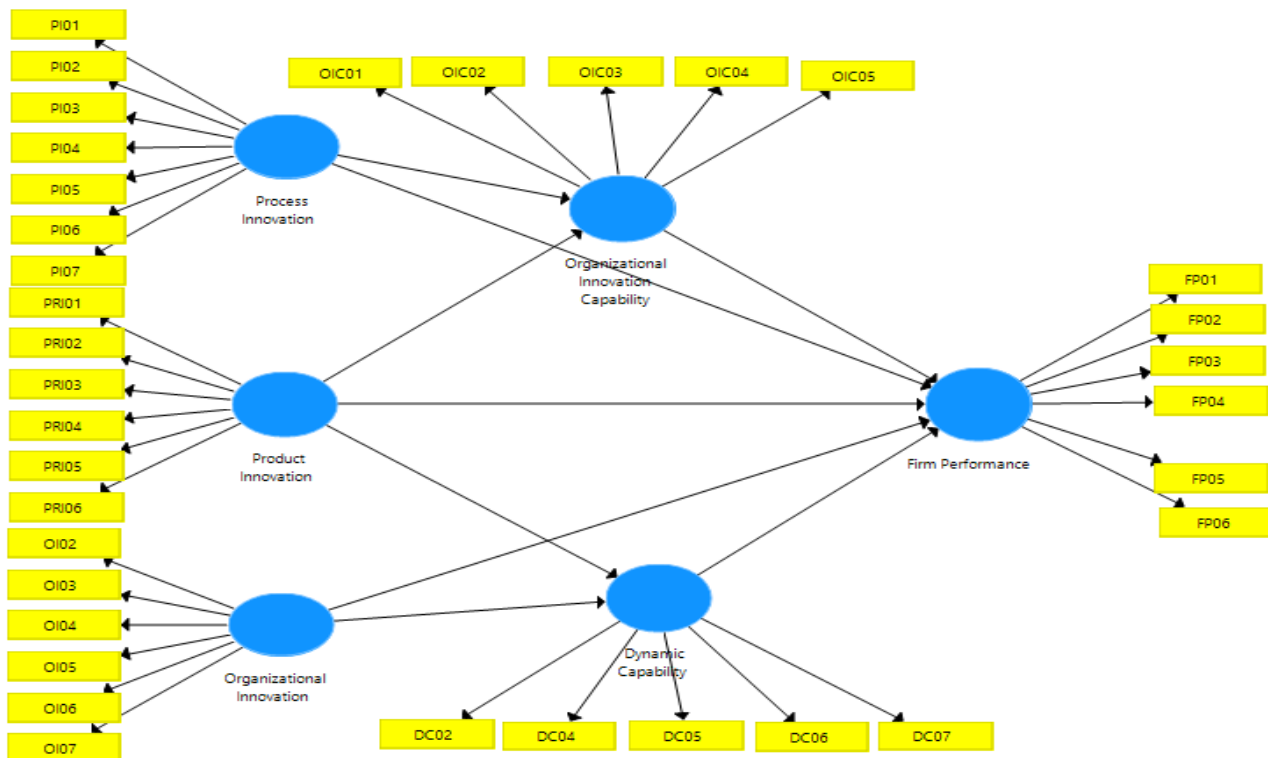
2. Review of Literature

One of the vital factor for not only survival but also for growth of manufacturing organizations is Innovation. Number of studies have highlighted the effect of innovation particularly on the firms dealing in manufacturing. In this context, Tomanna et al. (2018), conducted investigation on the nexus between innovation and pharmaceutical firms performance in Malaysia. The results of the investigation proposed that there is a positive nexus between the innovation and pharmaceutical firms' performance in Malaysia in terms of revenue generation, profitability, as well as productivity. Similarly, Saunila and Ukko (2012), conducted investigation on the nexus between innovation and pharmaceutical firms competitiveness in India. The results of the investigation proposed that there is a positive nexus between the innovation and pharmaceutical firms' competitiveness in India. Moreover, Maeda (2022), also conducted investigation on the nexus between innovation and market performance of pharmaceutical firms operating in Tunisia. The results of the investigation proposed that there is a positive nexus between the innovation and market performance of pharmaceutical firms operating in Tunisia in terms of market share, improved brand recognition, and enhanced product differentiation. A study carried out on the impact of innovation on the financial performance of pharmaceutical manufacturing firms in Ireland. The study found that innovation positively impacted the financial performance of pharmaceutical manufacturing firms through increased revenues, reduced costs, and improved profitability. The resource-based view (RBV) of a firm's strategy is a widely recognized framework that focuses on the internal resources of a firm as the primary source of sustainable competitive advantage, therefore, there is a strong relationship between innovation and the resource-based view. The essence of competitiveness is rooted in the ability to create value The resource-based theory (RBT) of the firm suggests that a firm's resources and capabilities are the primary sources of its competitive advantage. This theory is closely related to innovation, as innovation is one of the ways that a firm can develop and leverage its resources and capabilities to create sustainable competitive advantage.

3. Theoretical Framework and Formulation Hypothesis

This study unpacks the theory of RBV in the context of innovation in the firm setting the study is an empirical based investigation on Resource Based View theory (Barney, 2001) to analyze the effect of variables on firm performance. In this regard a conceptual framework is framed, which is represented in the figure 1.

Figure 1: Conceptual Framework



Source: Stack over flow.net

3.1. Hypothesis of the study

Hypothesis: 1 Process Innovation has positive impact on firm performance (Hassan, Malik, Hasnain, Faiz, & Abbas, 2013). Process innovation is essentially a method of organizational search. Organizations build and assess alternatives through a process called organizational search. Numerous studies have shown that companies perform well internally but poorly outside, and they do well when it comes to competence-enhancing innovation but poorly when it comes to competence-destroying innovation. Due to constrained rationality, businesses can search efficiently in technological fields where they have previous knowledge, but they may run into significant challenges when searching in fields where they don't (Wang & Chen, 2018) suggests four general categories for innovative assets: assets from scientific research, assets from innovative processes, assets from innovative products, and assets from novel aesthetic design. Internal R&D that makes use of the company's acquired expertise is one of the main sources of innovation. It is off the view that an organization's ability to innovate would help it acquire new technologies and expertise in the Asian context, particularly in rapidly modernizing countries like China and Korea. The ultimate aim of the process innovation is to attract new clients from the market (Chenavaz, 2012). Businesses use product innovation in a competitive setting to compete in the market. One of the main elements that contributes to an organization's success is process innovation (Chenavaz, 2012).

H₂: Product Innovation is associated significantly with firm performance (Hassan et al., 2013).

Process innovation is the application of a production or delivery method that is new or significantly improved. Product innovation is defined as bringing significant improvements to the production and logistic methods as well as supporting activities like purchasing, accounting, maintenance, and computing (Falahat, Ramayah, Soto-Acosta, & Lee, 2020). Companies innovate their goods to create novel items, and they also make changes to their production techniques to create the new products (Hang, Sarfraz, Khalid, Ozturk, & Tariq, 2022). Over the past 35 years, the management and innovation of products have received more attention in scientific and management research. This increased interest is largely due to the realization that innovation is essential to an organization's existence.

H₃: Organizational Innovation is positively related with firm Performance.

Hassan et al. (2013) Organizational innovation is characterized as the introduction of new business practices, workplace organization techniques, decision-making frameworks, and external relations management strategies (Hassan et al., 2013). Organizational innovation businesses alter the previously untried organizational strategy. The new organizational approach can be created by the company alone or with the assistance of a third party, and it must be at least new to the organization (Olson, Walker Jr, & Ruekert, 1995; Polder, Leeuwen, Mohnen, & Raymond, 2010). The process of developing new products is inherently an organizational search process, which makes it a crucial component of dynamic capability (Kristiansen & Ritala, 2018). Local or distant organizational searches are both possible, and distant researches are typically far more challenging than local researches. According to several studies, companies do well while searching within their own borders but poorly when searching abroad (Lanzolla, Pesce, & Tucci, 2021; Zhang & Wei, 2022). One of the significant gap between the information held by a focused agent and the knowledge needed to address an issue" (Wang & Chen, 2018). It also reveals the technical knowledge gap that exists between a company's present technological expertise and the technological knowledge needed to build a new product (Wang & Chen, 2018). In the literature, the term "effective distance of knowledge" is also used to describe the "capability gap" (Wang & Chen, 2018).

The obstacles of looking for, finding, and integrating new knowledge might temporarily lower performance when they are brought on by external search and unfamiliarity (Grimpe & Kaiser, 2010). However, in the long term, if businesses don't push the boundaries of their technological knowledge, their technological skills will swiftly lag behind those of the industry, and they would not be able to launch innovative, competitive items on the market. According to (Grimpe & Kaiser, 2010), the process of product innovation is essentially one of firm exploration. Organizational analysis is a procedure through which businesses create and evaluate alternatives. Internal or external searches for managers are both possible, however external searches are typically more difficult than internal ones (Brunswick & Chesbrough, 2018). According to

Sandberg, Kindström, and Haag (2021), innovation is a dynamic capacity that enables an organization to combine, develop, and reconfigure internal and external competencies in order to respond to quickly changing circumstances. According to Kusiak (2009) definition, innovation is a process that aims to produce new goods or services via the application of information that is either new or already known. As a result, it is now a need and is linked to the development, effectiveness, competitiveness, profit growth, and long-term survival of organizations (Yusof & Mohtar, 2016). A positive and significant association between innovation capability and company success was shown in prior research (Jiménez-Jiménez & Sanz-Valle, 2011).

H₄: there is a significant impact of organizational innovation capability on firm performance

Because of shifting business contexts, the concepts of dynamic capacities and firm performance have evolved. According to studies (Samsudin & Ismail, 2019), organizations must create dynamic skills for enhancing core competencies and organizational efficiency in order to maintain a competitive edge in a continuously changing environment. According to this study, dynamic competences have a big impact on organizational effectiveness. However, it is still unknown how dynamic skills relate to organizational effectiveness and performance (Zhou, Zhou, Feng, & Jiang, 2019). However, other studies (Wilden, Gudergan, Nielsen, & Lings, 2013) proposed that capabilities like dynamic allow the firms resource base integration with environmental alterations, offshoot the market changes, promote resource access and resource growth, and, as a result, improve organizational performance. Walsham (2006) says that through building certain talents and competences that support organizational effectiveness and performance, dynamic capabilities enable an organization to attain competitive advantage in a changing business environment. Fainshmidt, Pezeshkan, Lance Frazier, Nair, and Markowski (2016) contend that organizational efficiency is strongly correlated with dynamic skills. Zhou et al. (2019) emphasize that the success of an organization is indirectly impacted by dynamic skills. Organizational effectiveness is significantly impacted by dynamic capabilities. Support the organization's decision-making so that it might potentially improve its efficiency and performance in return. Indeed, there has been a lively discussion about this issue (Barreto, 2010). On the other hand, this study and other academics contend that dynamic skills significantly affect the success of firms. However, it is still unclear how dynamic skills relate to business performance.

Walsham (2006) proposed that dynamic capabilities allow an organization to gain a competitive edge in a changing business environment by building specialized capabilities and competences that enhance organizational effectiveness and performance. According to (Fainshmidt et al., 2016), dynamic competences have a major impact on organizational effectiveness. Dynamic capacities have an indirect effect on the success of the organization, according to researchers (Zhou et al., 2019). The effectiveness of organizations is significantly impacted by dynamic capacities. In exchange, assist in making decisions inside the organization that might improve organizational effectiveness and performance (Barreto, 2010) and (Easterby-Smith, Lyles, & Peteraf, 2009). Indeed, there has been a hot debate around this question (Easterby-Smith et al., 2009). On the other hand, others scholars like (Di Stefano, Peteraf, & Verona, 2014) this study argues that dynamic capabilities have a significant impact on firm performance. But the association among dynamic capabilities and firm performance is till confusing (Zhou et al., 2019). However, some studies like Wilden et al. (2013) proposed that the dynamic capabilities of the firm enable them to integrate their resource base with environmental changes, drive market transformation, and promote resource access and resource development, all of which boost organizational performance (Fainshmidt et al., 2016). The study by (Zhou et al., 2019) emphasize that the development of operational capabilities serves as a mediator between dynamic capabilities and their indirect effects on organizational performance. Many academics have yet to come around to the function and conceptualizations of dynamic capacities that have been articulated (Weerawardena & Mavondo, 2011). As a result, dynamic capabilities concepts are improved upon and expanded.

H₅: Dynamic capabilities have mediating effect on firm performance

Fainshmidt et al. (2016) Dynamic capabilities that bring about change for operational capabilities allow the organization to sustain the statuesque (Helfat, 2007). In 2009, Kusiak. Dynamic capabilities are viewed as a firm's capacity to decisively and systematically generate, enhance, or adjust its operational capabilities in order to attain this purpose (Eisenhardt, Martin, & Martin) and (Helfat, 2007). The relationship between a firm's success and its capabilities is still

not evident, but (Zhou et al., 2019). However, a small number of researchers (Wilden et al., 2013) contend that organizations' dynamic capacities allow them to integrate their resource base with environmental changes, spur market change, and ease resource access and resource growth, all of which improve organizational performance. According to Fainshmidt et al. (2016), the efficiency of an organization is strongly correlated with its dynamic capacities. Researchers have identified, seized, and redesigned dynamic skills as a vital component for company effectiveness in the scientific literature (Easterby-Smith et al., 2009). Various significant studies are documented by the various academics to analyze the influence of dynamic capacities on organizations, and it is established that these effects are both indirect and direct. These investigations by L. Zhou et al., (2014) employing various factors demonstrate the possibility of both a direct and an indirect relationship between dynamic capacity and competitive advantage. As a result, it is crucial to classify factors that influence and are associated with these variables.

4. Methodology

To materialize the rationale of the study pretested closed ended questionnaire was filled by the respondent of said firms for collecting the responses. For compilation of data Cluster sampling technique was used. Further, SPSS and PLS 3.5.V software is used. Structural Equation Modeling is employed with the view to derive the inferential statistics as well as simultaneously for testing the consistency, hypothesis as well as the reliability and validity of the selected items. Ishtiaq (2019) for analysis of the data quantitative method is employed by using the survey technique. The ultimate targeted population were pharmaceutical manufacturing firm's employees particularly in Sindh province of Pakistan. The questionnaires are composed of section: A & B. The section A composed of questions with the view to collect the demographic information of the concerned respondents. The section B based on the items measurement of with the study variables. Five Likert scale was used as measurement scale having the score range from 1 to 5 which indicating strongly disagree to strongly agree.

5. Results and Discussions

Table 1 presents the demographics of the data.

Table 1: Demographic Results

Demographics	Frequency	Percentage
Gender		
Male	210	60.7
Female	121	33.4
Age		
25-30	170	67.1
31 to 40	78	26
41 to 50	47	6.9
51 to 58	36	
Education		
Graduate	143	68.3
Master	137	31.7
M.Phil.	37	11.2
Ph.D.	14	4.2
Job Position		
Manager R/D	37	11.3
Manager Q/C	41	11.8
Manager Q/A	37	10.7
Asstt: Mgrs. R/D	37	10.7
Asstt: Mgrs. Q/C	39	11.3
Asstt: Mgrs. Q/A	40	11.6
Engrs.	50	14.5
Supervisors	48	13.9
Marital Status		
Married	137	50
Unmarried	105	31.7

5.1. Construct Reliability Analysis

Testing the validity of the instruments being used to analyze the responses is necessary prior to analysis (Woollins, 1992). The internal consistency of the construct's components is assessed with the help of Cronbach's alpha reliability test (Vaske, Beaman, & Sponarski, 2017).

There are six constructs and 40 items in this research. The reliability findings for all of the structures are shown in table 2, and they all have exceptional internal consistency, which means that the Cronbach's alpha must be near to 1.00. The results show that all the items associated with their respective constructions are dependable to use in the analysis, as shown in table 2, where the alpha values vary from 0.901 to 0.863. The degree to which a test measurement is repeated is reliability, thus, this study includes the effects of the measuring tool (Al et W, 2021). When creating a measuring instrument, a researcher must ensure that the instrument produces results that are comparable, near to, or even identical to those of the real study. To put it another way, would the instrument yield the same or a comparable result when used by other researchers in the same circumstances and molds. Sika (2000) defined dependability as the consistency among the variables' items (Roberts & Priest, 2006).

The measuring tool's stability, durability, and predictability are demonstrated by its reliability. It is a measurement tool's accuracy. A researcher can quickly assess the dependability of close to four methodologies (Bannigan & Watson, 2009). These include the Cronbach's alpha test, various (alternative) forms, split half approach, and test-retest reliability. The purpose of the Cronbach's Alpha test is to examine the average inter-correlation while also investigating the association and measurement of other measurement items. However, a series of questions are employed in this study to assess an organization's performance, and the data analysis method Cronbach's Alpha is used. The reliability test is run to determine whether the items used to explain the study's components are internally consistent. The majority of the items in this study's items have a Cronbach's alpha reliability of between 0.879 and 0.836, as shown in Graph 01; as a result, the items of the variables are properly defining the related constructs. For discriminant validity, cross factor loadings values and the criterion of (Ritchie, Kirche, & Fornaciari, 2007) are used to analyze construct validity. Factor analysis was conducted using the criteria of factor loading values, which should be more than 0.7 to demonstrate convergent validity (Ritchie et al., 2007).

5.2. Results of Reliability

With N=331 respondent the overall reliability and consistency of the data with 40 items remain 90.1% and items in each variable respectively as under. Results of Average variance extracted = $\frac{\text{Summation of square of the factor's loadings}}{(\text{summation of the square of the factors loading}) + (\text{Summation of the error variance})}$. The reliability of all projected constructs is clearly higher than the needed limit in the graph 3, where Cronbach's alpha values should be greater than 0.700 in accordance with PLS-SEM requirements (Almangoush et al., 2013). The range of between 0.5 and 0.597 also predictable from needed limit 0.500 is the value of the AVE average variance retrieved, which reveals the true convergent validity (Pexman, Siakaluk, & Yap, 2013). Composite construct dependability (Process Innovation = 0.892, Product Innovation = 0.876, Organizational Innovation = 0.911, Organizational Innovation Capability = 0.883, Dynamic Capability = 0.893, and Fir Performance = 0.882) is within and above their acceptable level of 0.700. The analysis's conclusion is that all loading values for measurements are not only valid but also reliable. The presence of convergent validity is demonstrated by the (AVE) average variance extracted, which is greater than the cutoff value of 0.5.

Figure 2: Cronbach's Alpha

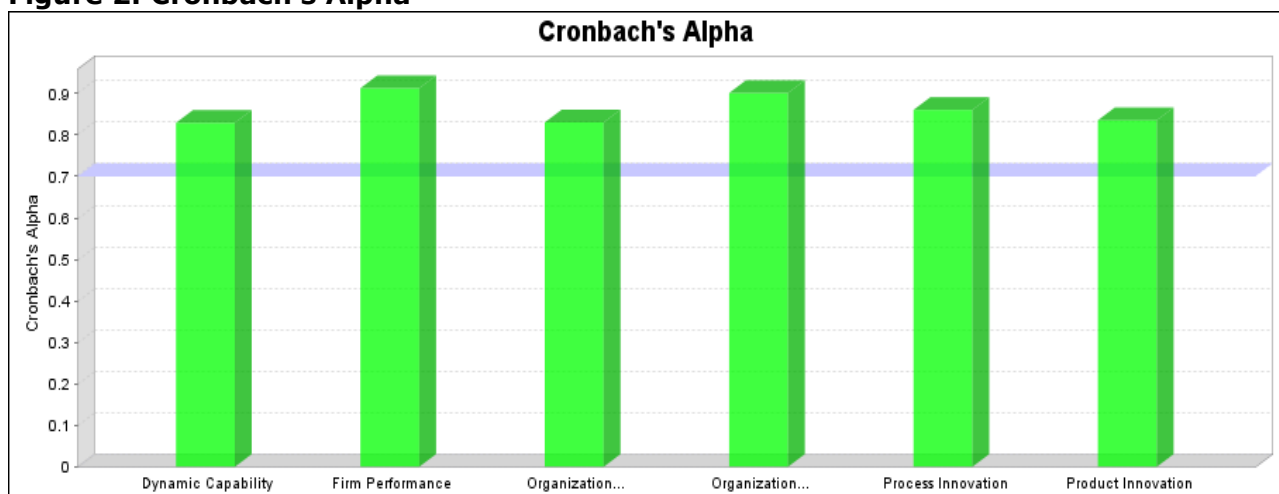


Figure 3: Composite Reliability

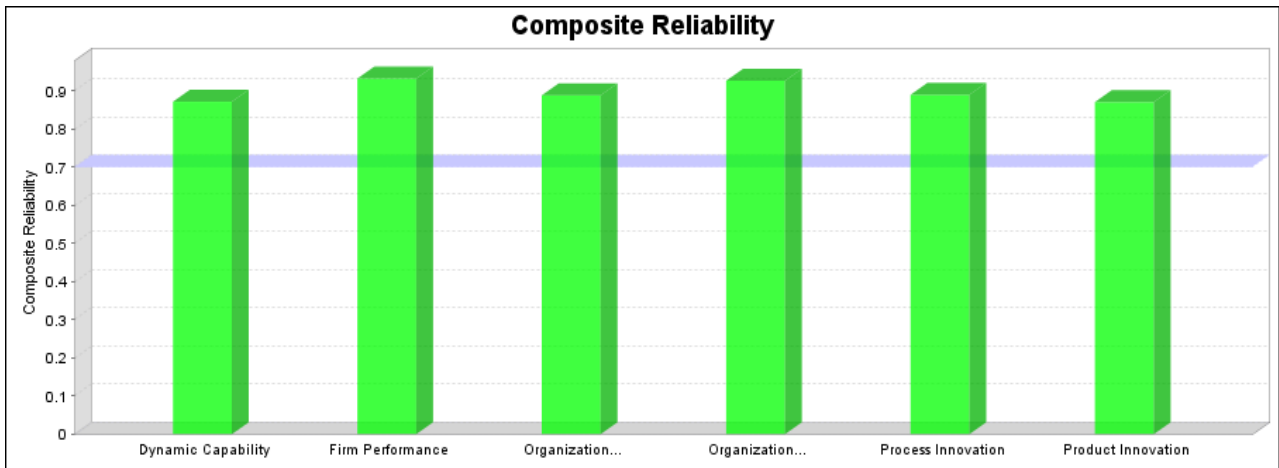
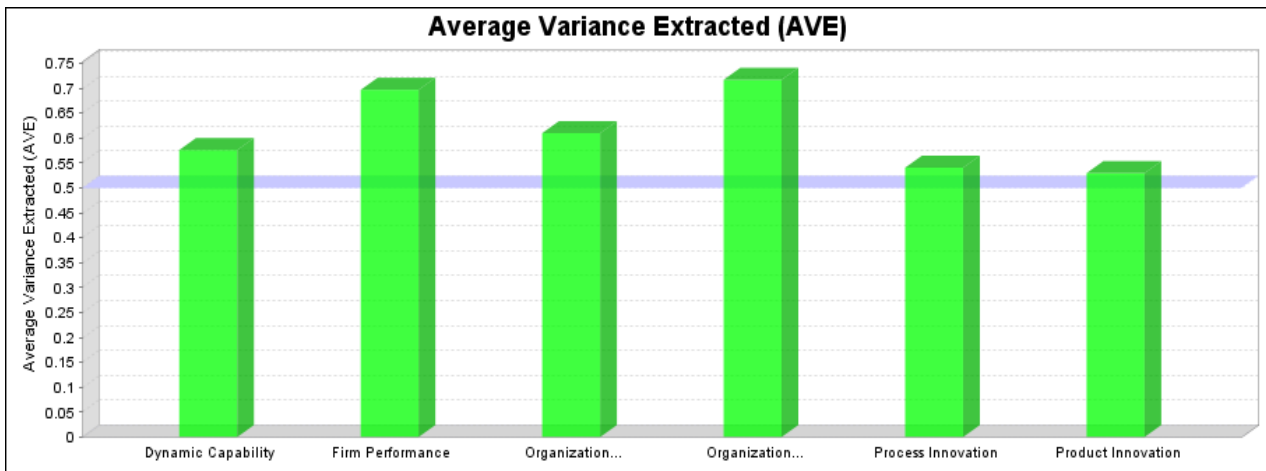


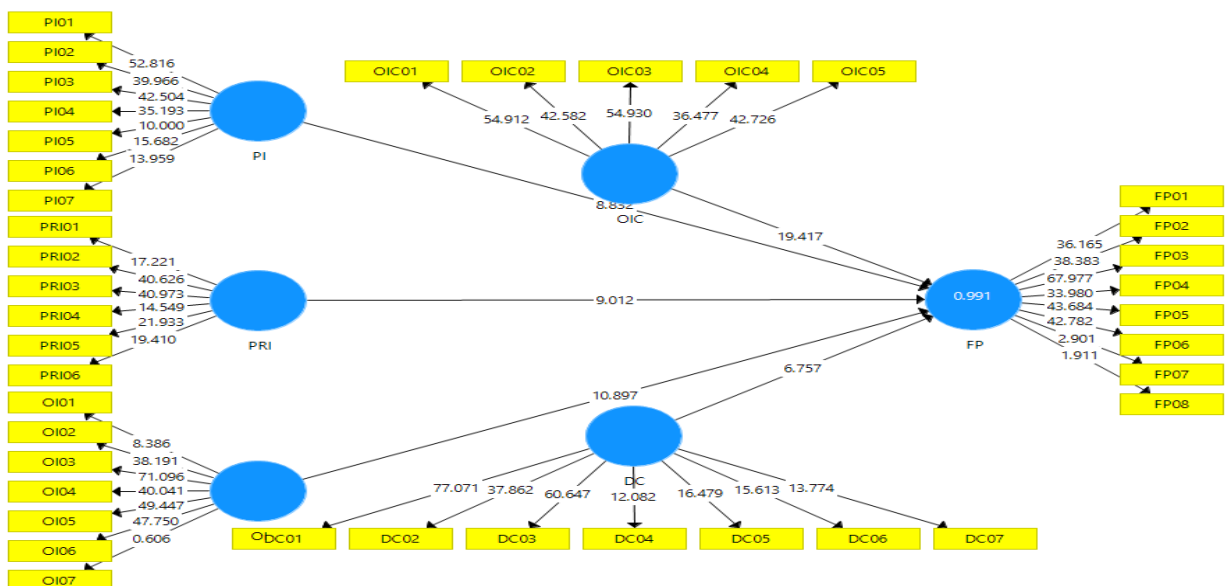
Figure 4: Average Variance



5.3. Path Analysis

Path analysis is a multivariate method for examining the casual relationship between several variables. According to Nitzl, Roldán, and Cepeda (2017) and (Hayes & Preacher, 2014), its purpose is to offer estimates of the size and significance of hypothesized causal associations between sets of variables. Understanding mediating effects is crucial before understanding the importance of assessing them in a PLS-SEM.

Figure 5



According to Sarstedt, Ringle, and Hair (2021) and (Müller, Schuberth, & Henseler, 2018), PLS is a valuable technique for evaluating hypotheses in complicated path models in an explanatory manner. Studies in PLS frequently do not explicitly address mediating effects in their hypotheses or analyze mediating effects in their path models, despite a growing usage and knowledge of mediation effects (Ali et al., 2022). These technical challenges have recently been an active area of research in the field of quantitative techniques, including multiple regression analysis and CV-SEM (Hayes & Preacher, 2014; Rucker, Preacher, Tormala, & Petty, 2011). In recent years, the management and social sciences have embraced PLS, a variance-based structural equation modelling method (Ali, Hussin, Haddad, Al-Araj, & Abed, 2021; Ferreira et al., 2021; Hayes & Preacher, 2014; Müller et al., 2018).

5.4. Results of Direct Effect

The results reveal that organization innovation capability has a significant effect on firm performance as shown in the table 01. A process innovation has positive effect on firm performance, process innovation is significantly associated with firm performance and organization innovation also has significant positive effect on firm performance, dynamic capability is associated significantly with firm performance. Hence, it is clear all IVs are significantly associated with firm performance.

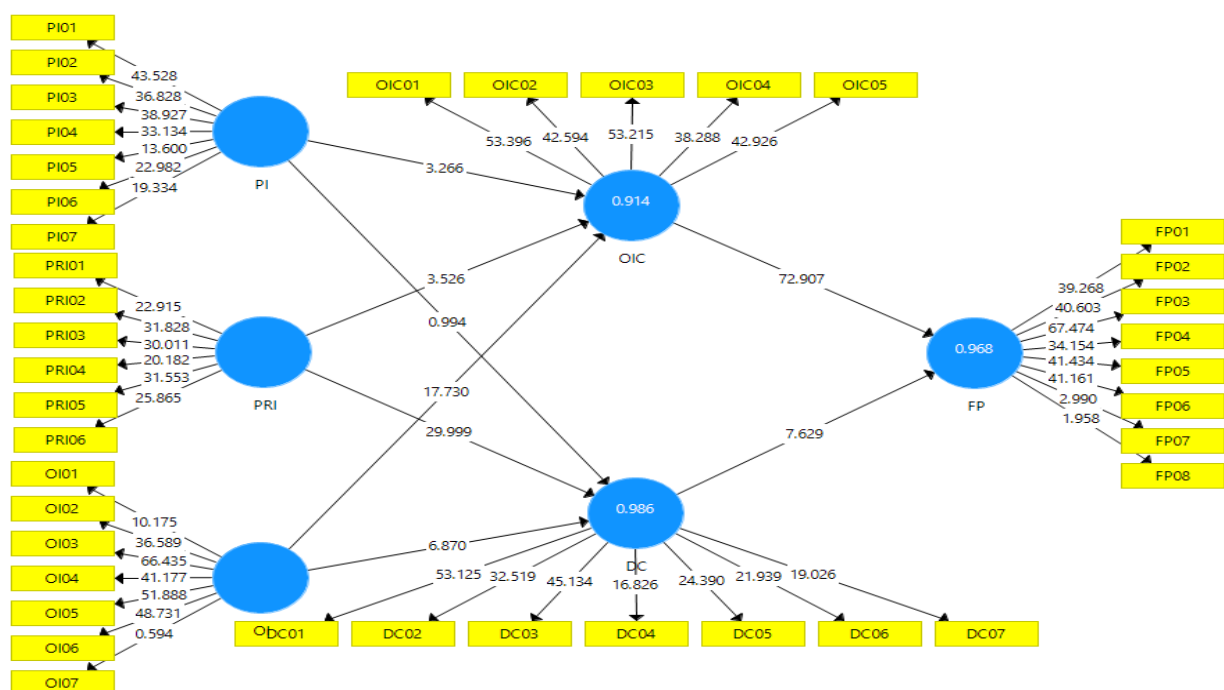
Table 2: Direct Effect

Direct Effects	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
OIC -> FP	0.459	0.46	0.022	21.205	0.000
PI -> FP	0.49	0.487	0.056	8.775	0.000
PRI -> FP	-0.315	-0.314	0.037	8.597	0.000
OI -> FP	0.783	0.785	0.033	23.711	0.000
DC -> FP	0.374	0.378	0.054	6.862	0.000

5.5. Indirect Effect

Mediating indirect impact establish a type of association between constructs which is usually take place in partial least square (PLS) path modeling. From many years testing of mediation, be more and more complicated method. Although, countless scholars are continuing to use old version and technics for testing mediating effect in partial least square (PLS) which leads to flawed outcomes. Partial least square is a variance-based structural equation modeling technique which is become very profound in Management and Social Sciences in current year's (Ferreira et al., 2021).

Figure 6: Results of Indirect Effect



Organizational innovation is indirectly significant with dynamic capability and also dynamic capability is related significantly to firm performance. Product innovation is insignificantly related with dynamic capability and dynamic capability is also insignificantly associated with firm performance. Product process innovation is related significantly with dynamic capability and dynamic capability is associated with firm performance significantly. Organizational innovation is associated significantly with organizational innovation capability and organizational innovation capability related significantly with firm performance. Finally, product process innovation is significantly related with organizational innovation and organizational innovation is significant with firm performance which indicates all the exogenous variables are significant with endogenous variable as shown in the table.

Table 3: Results of Indirect Effect

Constructs	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
OI -> DC -> FP	0.021	0.021	0.004	5.434	0.000
PI -> DC -> FP	-0.005	-0.005	0.005	0.949	0.343
PRI -> DC -> FP	0.096	0.095	0.014	6.727	0.000
OI -> OIC -> FP	0.762	0.764	0.046	16.481	0.000
PI -> OIC -> FP	0.288	0.285	0.087	3.289	0.001
PRI -> OIC -> FP	-0.217	-0.215	0.061	3.549	0.000

- H₁: OI -> DC -> FP. Result shows that organizational innovation has significant positive effect on firm performance through dynamic capability. Partial mediation has been established.
- H₂: PI -> DC -> Pursuits reveals process innovation has not significant effect on firm performance through dynamic capability therefore no mediation established
- H₃: PRI -> DC -> FP. Results indicate product process innovation is significant with firm performance through dynamic capability. Therefore, partial mediation proven.
- H₄: OI -> OIC -> FP. Indicating results reveal that organization innovation is significant positive related with firm performance through organizational innovation capability. Partial mediation is proven.
- H₅: PI -> OIC -> FP. Results show process innovation has significant positive effect on firm performance through organizational innovation. Partial mediation is established
- H₆: PRI -> OIC -> FP. Results expose product innovation is significant positively associated with firm performance through organizational innovation capability. Partial mediation is proven.

5.6. Total Effect and Hypothesis Analysis

As in Figure 7 shows the executed results and Table 3 indicates the reliability statistics also supports path analysis by showing their P-value, path coefficients and T- statistic value. Result indicates that dynamic capability ($\beta=0.054$, and $p\text{-value}=0.000$). Firm performance is related significantly, also organizational innovation is significant to dynamic capability ($\beta=0.028$ $P\text{-value}=0.000$), organizational innovation is associated significantly with firm performance capability ($\beta=0.033$ $P\text{-value}=0.000$), organizational innovation is significant with organizational innovation capability ($\beta=0.028$ $P\text{-value}=0.000$), organizational innovation capability is related with firm performance ($\beta=0.022$ $P\text{-value}=0.000$). Process innovation is significantly related with dynamic capability ($\beta=0.046$ $P\text{-value}=0.000$) and process innovation is insignificant to dynamic capability ($\beta=0.046$ $P\text{-value}=0.337$) and not supported. Process innovation is significant related with firm performance ($\beta=0.056$ $P\text{-value}=0.000$) also process innovation is significantly related with organizational innovation capability ($\beta=0.102$ $P\text{-value}=0.000$), product process innovation is significant with dynamic capability ($\beta=0.102$ $P\text{-value}=0.000$), product process innovation also significant with firm performance ($\beta=0.037$ $P\text{-value}=0.000$). Finally, product process innovation is significantly related with organizational innovation capability ($\beta=0.067$ $P\text{-value}=0.000$) the results are directly supported.

Figure: 7 Results of Total Effect and Hypothesis

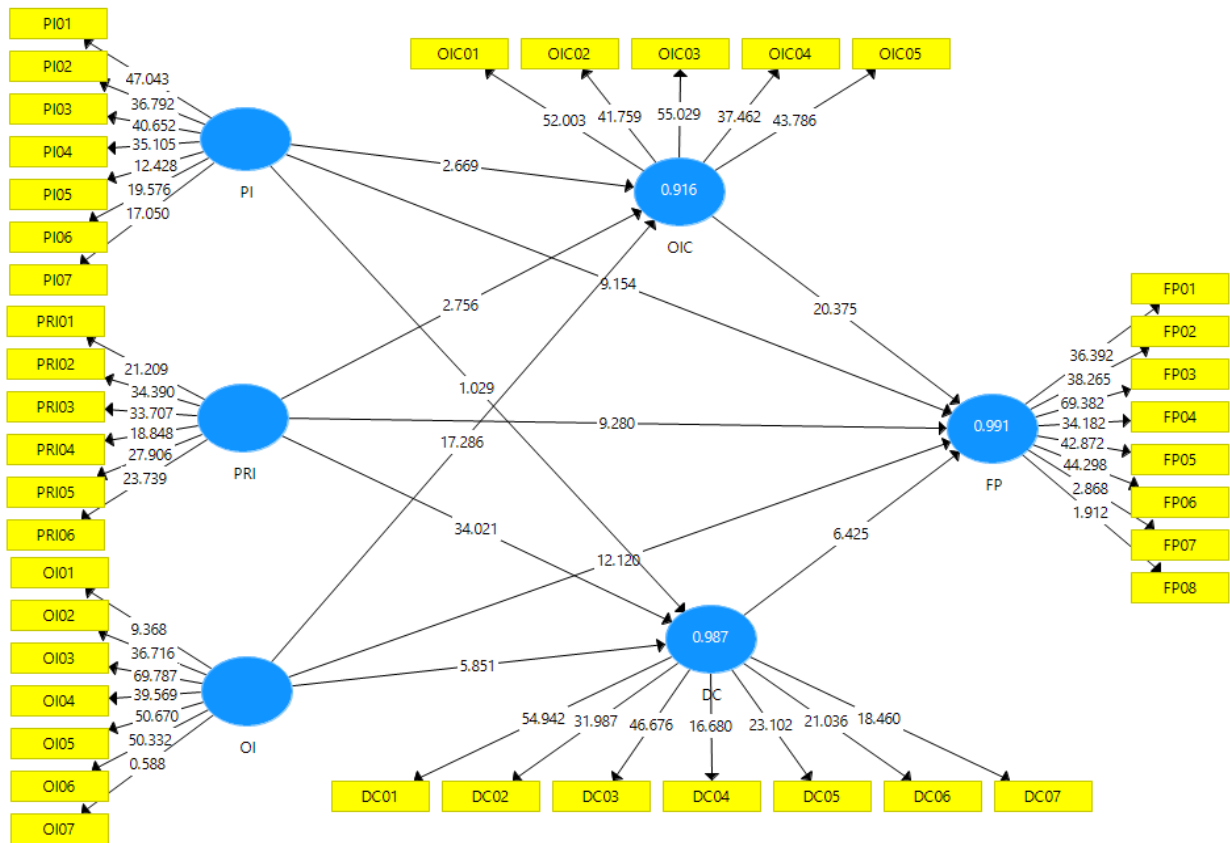


Table 4: Results of Total Effect and Hypothesis

Path	Original	Sample	Mean	Standard	T.	P Values	Supported
Coefficients	Sample	Sample		Deviation	Statistics		
	(O)	(M)					
DC -> FP	0.374	0.378		0.054	6.862	0.000***	Yes
OI -> DC	0.156	0.158		0.028	5.532	0.000***	Yes
OI -> FP	0.783	0.785		0.033	23.711	0.000***	Yes
OI -> OIC	0.842	0.846		0.052	16.261	0.000***	Yes
OIC -> FP	0.459	0.46		0.022	21.205	0.000***	Yes
PI -> DC	-0.044	-0.049		0.046	0.962	0.337	Not
PI -> FP	0.49	0.487		0.056	8.775	0.000***	Yes
PI -> OIC	0.295	0.29		0.102	2.907	0.004***	Yes
PRI -> DC	0.901	0.903		0.025	35.564	0.000***	Yes
PRI -> FP	-0.315	-0.314		0.037	8.597	0.000***	Yes
PRI -> OIC	-0.196	-0.195		0.067	2.923	0.004***	Yes

- H₁: DC -> FP: Dynamic capability has significant positive effect on firm performance. (Proved).
- H₂: OI -> DC: Organizational Innovation has insignificant positive effect on dynamic capability (Proved).
- H₃: OI -> FP: Organizational Innovation has a significant positive effect on firm performance. (Proved).
- H₄: OI -> OIC: Organizational Innovation has significant impact on organizational innovation capability. (Proved).
- H₅: OIC -> FP: process innovation has significant effect on dynamic capability (Proved).
- H₆: PI -> DC: Process innovation has insignificant effect on dynamic capability. (Not proved).
- H₇: PI ->FP: Process innovation has significant positive effect on firm performance (Proved).

- H₈: PI -> Misprocess innovation is associated significantly positive with organizational innovation capability (Proved).
- H₉: PRI -> DC: Product process innovation has a significant positive effect on dynamic capability (Proved).
- H₁₀: PRI -> Product innovation has a significant positive effect on firm performance (Proved).
- H₁₁: PRI -> OIC: Product process innovation has a positive effect on organizational innovation capability (Proved).

6. Conclusion

The outcome indicates that the Process Innovation, Product Innovation and organizational Innovation has a significant positive effect on Firm Performance (Hilman & Kaliappen, 2014). Bloem and Salimi (2022).the results of this study are very precise and tacitly is unique with regard to analysis of direct, indirect and total effect and mediation effect (Hilman & Kaliappen, 2014; Kristiansen & Ritala, 2018). (Bloem & Salimi, 2022; Prifti & Alimehmeti, 2017). The results of the study also support prior analysis of research those were conducted with various approaches to their environment (2016). This study reveals through empirical observation that pharmaceutical manufacturing firms in Sindh Pakistan incorporate, Process Innovation, Product Innovation and Organizational Innovation in operations to enhance firm performance. Explicitly, this research demonstrates, that there is partial mediation of Organizational Innovation Capability and Dynamic Capability is established for further improvement of firm's performance it is recognized by the researchers (Hu, Danso, Mensah, & Addai, 2020).

6.1. Suggestions

The following are few suggestions for firm performance the important and more significant role of Process Innovation, Product Innovation and organizational Innovation is to enhance operational performance of the firm and accomplish excellence and firms frames such type of strategies and policies to mitigate the innovation towards the firms produce an innovative products and service for the accomplishment of maximum competitive advantage. The study recommend that the dynamics of innovation should be administrated and incorporated in pharmaceutical manufacturing firms of Sindh Pakistan.

6.2. Limitations

This study has various boundaries on pharmaceutical manufacturing firms of Sindh. In this regard, upcoming research may be exploring the issues of pharmaceutical manufacturing firms. Moreover, this study analyzed the direct, indirect and total effect of the innovation on firm performance, so in this regard further study could be executed with different variables with mediator and moderator. This study's potential contributions may be hampered by methodological limitations. Obviously, no one is perfect in every way. Its capacity to establish tight causation between variables is constrained since it is a cross-sectional research that present one picture in time. The optimal research may be longitudinal since talents and creativity-innovation develop in a dynamic manner. Future research suggestions include testing the model with factors like entrepreneurial and market orientation, both as mediators and moderators. Innovation and the success of new products are important outcomes that may also be examined seldom by researchers; yet, these restrictions provide up an unanticipated avenue for future study.

6.3. Future direction

Upcoming research could be done on Automobile Manufacturing companies' Cellular companies, in education and hospitals. In future research different data collection methods could be used to improve the response rate. This analysis focusses only the dynamics of innovation on firm performance its effect, unquestionably various factors may affect the performance when such condition occur. This to be considered as a too limitations, however it sure that this current study support to resolve few differences in dynamics of innovation., literature and the association of relationship among innovation and firm performance. The empirical analysis carried out according to sample size and might be affect the results.

References

- Akram, K., Siddiqui, S. H., Nawaz, M. A., Ghauri, T. A., & Cheema, A. K. H. (2011). Role of knowledge management to bring innovation: an integrated approach. *Cell*, 92(333), 6183035.
- Al-kalouti, J., Kumar, V., Kumar, N., Garza-Reyes, J. A., Upadhyay, A., & Zwiendelaar, J. B. (2020). Investigating innovation capability and organizational performance in service firms. *Strategic Change*, 29(1), 103-113.
- Ali, M. A., Hussin, N., Haddad, H., Al-Araj, R., & Abed, I. A. (2021). Intellectual capital and innovation performance: Systematic literature review. *Risks*, 9(9), 170. doi:<https://doi.org/10.3390/risks9090170>
- Ali, M. A., Hussin, N., Haddad, H., Al-Ramahi, N. M., Almubaydeen, T. H., & Abed, I. A. (2022). The Impact of Intellectual Capital on Dynamic Innovation Performance: An Overview of Research Methodology. *Journal of Risk and Financial Management*, 15(10), 456. doi:<https://doi.org/10.3390/jrfm15100456>
- Almangoush, A., Herrington, L., Attia, I., Jones, R., Aldawoudy, A., Aziz, A. A., & Waley, A. (2013). Cross-cultural adaptation, reliability, internal consistency and validation of the Arabic version of the Knee injury and Osteoarthritis Outcome Score (KOOS) for Egyptian people with knee injuries. *Osteoarthritis and Cartilage*, 21(12), 1855-1864. doi:<https://doi.org/10.1016/j.joca.2013.09.010>
- Ambrosini, V., & Bowman, C. (2009). What are dynamic capabilities and are they a useful construct in strategic management? *International journal of management reviews*, 11(1), 29-49. doi:<https://doi.org/10.1111/j.1468-2370.2008.00251.x>
- Bannigan, K., & Watson, R. (2009). Reliability and validity in a nutshell [Electronic Version]. *Journal of Clinical Nursing*. <https://doi.org/10.1111/j.1365-2702.2009>
- Baptista, B., Carapito, R., Laroui, N., Pichon, C., & Sousa, F. (2021). mRNA, a Revolution in Biomedicine. *Pharmaceutics*, 13(12), 2090. doi:<https://doi.org/10.3390/pharmaceutics13122090>
- Barney, J. B. (2001). Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of management*, 27(6), 643-650. doi:<https://doi.org/10.1177/014920630102700602>
- Barreto, I. (2010). Dynamic capabilities: A review of past research and an agenda for the future. *Journal of management*, 36(1), 256-280. doi:<https://doi.org/10.1177/0149206309350776>
- Bigliardi, B., & Filippelli, S. (2022). A review of the literature on innovation in the agrofood industry: sustainability, smartness and health. *European Journal of Innovation Management*, 25(6), 589-611. doi:<https://doi.org/10.1108/EJIM-05-2021-0258>
- Bjornsson, T. D., Callaghan, J. T., Einolf, H. J., Fischer, V., Gan, L., Grimm, S., . . . Ni, L. (2003). The conduct of in vitro and in vivo drug-drug interaction studies: a Pharmaceutical Research and Manufacturers of America (PhRMA) perspective. *Drug metabolism and disposition*, 31(7), 815-832.
- Bloem, V., & Salimi, N. (2022). Role of knowledge management processes within different stages of technological innovation: evidence from biotechnology SMEs. *Knowledge Management Research & Practice*, 1-15. doi:<https://doi.org/10.1080/14778238.2022.2064352>
- Bocquet, R., Le Bas, C., Mothe, C., & Poussing, N. (2017). CSR, innovation, and firm performance in sluggish growth contexts: A firm-level empirical analysis. *Journal of Business Ethics*, 146, 241-254. doi:<https://doi.org/10.1007/s10551-015-2959-8>
- Brunswick, S., & Chesbrough, H. (2018). The Adoption of Open Innovation in Large Firms: Practices, Measures, and Risks A survey of large firms examines how firms approach open innovation strategically and manage knowledge flows at the project level. *Research-Technology Management*, 61(1), 35-45. doi:<https://doi.org/10.1080/08956308.2018.1399022>
- Bughin, J., Deakin, J., & O'Beirne, B. (2019). Digital transformation: Improving the odds of success. *McKinsey Quarterly*, 22, 1-5.
- Chenavaz, R. (2012). Dynamic pricing, product and process innovation. *European Journal of Operational Research*, 222(3), 553-557. doi:<https://doi.org/10.1016/j.ejor.2012.05.009>
- Di Stefano, G., Peteraf, M., & Verona, G. (2014). The organizational drivetrain: A road to integration of dynamic capabilities research. *Academy of Management Perspectives*, 28(4), 307-327. doi:<https://doi.org/10.5465/amp.2013.0100>
- Domokos, A., Nagy, B., Szilagyi, B., Marosi, G., & Nagy, Z. K. (2021). Integrated continuous pharmaceutical technologies—A review. *Organic Process Research & Development*, 25(4), 721-739. doi:<https://doi.org/10.1021/acs.oprd.0c00504>

- Easterby-Smith, M., Lyles, M. A., & Peteraf, M. A. (2009). Dynamic capabilities: Current debates and future directions. *British Journal of Management*, 20, S1-S8. doi:<https://doi.org/10.1111/j.1467-8551.2008.00609.x>
- Eisenhardt, K., Martin, & Martin, J. a. 2000."Dynamic capabilities: what are they?,". *Strategic Management Journal*, 21(10/11), 1105. doi:[https://doi.org/10.1002/1097-0266\(200010/11\)21:10/11<1105::AID-SMJ133>3.0.CO;2-E](https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E)
- Evans, J., Karvonen, A., Luque-Ayala, A., Martin, C., McCormick, K., Raven, R., & Palgan, Y. V. (2019). Smart and sustainable cities? Pipedreams, practicalities and possibilities. In (Vol. 24, pp. 557-564): Taylor & Francis.
- Fainshmidt, S., Pezeshkan, A., Lance Frazier, M., Nair, A., & Markowski, E. (2016). Dynamic capabilities and organizational performance: a meta-analytic evaluation and extension. *Journal of management studies*, 53(8), 1348-1380. doi:<https://doi.org/10.1111/joms.12213>
- Falahat, M., Ramayah, T., Soto-Acosta, P., & Lee, Y.-Y. (2020). SMEs internationalization: The role of product innovation, market intelligence, pricing and marketing communication capabilities as drivers of SMEs' international performance. *Technological Forecasting and Social Change*, 152, 119908. doi:<https://doi.org/10.1016/j.techfore.2020.119908>
- Ferreira, J., Cardim, S., & Coelho, A. (2021). Dynamic capabilities and mediating effects of innovation on the competitive advantage and firm's performance: The moderating role of organizational learning capability. *Journal of the Knowledge Economy*, 12, 620-644. doi:<https://doi.org/10.1007/s13132-020-00655-z>
- Grimpe, C., & Kaiser, U. (2010). Balancing internal and external knowledge acquisition: the gains and pains from R&D outsourcing. *Journal of management studies*, 47(8), 1483-1509. doi:<https://doi.org/10.1111/j.1467-6486.2010.00946.x>
- Hang, Y., Sarfraz, M., Khalid, R., Ozturk, I., & Tariq, J. (2022). Does corporate social responsibility and green product innovation boost organizational performance? a moderated mediation model of competitive advantage and green trust. *Economic Research-Ekonomska Istraživanja*, 35(1), 5379-5399. doi:<https://doi.org/10.1080/1331677X.2022.2026243>
- Hassan, M. U., Malik, A. A., Hasnain, A., Faiz, M. F., & Abbas, J. (2013). Measuring employee creativity and its impact on organization innovation capability and performance in the banking sector of Pakistan. *World Applied Sciences Journal*, 24(7), 949-959. doi:<https://doi.org/10.5829/idosi.wasj.2013.24.07.13253>
- Hayes, A. F., & Preacher, K. J. (2014). Statistical mediation analysis with a multicategorical independent variable. *British journal of mathematical and statistical psychology*, 67(3), 451-470. doi:<https://doi.org/10.1111/bmsp.12028>
- Helfat, C. (2007). Stylized facts, theory development and empirical research in management. *Strategic Organization*, 5, 185-192.
- Hilman, H., & Kaliappen, N. (2014). Do cost leadership strategy and process innovation influence the performance of Malaysia hotel industry? *Asian Social Science*, 10(10), 134. doi:<http://dx.doi.org/10.5539/ass.v10n10p134>
- Hitt, M. A., Bierman, L., Shimizu, K., & Kochhar, R. (2001). Direct and moderating effects of human capital on strategy and performance in professional service firms: A resource-based perspective. *Academy of Management journal*, 44(1), 13-28. doi:<https://doi.org/10.5465/3069334>
- Hu, X., Danso, B. A., Mensah, I. A., & Addai, M. (2020). Does innovation type influence firm performance? A dilemma of star-rated hotels in Ghana. *Sustainability*, 12(23), 9912. doi:<https://doi.org/10.3390/su12239912>
- Hussain, R., Hassali, M. A., Hashmi, F., & Farooqui, M. (2018). A qualitative exploration of knowledge, attitudes and practices of hospital pharmacists towards adverse drug reaction reporting system in Lahore, Pakistan. *Journal of pharmaceutical policy and practice*, 11, 1-10. doi:<https://doi.org/10.1186/s40545-018-0143-0>
- Ishtiaq, M. (2019). Book Review Creswell, JW (2014). Research Design: Qualitative, Quantitative and Mixed Methods Approaches . Thousand Oaks, CA: Sage. *English Language Teaching*, 12(5), 40. doi:<https://doi.org/10.5539/elt.v12n5p40>
- Jiménez-Jiménez, D., & Sanz-Valle, R. (2011). Innovation, organizational learning, and performance. *Journal of business research*, 64(4), 408-417. doi:<https://doi.org/10.1016/j.jbusres.2010.09.010>

- Jotabá, M. N., Fernandes, C. I., Gunkel, M., & Kraus, S. (2022). Innovation and human resource management: a systematic literature review. *European Journal of Innovation Management*, 25(6), 1-18. doi:<https://doi.org/10.1108/EJIM-07-2021-0330>
- Kafouros, M., Love, J. H., Ganotakis, P., & Konara, P. (2020). Experience in R&D collaborations, innovative performance and the moderating effect of different dimensions of absorptive capacity. *Technological Forecasting and Social Change*, 150, 119757. doi:<https://doi.org/10.1016/j.techfore.2019.119757>
- Kremer, M. (2002). Pharmaceuticals and the developing world. *Journal of Economic perspectives*, 16(4), 67-90.
- Kristiansen, J. N., & Ritala, P. (2018). Measuring radical innovation project success: typical metrics don't work. *Journal of Business Strategy*. doi:<https://doi.org/10.1108/JBS-09-2017-0137>
- Kusiak, A. (2009). Innovation: A data-driven approach. *International Journal of Production Economics*, 122(1), 440-448. doi:<https://doi.org/10.1016/j.ijpe.2009.06.025>
- Lanzolla, G., Pesce, D., & Tucci, C. L. (2021). The digital transformation of search and recombination in the innovation function: Tensions and an integrative framework. *Journal of Product Innovation Management*, 38(1), 90-113. doi:<https://doi.org/10.1111/jpim.12546>
- Maeda, Y. (2022). Roles of Sulfites in Reverse Osmosis (RO) Plants and Adverse Effects in RO Operation. *Membranes*, 12(2), 170. doi:<https://doi.org/10.3390/membranes12020170>
- Mirza, A., Abbas, J., & Nawaz, M. A. (2020). Which financial information leads to better market valuation and economic decision making in Malaysian main market listed firms? A value relevance perspective. *Pakistan Journal of Social Sciences*, 40(2), 995-1006.
- Müller, T., Schuberth, F., & Henseler, J. (2018). PLS path modeling—a confirmatory approach to study tourism technology and tourist behavior. *Journal of Hospitality and Tourism Technology*. doi:<https://doi.org/10.1108/JHTT-09-2017-0106>
- Naranjo-Valencia, J. C., Jiménez-Jiménez, D., & Sanz-Valle, R. (2016). Studying the links between organizational culture, innovation, and performance in Spanish companies. *Revista Latinoamericana de Psicología*, 48(1), 30-41. doi:<https://doi.org/10.1016/j.rlp.2015.09.009>
- Nitzl, C., Roldán, J. L., & Cepeda, G. (2017). *Mediation analyses in partial least squares structural equation modeling, helping researchers discuss more sophisticated models: an abstract*. Paper presented at the Marketing at the confluence between entertainment and analytics: Proceedings of the 2016 Academy of Marketing Science (AMS) World Marketing Congress.
- Olson, E. M., Walker Jr, O. C., & Ruekert, R. W. (1995). Organizing for effective new product development: The moderating role of product innovativeness. *Journal of marketing*, 59(1), 48-62. doi:<https://doi.org/10.1177/002224299505900105>
- Ostrom, A. L., Bitner, M. J., Brown, S. W., Burkhard, K. A., Goul, M., Smith-Daniels, V., . . . Rabinovich, E. (2010). Moving forward and making a difference: research priorities for the science of service. *Journal of service research*, 13(1), 4-36. doi:<https://doi.org/10.1177/1094670509357611>
- Pexman, P. M., Siakaluk, P. D., & Yap, M. J. (2013). Introduction to the research topic meaning in mind: Semantic richness effects in language processing. In (Vol. 7, pp. 723): Frontiers Media SA.
- Polder, M., Leeuwen, G. v., Mohnen, P., & Raymond, W. (2010). Product, process and organizational innovation: drivers, complementarity and productivity effects. *CIRANO-scientific publications 2010s-28*.
- Prifti, R., & Alimehmeti, G. (2017). Market orientation, innovation, and firm performance—an analysis of Albanian firms. *Journal of Innovation and Entrepreneurship*, 6(1), 1-19. doi:<https://doi.org/10.1186/s13731-017-0069-9>
- Psomas, K., & Gotzamani, 2018, Wang, & Assad & Alshurideh. (2020). The Impact of Innovation on Firm Performance: A Systematic Review. *International Journal of Innovation, Creativity and Change*, 1-29.
- Ritchie, W. J., Kirche, E., & Fornaciari, C. J. (2007). An Exploration Of Students' Perceptions Of Strategic Management Model Usefulness. *Journal of Applied Business Research (JABR)*, 23(2). doi:<https://doi.org/10.19030/jabr.v23i2.1397>
- Roberts, P., & Priest, H. (2006). Reliability and validity in research. *Nursing standard*, 20(44), 41-46.
- Rucker, D. D., Preacher, K. J., Tormala, Z. L., & Petty, R. E. (2011). Mediation analysis in social psychology: Current practices and new recommendations. *Social and personality*

- psychology compass*, 5(6), 359-371. doi:<https://doi.org/10.1111/j.1751-9004.2011.00355.x>
- Samsudin, Z., & Ismail, M. D. (2019). The concept of theory of dynamic capabilities in changing environment. *International Journal of Academic Research in Business and Social Sciences*, 9(6), 1071-1078. doi:<http://dx.doi.org/10.6007/IJARBS/v9-i6/6068>
- Sandberg, E., Kindström, D., & Haag, L. (2021). Delineating interorganizational dynamic capabilities: A literature review and a conceptual framework. *Journal of Inter-Organizational Relationships*, 27(3-4), 98-113. doi:<https://doi.org/10.1080/26943980.2021.1939224>
- Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In *Handbook of market research* (pp. 587-632): Springer.
- Sarwar, S., Waheed, R., Sarwar, S., & Khan, A. (2020). COVID-19 challenges to Pakistan: Is GIS analysis useful to draw solutions? *Science of the Total Environment*, 730, 139089. doi:<https://doi.org/10.1016/j.scitotenv.2020.139089>
- Saunila, M. (2017). Innovation capability in achieving higher performance: perspectives of management and employees. *Technology Analysis & Strategic Management*, 29(8), 903-916. doi:<https://doi.org/10.1080/09537325.2016.1259469>
- Saunila, M., & Ukko, J. (2012). A conceptual framework for the measurement of innovation capability and its effects. *Baltic Journal of Management*. doi:<https://doi.org/10.1108/17465261211272139>
- Schuirman, D. J. (1987). A comparison of the two one-sided tests procedure and the power approach for assessing the equivalence of average bioavailability. *Journal of pharmacokinetics and biopharmaceutics*, 15, 657-680. doi:<https://doi.org/10.1007/BF01068419>
- Shouyu, C. (2017). *The relationship between innovation and firm performance: A literature review*. Paper presented at the 2017 7th International Conference on Social Network, Communication and Education (SNCE 2017).
- Siewert, M., Dressman, J., Brown, C. K., Shah, V. P., Aiache, J.-M., Aoyagi, N., . . . Burgess, D. (2003). FIP/AAPS guidelines to dissolution/in vitro release testing of novel/special dosage forms. *Aaps Pharmscitech*, 4, 43-52. doi:<https://doi.org/10.1208/pt040107>
- Su, M.-F., Cheng, K.-C., Chung, S.-H., & Chen, D.-F. (2018). Innovation capability configuration and its influence on the relationship between perceived innovation requirement and organizational performance: Evidence from IT manufacturing companies. *Journal of Manufacturing Technology Management*. doi:<https://doi.org/10.1108/JMTM-03-2018-0097>
- Tauqeer, F., Myhr, K., & Gopinathan, U. (2019). Institutional barriers and enablers to implementing and complying with internationally accepted quality standards in the local pharmaceutical industry of Pakistan: a qualitative study. *Health policy and planning*, 34(6), 440-449. doi:<https://doi.org/10.1093/heapol/czz054>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509-533. doi:[https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)
- Tomanna, T., Gerbi, D. Y., Hossin, M. A., & Zhang, S. (2018). Impact of Information System on Transformation of Human Resource Performance: An Exploratory Study in Oromia Radio and Television Organization. *Journal of Human Resource and Sustainability Studies*, 6(01), 37. doi:<https://doi.org/10.4236/jhrss.2018.61025>
- Vaske, J. J., Beaman, J., & Sponarski, C. C. (2017). Rethinking internal consistency in Cronbach's alpha. *Leisure sciences*, 39(2), 163-173. doi:<https://doi.org/10.1080/01490400.2015.1127189>
- Walsham, G. (2006). Doing interpretive research. *European journal of information systems*, 15(3), 320-330. doi:<https://doi.org/10.1057/palgrave.ejis.3000589>
- Wang, T., & Chen, Y. (2018). Capability stretching in product innovation. *Journal of management*, 44(2), 784-810. doi:<https://doi.org/10.1177/0149206315594847>
- Wilden, R., Gudergan, S. P., Nielsen, B. B., & Lings, I. (2013). Dynamic capabilities and performance: strategy, structure and environment. *Long range planning*, 46(1-2), 72-96. doi:<https://doi.org/10.1016/j.lrp.2012.12.001>
- Woollins, J. D. (1992). The preparation and structure of metalla-sulphur/selenium nitrogen complexes and cages. In *Studies in inorganic chemistry* (Vol. 14, pp. 349-372): Elsevier.

- Yusof, K. A., & Mohtar, S. (2016). THE INFLUENCE OF INNOVATION PROCESS ON ORGANIZATION PERFORMANCE: ANTECEDENT AND PERFORMANCE EFFECT. *Journal of Information, 1(2)*, 16-40.
- Zahra, S. A., & George, G. (2002). The net-enabled business innovation cycle and the evolution of dynamic capabilities. *Information systems research, 13(2)*, 147-150. doi:<https://doi.org/10.1287/isre.13.2.147.90>
- Zhang, B., & Wei, Z. (2022). Modeling and Simulation of Emergency Resource Allocation Process Based on Generalized Stochastic Petri Net. *Mobile Information Systems, 2022*. doi:<https://doi.org/10.1155/2022/4979292>
- Zhou, S. S., Zhou, A. J., Feng, J., & Jiang, S. (2019). Dynamic capabilities and organizational performance: The mediating role of innovation. *Journal of Management & Organization, 25(5)*, 731-747.