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Conflict of Interest

The author (s) declared no conflict of interest and have not received any funds for the project.

Antecedents to Firm Performance and the Moderating Role of Environment Turbulence

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Abstract

Innovation is necessary for all industries' growth and sustainability, including the pharmaceutical sector. The study has focused on the pharmaceutical sector of Karachi to examine the impact of product, process, marketing, and organizational innovations on firm performance. It also examined the moderating role of environmental turbulence. The study collected a sample of 423 employees from the target firms. We found: "product innovation, process innovation, marketing innovation, and organizational innovation positively affect firm performance." We also found that (i) environmental turbulence moderates product innovation and firm performance, and (ii) environmental turbulence insignificantly moderates process innovation and firm performance. Past studies exhibit that innovation impacts business performance differently due to intensive competitive markets and environmental influence. Thus, to achieve high business performance, firms must focus on all the dimensions of innovation (i.e., product, process, marketing, and organization). Environmental turbulence, directly and indirectly, affects firm performance. Therefore, firms must deal with it adequately.

Keywords: *Environmental turbulence, product innovation, process innovation, market innovation, organizational innovation, and firm performance.*

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Introduction

Innovation is a key tool for organizations to gain a competitive advantage against their rivals (Cepeda-Carrion et al., 2023). It includes improving marketing, financial, and organizational structures (Dana et al., 2022). Such steps help organizations enhance performance in competitive and uncertain environments (Farida & Setiawan, 2022). It also helps firms enter new markets, enhance market share and ensure long-term success (Suchek et al., 2021). Researchers acknowledge that innovation is important to firms' survival, growth, and sustainability (Wies, Moorman, & Chandy, 2023).

Muneeb et al. (2023) stress that organizations have started spending resources on innovation in the prevailing turbulent and rapidly changing technological environment. Many studies cite that firms face challenges, including international hyper-competition, swift technological changes, and short product life cycles (Crnogaj, Tominc, & Rožman, 2022). Therefore, organizations must focus on innovation to improve performance and sustain their competitive advantage (Farida & Setiawan, 2022). Since the available products and services face vulnerability due to abrupt market changes, manufacturing organizations focus on innovation to cater to customers' needs in a better way (Ahmad et al., 2022; Yahia-Marzouk & Jin, 2022). Organizations and countries with continuous innovativeness are ahead of those who do not invest resources in research and development. Developed countries like Switzerland, Japan, and the USA invest heavily in R&D for economic progress and growth (Blind & Schubert, 2023). Conversely, Pakistan is neither a leader nor an auspicious country in the context of innovativeness (Shahbaz et al., 2022). The severe international competition has motivated organizations to focus on business strategies, particularly innovation (Bähr & Fliaster, 2023). The literature on innovation also claims innovation is vital for the organization's success and sustainability (Elshaer & Marzouk, 2022). Ciasullo and Lim (2022) explain that innovation is a multifaceted phenomenon, and it includes product innovation (Ahsan et al., 2023), process innovation (Chatterjee et al., 2022), marketing innovation (Jeong & Chung, 2023) and organization innovation (Banmairuroy, Kritjaroen, Homsombat, 2022). All these facets, directly and indirectly, affect firms' performance (Farida & Setiawan, 2022). Similarly, Schoemaker and Da (2021) cite that the prevailing turbulent global market environment has forced organizations to evaluate their innovation strategies to gain and sustain their competitive advantage.

Given the importance of innovation, this study examined the impact of product, process, marketing, and organization innovations on firm performance. It also examined the moderating effect of environmental turbulence on (i) product innovation and firm performance and (ii) process innovation and firm promise.

Literature Review

Firm Performance

Researchers have conceptualized firm performance from different perspectives (Yu, 2023). However, most researchers have measured it based on market, finance, and production performance (Dvouletý, Srhoj & Pantea, 2021). Market performance is the most important component of organizational performance. It promotes growth and sustainability in an organization. Without sales of goods and services, the financial and production performance would be irreverent (Khan et al., 2023). It provides inputs to the finance department on pricing and the production department on capacity utilization (Ghardallou, 2022). Financial performance is the core indicator to measure firm performance (Zheng & Iatridis, 2022). It has different indicators, including return on investment (ROI), return on assets (ROA), and enhancement in profit share (Korherr & Kanbach, 2023). Production performance relates to all the production output in a business entity (Otto, Szymanski, & Varadarajan, 2020). It includes capacity utilization and the quality of the output. Factors like R&D and new products also affect production performance (Almashhadani & Almashhadani, 2022). Apart from these factors, quality improvement, cost efficiency, flexibility, and production cycle are important components of production performance (Korherr & Kanbach, 2023). An effective supply chain also relates to production performance (Brahma, Nwafor, & Boateng, 2021).

Product Innovation

Product innovation is necessary for a firm's growth, stability, and competitive advantage (Ahsan et al., 2023). For product innovation, firms must develop an environment that allows employees to give new ideas about changing the specifications of products per customers' needs (Hang et al., 2022). Product innovation also reduces the cost of production (Granja & Moreira, 2023). Many successful firms have a policy that mandates employees to give new ideas about developing new products (Begum et al., 2022). Most of these ideas are often of raw form and have no or little market viability. But, after refinements and discussion, a few turned into viable innovative products (Ali, Wu, & Ali, 2023). Past literature documents that product innovation is positively associated with organizational performance and the motivation of employees (Patmawati, Dewi, & Asbari, 2023). Bhatia and Jakhar (2021) assert that innovation's determinants are efficiency and efficacy, which individuality and collectively affect organizational performance.

Process Innovation

Process innovation improves production and other related processes (Chatterjee, Chaudhuri, & Vrontis, 2022). It improves firms' operational processes, a precursor

of firm performance (Aliasghar, Sadeghi, & Rose, 2023). Saunila. (2020) asserts that process innovations refer to the changes firms bring in tools and techniques to improve operational activities or the delivery method. Firms adopt process innovation to develop or improve existing products by amending the existing operational process or adopting a new operational process (Fianko et al., 2023). Firms can evaluate the effectiveness of the process innovation by measuring customer satisfaction in terms of delivery time and after-sales service (Beltramino et al. 2021). Reljic et al. (2023) believe that firms must develop new operational procedures to stay competitive in the prevailing turbulent environment and to satisfy customers. Similarly, Perez-Alaniz et al.(2023) assert that equipment, employee skills, and efficiency are precursors of process innovation.

Market Innovation

Market innovation changes marketing strategies by altering a firm's marketing mix (i.e., product, price, place, and promotion) to develop new markets and increase market share (Christofi et al. 2021). Jung and Shegai (2023) stress market innovation also includes brand extension, changing or modifying existing products or packaging, or stretching the product upward or downward (Hanaysha et al. 2022). Endorsing the above authors, Jeong and Chung (2023) argue that market innovation requires improving existing marketing strategies by aligning them with customers' needs and firms' long-term objectives. The key to innovative marketing is to keep changing the strategies according to the changes in the business environment and customers' needs (Mabenge, Ngorora-Madzimure, & Makanyeza, 2022). Firms with dynamic and innovative marketing will always have a competitive edge over others and achieve sustainable growth (Henao-García & Cardona-Montoya, 2023). Many past studies show that market innovation and firms' performance positively correlate (Ucm et al., 2022).

Organizational Innovation

Organizational innovation is developing and implementing new business practices and realigning them with external stakeholders' requirements. As a result, it reduces cost and increases efficiency (Heredia et al., 2022; Sonmez-Cakir & Adiguzel, 2023). These new methods and practices are either developed within the organization internally or procured from external sources (Banmairuoy, Kritjaroen, & Homsombat, 2022). Organizational innovation allows firms to compete in a turbulent competitive environment. Farrukh, Raza, and Waheed (2023) believe organizational innovation also aims to cater the needs and demand of customers. As a result it helps firms develop loyal customer base.

Environment Turbulence

In the present era, industries operate in a highly unpredictable environment, which many researchers named environment turbulence. Environment turbulence directly and

indirectly affects firm performance (Zhang et al., 2023). Researchers have categorized environmental turbulence into three sub-dimensions: marketing, technology, and competitive intensity (Ojha et al., 2021). Market turbulence refers to customers’ dynamic changes in their product preferences. Consequently, customers’ demands for new products have increased immensely (Rajala & Hautala-Kankaanpää, 2023). Technological turbulence refers to technological changes in producing goods and services (Arias-Pérez & Vélez-Jaramillo, 2022). Competitive intensity refers to increased competition due to competitors’ promotional and price strategies and new firms’ entrance into the market (Gemici & Zehir, 2023).

Conceptual Framework

The study has adopted the conceptual framework of Turulja and Bajgoric (2019), containing six variables presented in Figure 1.

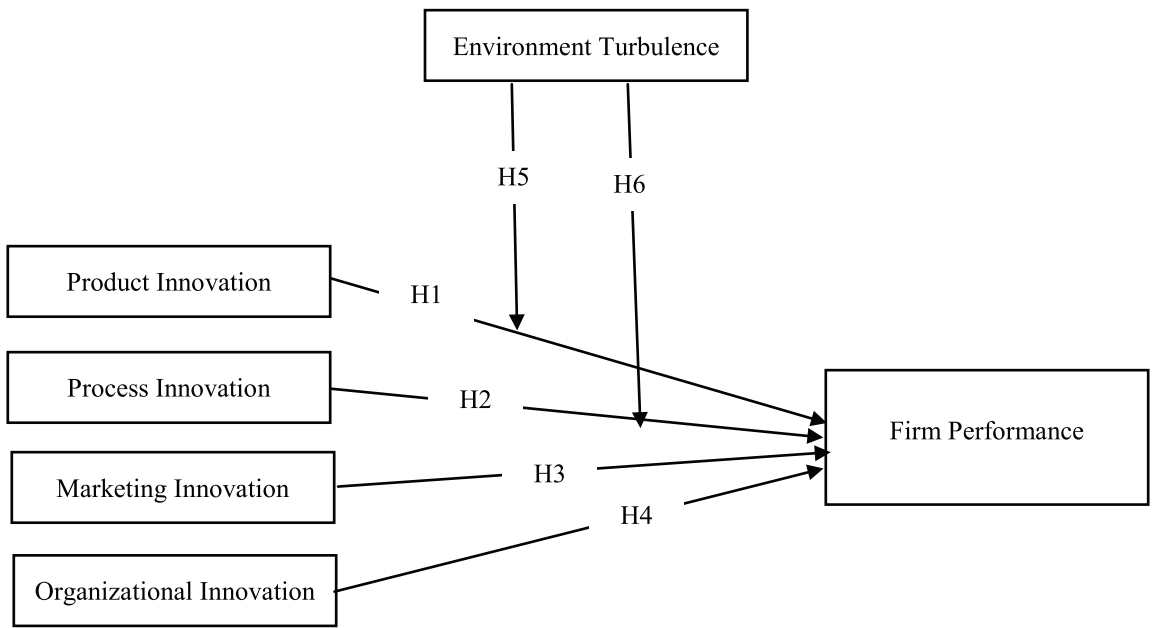


Figure 1 Conceptual Framework

Hypothesis Development

Product Innovation and Firm Performance

Product innovation refers to the changing characteristics of a product and packaging to improve production efficiency and costs (Patroni, Von-Briel, & Recker, 2022; Farrukh,

Raza, & Waheed, 2023). Consequently, it improves sales, market share, and financial performance (Abduvakhidovna, 2023). The prevailing market is dynamic; therefore, consumers' tastes and demands keep changing. The firms need to cater to the changing demands of consumers by launching new and innovative products in the market. This product innovation strategy makes customers happy and they remain loyal to the firms (Banmairuoy, Kritjaroen, & Homsombat, 2022).

Moreover, launching new products in addition to existing customers attracts new customers, increasing the firms' customer base (Sonmez-Cakir & Adiguzel, 2023). A large customer base enhances market share and reduces marketing, production, and other costs. All these factors, individually and collectively, improve firms' performance (Ayinaddis, 2023). Motivation and employee performance are essential precursors of firm performance. In this context, many studies, including Erena, Kalko, and Debele (2023), believe launching new products improves employee engagement and productivity.

H1: Product innovation "positively affects firm performance."

Process Innovation and Firm Performance

Process innovation focuses on improving internal business processes and the quality of goods and services (Tsou & Chen, 2023). Del-Carcio-Gallegos & Miralles (2023) argue process innovation focuses on aligning the production with lean and peak sales, improving total quality management practices. All these factors are essential precursors of firm performance (Junaid, Zhang, & Syed, 2022). Process innovation has a broad horizon, effectively improving all aspects of firm performance, including manufacturing, marketing, and finance (Tsou & Chen, 2023). Compared to other innovations, competitors may find process innovation difficult to copy and imitate. Therefore, performance based on process innovation has more sustainability than other types of innovations (Tariq et al., 2023). Many researchers argue that process innovation continuously improves technological and administrative processes. As a result, it gives a competitive advantage to firms in a dynamic and fast-moving environment (Zheng & Iatridis, 2022). Many researchers, including Cirillo et al. (2023), believe since process innovation is difficult to implement properly, it could have a negative or positive association with the firm performance (Montani et al., 2023). At the same time, many researchers believe that long-term innovativeness improves firm performance, but in the short run, it may cause losses (Adomako & Tran, 2022).

H2: Process innovation "positively affects firm performance."

Marketing Innovation and Firm Performance

The firms must monitor marketing performance continuously. Otherwise, they will lag (Jung & Shegai, 2023). Many past studies found a positive association between marketing innovation and firm performance and suggested business entities must spend resources on innovative marketing to increase their performance (Zheng & Iatridis, 2022). Similarly, other studies have cited that market innovation helps firms create product differentiation, cost efficiency, and long-term competitive advantage (Wang, Guo, & Zhang, 2023). Extant literature also documents that marketing innovations help medium-sized service industries identify and target profitable market segments to increase sales, yielding additional profit (Bhat & Sharma, 2022).

Similarly, market-driven innovation allows firms to modify existing products and services according to customers' needs (Henao-García & Cardona-Montoya, 2023). Familiarity with the target segments enables firms to curtail promotional and other marketing expenses, resulting in customer retention and increased performance (Jeong & Chung, 2023). Researchers believe that short and long-term marketing innovation generates stable returns and steady growth (Montani et al., 2023). Researchers assert that successful firms keep themselves updated on the development of the market and continuously launch innovative products to increase their market share and performance (Tsou & Chen, 2023).

H3: Market innovation "positively affects firm performance."

Organizational Innovation and Firm Performance

Many researchers believe that organizational innovation strongly affects firm performance compared to other innovations (Singh et al. 2022). Similarly, other studies found that organizational innovativeness focuses on management practices. Therefore, it impacts firm performance more than other innovations (Zhong, Sukpasjaroen & Pu, 2023). Extant literature documents that organizational innovation amalgamates technical and non-technical innovational activities (Sonmez-Cakir & Adiguzel, 2023). As a result, firms achieve growth and sustainability (Cao, Le, & Nguyen, 2022; Farrukh, Raza, and Waheed, 2023). Researchers believe firms can handle environmental challenges by incorporating technical and non-technical innovations to achieve organizational goals and sustainability (Barlatier et al., 2023). Similarly, Zhang (2023) argues that organizational innovation gives a competitive advantage to firms, resulting in increased organizational performance (Chaubey, Sahoo, & Das, 2022). Also, organizational innovation promotes novelty in organizational methods and practices, which positively impacts firm performance (Sonmez-Cakir & Adiguzel, 2023).

H4: Organizational innovation "positively affects firm performance."

Moderating Role of Environment Turbulance

Product innovation refers to the changing characteristics of a product and packaging to improve production efficiency and costs (Granja & Moreira, 2023). Consequently, it improves sales, market share, and financial performance. In the present era, industries operate in a highly unpredictable environment, so their performance immensely suffers (Naderpour, 2023). Extending the Contingency Theory, Calantone et al. (2003) and Turulja and Bajgoric (2019) found that environmental turbulence moderates product innovation and business performance. Past studies suggest that innovation impacts business performance differently due to intensive competitive markets and environmental influence. Others, including Zulu-Chisanga et al. (2016), also endorsed that environmental turbulence inversely affects product success and financial performance. Fu et al. (2021), while explaining the association between innovation and firm performance, stress that this association significantly depends on the external environment. Thus, to achieve high business performance, firms must focus on product innovation, process innovation, and environmental turbulence (Zhang, Teng, Le, & Li, 2023).

H5: Environmental turbulence “moderates product innovation and firm performance.”

H6: Environmental turbulence “moderates process innovation and firm performance.”

Methodology

Research Design

The research design used in the study is descriptive and cross-sectional. It is deductive since we, based on the literature, developed the hypotheses, which we tested by collecting data from the pharmaceutical sector of Karachi. Since this study involves the development of research questions and the formation of the hypotheses that we tested through statistical analysis, the current study's philosophical approach is positivism.

Sampling and Population

The population for the current study included all the manufacturing units of the pharmaceutical industry in Karachi, Sindh. We obtained the list of the pharmaceutical industry from the Drug Regulatory Authority of Pakistan (DRAP), sub-office Karachi. It includes the names of operating pharmaceutical units and addresses that help us to distribute the questionnaires. We distributed 500 questionnaires and received 423 with a response rate of 89%, which is appropriate in quantitative research like ours.

Scale and Measures

The study has six latent variables, each with various indicators, discussed in the following section. We measured the responses on “Five Point Likert Scale, with five showing high agreement and one showing low agreement. A summary narration about the scales and measures we adopted are as follows.

Product Innovation Scale

Product innovation refers to the changing characteristics of a product and packaging to improve production efficiency and costs (Granja & Moreira, 2023). Consequently, it improves sales, market share, and financial performance. It has five items adopted from the study of Ellonen et al. (2008).

Process Innovation

Process innovation focuses on improving internal business processes for producing goods and services efficiently (Chatterjee, Chaudhuri, & Vrontis, 2022). Reljic et al. (2023) argue process innovation focuses on aligning production with lean and peak sales, improving total quality management practices. All these factors are essential precursors of firm performance (Aliasghar, Sadeghi, & Rose, 2023). This scale has five items adopted from West and Farr (1990).

Market Innovation

Market innovation changes marketing strategies by altering a firm’s marketing mix (i.e., product, price place, promotion) to identify new markets and increase market share (Mabenge, Ngorora-Madzimure, & Makanyeza, 2022). Jeong and Chung (2023) stress market innovation also includes brand extension, changing or modifying existing products or packaging, or stretching the product upward or downward (Hanaysha et al. 2022). It has five items adapted from Kmiecik et al.(2012).

Organization Innovation

Organizational innovation is developing and implementing new business practices and realigning relationships with external stakeholders to reduce costs and increase efficiency (Heredia et al., 2022). Organizational innovation is necessary for the growth and sustainability of business and non-business entities (Sonmez-Cakir & Adiguzel, 2023). It has nine items adopted from Chen et al. (2016).

Environment Turbulence

In the present era, industries operate in a highly unpredictable environment, so their performance immensely suffers (Zhang et al., 2023). Researchers have categorized environmental turbulence into three sub-dimensions: marketing technology and competitive intensity (Ojha et al., 2021). We adopted seven items to measure environment

turbulence based on the study of Sun (et al., 2023).

Firm Performance

Researchers have conceptualized organizational performance differently (Dvouletý, Srhoj & Pantea, 2021). However, most researchers have measured it based on market, finance, and production performance (Ahsan et al., 2023). The firm performance scale has three sub-dimensions: Production (4 items), Marketing (3 items) and finance (4 items). We adopted these constructs and items based on the study of Gunday et al. (2011).

Pilot Testing

We adopted the questionnaire from previous research work. Therefore, we conducted a pilot study to find the reliability and validity before administering the questionnaire to the target population. The study distributed 20 questionnaires to the respondents in the pharmaceutical industry for the pilot test. We found that the respondents selected for the pilot test did not have difficulty reading and comprehending the wording of the questionnaires. Subsequently, we assessed the instruments' reliability values and found them to be more than 0.70, which is within the acceptable (Aburumman et al., 2022).

Ethical Guidelines

Before administering the survey, we briefed the respondents about the study's objective. We explained the data collection and analysis procedures to the respondents so that they had clarity in responding to the questions in the questionnaire. We also assured the respondents that we would maintain anonymity and confidentiality. We also told the respondent that we would use the data for educational research purposes and would not share the data with any third person. In addition, the respondents used pseudonyms instead of original names to maintain privacy, anonymity, and confidentiality.

Statistical Analysis

Researchers suggest a two-step approach (Santoso, Sunarjo, & Fadli, 2023) in SMART PLS, which is more appropriate than a one-step approach. Following the suggestions of the researcher mentioned above, we adopted a two-step approach (Wong, 2013). First, we generated a measurement model (Ringle et al., 2015) for the results related to reliability and validity (Wong, 2013), followed by the generating structural model (Santoso, Sunarjo & Fadli, 2023) for the hypotheses results.

Results

Measurement Model

Since the study has adopted a two-stage analysis (Wong, 2013), we initially developed a measurement model (Santoso, Sunarjo, & Fadli, 2023), presented in Figure 2, for relevant statistical results.

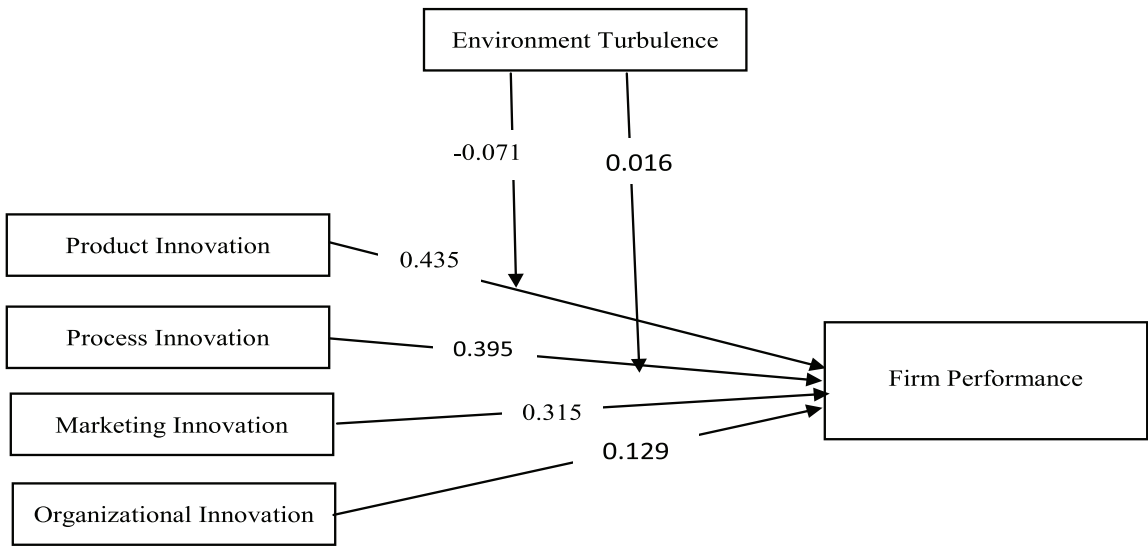


Figure 2: Measurement Model

Convergent Validity

Convergent validity explains the convergence of indicator variables into their respective latent variable. The results presented in Table 1 show that outer loadings, Cronbach’s Alpha values, composite reliability values, and AVE values are within the prescribed range as recommended by Aburumman et al. (2022), suggesting the constructs meet the requirements of internal consistency and convergent validity.

Table 1: Convergent Validity Analysis

Constructs	Items	Outer Loading	Cronbach’s Alpha	Composited Reliability	Average Variance Extracted
Product Innovation	PRI1	0.581	0.735	0.805	0.697
	PI2	0.489			
	PI3	0.645			
	PI4	0.816			
	PI5	0.835			

Process Innovation	PI1	0.575	0.735	0.799	0.699
	PI2	0.602			
	PI3	0.765			
	PI4	0.689			
	PI5	0.768			
Marketing Innovation	MI1	0.531	0.769	0.815	0.796
	MI2	0.764			
	MI3	0.769			
	MI4	0.801			
	MI5	0.774			
Organizational Innovation	OI1	0.631	0.701	0.787	0.869
	OI2	0.731			
	OI3	0.635			
	OI4	0.571			
	OI5	0.663			
	OI6	0.771			
	OI7	0.645			
	OI8	0.628			
	OI9	0.641			
Firm Performance					0.887
Firm Production Performance	FPP1	0.743	0.709		0.603
	FPP2	0.633			
	FPP3	0.782			
	FPP4	0.736			
Firm Market Performance	FMP1	0.743	0.771		0.776
	FMP2	0.744			
	FMP3	0.776			
Firm Financial Performance	FFP1	0.725	0.743		0.865
	FFP2	0.709			
	FFP3	0.834			
	FFP4	0.769			
Firm Turbulence	FT1	0.877	0.805	0.889	0.775
	FT2	0.774			
	FT3	0.649			
	FT4	0.655			
	FT5	0.711			

Discriminant Validity

Discriminant validity suggests how unique (Richter et al., 2023) and distinct (Aburumman et al., 2022) the latent variables used in the study are. The results presented in Table 2 show the summary of the results. The results in Table 2 show that the constructs have acceptable discriminant validity since "Ave Square roots values are more than the Pearson Correlation values."

Table 2: Discriminant Validity

Constructs	PI	PRI	MI	OI	FP	ET
Product Innovation	0.881					
Process Innovation	0.347	0.835				
Marketing Innovation	0.681	0.345	0.885			
Organizational Innovation	0.305	0.514	0.329	0.881		
Firm Performance	0.429	0.309	0.565	0.527	0.884	
Environment Turbulence	0.541	0.468	0.468	0.315	0.502	0.880

Structural Model

In step two, we generated a structural model for the association between latent variables. Refer to Figure 3 for the structural model showing that the study supports four direct and two moderating hypotheses.

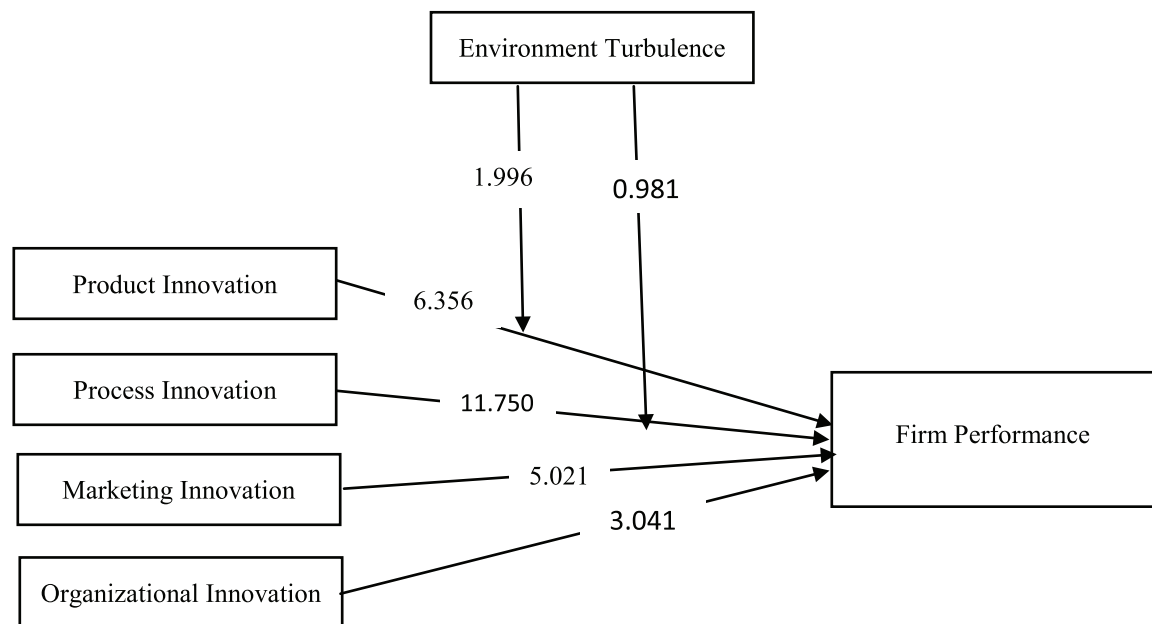


Figure 3 Structural Model

Hypothesis Results

We have summarized the hypothesis results in Table 3, which we proposed based on past theoretical support.

Table 3: Hypotheses Results

Hypotheses	B	T-value	P-value	Results
Product Innovation -> Firm Performance(H1)	0.435	6.365	0.002	Accepted
Process Innovation -> Firm Performance (H2)	0.395	11.750	0.001	Accepted
Marketing Innovation -> Firm Performance (H3)	0.315	5.021	0.003	Accepted
Organization Innovation -> Firm Performance (H4)	0.129	3.014	0.001	Accepted
Product Innovation* Env. Turbulence -> Firm Per. (H5)	-0.071	1.996	0.047	Accepted
Process Innovation* Env. Turbulence -> Firm Per. (H6)	0.016	0.981	0.328	Rejected

The results show that our study supports four direct hypotheses and one moderating hypothesis. However, we rejected 5, which states environmental turbulence moderates process innovation and firm performance.

Discussion and Conclusion

Discussion

The focus of the study was on the pharmaceutical industry in Pakistan. To achieve the study objectives, we proposed six hypotheses and failed to reject five, and rejected one. We have presented hypotheses results and their alignment with past studies in the following paras.

The study accepted Hypothesis 1 ($\beta = 4.35$, $t = 6.35 < 0.05$), stating product innovation positively affects firm performance. The firms need to cater to the changing demands of consumers by launching new and innovative products in the market. This product innovation strategy makes customers happy and they remain loyal to the firms (Banmairuoy, Kritjaroen, & Homsombat, 2022). Moreover, launching new products in addition to existing customers attracts new customers, increasing the firms' customer base (Sonmez-Cakir & Adiguzel, 2023). A large customer base enhances market share and reduces marketing, production, and other costs. All these factors, individually and collectively, improve firms' performance (Ayinaddis, 2023). Motivation and employee performance are essential precursors of firm performance. In this context, many studies, including Erena, Kalko, and Debele (2023), believe launching new products improves employee engagement and productivity.

The study supported Hypothesis 2 ($\beta = 0.395$, $t = 11.75 < 0.05$), which states, "Process

innovation positively affects firm performance." Process innovation has a broad horizon, effectively improving all aspects of firm performance, including manufacturing, marketing, and finance (Tsou & Chen, 2023). Compared to other innovations, competitors may find process innovation difficult to copy and imitate. Therefore, performance based on process innovation has more sustainability than other innovations (Tariq et al., 2023). Many researchers argue that process innovation continuously improves technological and administrative processes. As a result, it gives a competitive advantage to firms in a dynamic and fast-moving environment (Zheng & Iatridis, 2022). Many researchers, including Cirillo et al. (2023), believe since process innovation is difficult to implement properly, it could have a negative or positive association with the firm performance (Montani et al., 2023). At the same time, many researchers believe that long-term innovativeness improves firm performance, but in the short run, it may cause losses (Adomako & Tran, 2022).

The study accepted Hypothesis 3 ($\beta = 0.315$, $t = 5.021 < 0.05$), stating, "Market innovation positively affects firm performance." Extant literature documents that market innovations help medium-sized service industries identify and target profitable market segments to increase sales, yielding additional profit (Bhat & Sharma, 2022). Similarly, market-driven innovation allows firms to modify existing products and services according to customers' needs (Henao-García & Cardona-Montoya, 2023). Familiarity with the target segments enables firms to curtail promotional and other marketing expenses, resulting in customer retention and increased performance (Jeong & Chung, 2023). Researchers believe that short and long-term marketing innovation generates stable returns and steady growth (Montani et al., 2023). Researchers assert that successful firms keep themselves updated on the development of the market and continuously launch innovative products to increase their market share and performance (Tsou & Chen, 2023).

Hypothesis 4 states that "organizational innovation positively affects firm performance," which the study's results support ($\beta = 0.129$, $t = 3.014 < 0.05$). Extant literature documents that organizational innovation amalgamates technical and non-technical innovational activities (Sonmez-Cakir & Adiguzel, 2023). As a result, firms achieve growth and sustainability (Cao, Le, & Nguyen, 2022; Farrukh, Raza, and Waheed, 2023). Researchers believe firms can handle environmental challenges by incorporating technical and non-technical innovations to achieve organizational goals and sustainability (Barlatier et al., 2023). Similarly, Zhang (2023) argues that organizational innovation gives a competitive advantage to firms, resulting in increased organizational performance (Chaubey, Sahoo, & Das, 2022). Also, organizational innovation promotes novelty in organizational methods and practices, which positively impacts firm performance (Sonmez-Cakir & Adiguzel, 2023).

The study supported Hypothesis 5: "Environment turbulence moderates product innovation and firm performance" ($\beta = -0.071$, $t = 1.996 < 0.05$). At the same time, the study rejected Hypothesis 6: "Environment turbulence moderates process innovation and firm performance" ($\beta = 0.016$, $t = 0.981 > 0.05$). Extending the Contingency Theory, Calantone et al. (2003) and Turulja and Bajgoric (2019) found that environmental turbulence moderates product innovation and business performance. Past studies exhibit that innovation impacts business performance differently due to intensive competitive markets and environmental influence. Others, including Zulu-Chisanga et al. (2016), also endorsed that environmental turbulence inversely affects product success and financial performance. Fu et al. (2021), while explaining the association between innovation and firm performance, stress that this association significantly depends on the external environment. Thus, to achieve high business performance, firms must focus on product innovation, process innovation, and environmental turbulence (Zhang, Teng, Le, & Li, 2023).

Conclusion

Innovation is necessary for all industries' growth and sustainability. The study has focused on the pharmaceutical sector of Karachi to examine the impact of product, process, marketing, and organizational innovations on firm performance. It also examined the moderating role of environmental turbulence. Based on a sample of 423 from the target firms, we found: "product innovation, process innovation, marketing innovation, and organizational innovation affect firms' performance." We also found that (i) "environmental turbulence moderates product innovation, and (ii) environmental turbulence insignificantly moderates process innovation and firm performance.

Managerial Implications

In today's turbulent market environment, corporate managers focus on reducing costs and enhancing productivity to generate value propositions for their customers to sustain and maintain a competitive advantage. Based on our results, we recommend that business managers pay extra attention to different innovation types for achieving high performance of organization. In addition, the study further recommends that business managers must involve all the employees to implement innovation strategies. We also suggest that firms must create an environment that encourages employees to share their innovative ideas with all the employees. Such an environment enhances the motivation and engagement of employees and generates positive results in the context of innovation.

Limitations and Future Research

The study focuses on the pharmaceutical industries of Karachi, Pakistan. We invite others to examine the innovational aspects in other industries and cities of Pakistan. A comparative study between the two sectors may bring more insight into the discussed

phenomenon. The study has examined the impact of sub-dimensions of innovation on firm performance. Other studies may examine the indirect effects of these dimensions on firm performance. This study used environmental turbulence as a moderator, which future studies may use as an antecedent to firm performance. The study has examined the moderating role of environmental turbulence on the two sub-dimensions of innovation (i.e., product and process innovations) and firm performance. Future studies may examine the moderating role of environmental turbulence on all innovation factors and firm performance.

Annexure-1

Constructs and Items Used in the Questionnaire

Product Innovation

PI1. Increasing manufacturing quality in components and materials of current products.

PI2. Decreasing manufacturing costs in components and materials of current products.

PI3. Developing newness for current products leads to improved customer satisfaction.

PI4. Developing new products with technical specifications and functionalities differing from the current ones.

PI5. Developing new products with components and materials differing from the current ones.

Process Innovation measure

PI1. Determining and eliminating non-value-adding activities in the production process.

PI2. Decreasing variable cost components in manufacturing processes, techniques, machinery, and software.

PI3. Increasing output quality in manufacturing processes, techniques, machinery, and software.

PI4. Periodically checking whether a firm strategy aligns with the business environment.

PI5. Determining and eliminating non-value-adding activities in the delivery-related process.

Marketing Innovation

MI1. Renewing the design of the current or new products through changes.

MI2. Renewing the distribution channels without changing the logistics processes related to product delivery.

MI3. Renewing the product promotion techniques employed to promote the current or new products.

MI4. Renewing the product pricing techniques employed to promote the current or new products.

MI5. Renewing general marketing management activities.

Organization Innovation

OI1. Renewing the routines, procedures, and processes employed to execute firm activities innovatively.

OI2. Renewing the supply chain management system.

OI3. Renewing the production and quality management systems.

OI4. Renewing the human resource management systems.

OI5. Renewing the in-firm management information system and information-sharing

practice.

OI6. Renewing the organizational structure to facilitate teamwork.

OI7. Renewing the organizational structure to facilitate coordination between different functions, such as marketing and manufacturing.

OI8. Renewing the organizational structure to increase organizational performance.

OI9. Renewing the organizational structure to facilitate strategic partnerships and long-term business collaborations.

Firm Performance

Production Performance

FPP1. Conformance quality.

FPP2. Production cost.

PPP3. Production (volume) flexibility.

FPP4. Production and delivery speed.

Market Performance

FMP1. Customer Satisfaction.

FMP2. Total sales.

FMP3. Market share.

Financial Performance Measure

FFP1. Return on sales (profit/total sales).

FFP2. Return on assets (profit/total assets).

FFP3. General profitability of the firm.

FFP4. Cash flow excluding investments.

Environmental Turbulence

ET1. In our business, customers' product preferences change significantly over time.

ET2. Our customers tend to look for new products all the time.

ET3. Technological changes provide big opportunities in our industry.

ET4. The technology in our industry is changing rapidly.

ET5. Competition in our industry is cutthroat.

ET6. Rating realized profits compared to its main competitors in the past three years.

RT7. Rating realized sales compared to its main competitors in the past three years.

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