

# DRIVING INNOVATIVE PERFORMANCE AND MARKET COMPETITIVENESS THROUGH QUALITY PRACTICES, UNCERTAINTY AND QUALITY IMPROVEMENT: MEDIATING ROLE OF ORGANIZATIONAL LEARNING AND MODERATING ROLE OF FIRM SIZE

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**ABSTRACT:** The primary objective of this study is to investigate the influence of environmental uncertainty and quality on driving both competitiveness and innovation. Additionally, we examine the roles played by organizational learning and firm size in this context. Employing a quantitative research approach, our study is centred on employees within organizations in Saudi Arabia. Data analysis was conducted using SPSS software. Our findings reveal a noteworthy impact of Total Quality Management (TQM) and technology uncertainty on innovation. However, it is important to note that the influence of quality improvement and demand uncertainty was found to be statistically insignificant in this regard. Concerning market competitiveness, we observed significant impacts from quality improvement and technology uncertainty. On the other hand, the effects of demand uncertainty and total quality management on market competitiveness were not statistically significant. Additionally, our study reveals the importance of organizational learning as a mediator and the moderating impact of firm size. This research holds both theoretical and practical significance and provides valuable insights for future research, acknowledging its limitations.

**Keywords:** Quality Practices of Top Management, Demand Uncertainty, Technology Uncertainty, Quality Improvement, Innovation Performance, Market Competitiveness

## 1. Introduction

There is a prevailing consensus that numerous countries are presently expediting technology and scientific progress in order to bolster the overall competitiveness of both-governments and businesses (Deng et al., 2022). Similarly, Saudi Arabia is currently undergoing a swift acceleration of its transition process towards an economic development model, with the aim of enhancing its resources and general economic growth (Al-Hanawi, Khan, & Al-Borie, 2019). The influence of environmental uncertainty on the innovative performance and competitiveness of organisations is significant, as highlighted by Laguir et al. (2022). The uncertainties encountered by organisations arise from several variables at both micro and macro levels. The micro-level changes are driven by various factors, such as shifts in sales and fluctuations in stock prices (Deng et al., 2022).

Numerous prior research have been undertaken to investigate the influence of business uncertainty on innovation (Eastwood & Renwick, 2020; Kafetzopoulos, Psomas, & Skalkos, 2020). Innovation in corporations rises during low economic productivity but declines during high economic productivity. An organization's overall performance, including innovation and competitiveness, relies on evaluating work processes, not just outputs. Efficient performance monitoring and control are crucial. Total Quality Management (TQM) is widely recognised as an exemplary methodology (Oakland, Oakland, & Turner, 2020). Several previous studies have provided evidence in favour of the notion

that TQM has the potential to improve management performance and yield advantageous consequences for the organisation as a whole (Hwang, Yoon, & Choi, 2020). TQM has been identified as a valuable tool for enhancing a business's innovative strategies and overall performance, as evidenced by the research conducted by Khalfallah et al. (2022) and (Yusr et al., 2022).

According to the findings of Abimbola, Oyatoye, and Oyenuga (2020), TQM has been identified as a strategic approach that can confer a competitive edge to businesses in relation to their industry rivals. The TQM method encompasses all functional considerations and leverages the full spectrum of available capital and human resources (Verma et al., 2022). For organizational success, active engagement at all management levels is crucial. Collaboration plays a vital role in efficiently achieving organizational objectives. Environmental uncertainty can impact a corporation's performance significantly. Haarhaus and Liening (2020) suggest that the uncertainty of the environment refers to an individual's sense of their limited ability to accurately forecast the state of the environment.

Ahmed et al. (2022) define ecological uncertainty as the need for information about the surrounding environment, making it challenging to predict future changes. Predictive ability is negatively correlated with ecological uncertainty. According to Deng et al. (2022), there exists a negative correlation between managerial performance and environmental uncertainty. This implies

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that as the amount of uncertainty in the environment increases, the performance of management tends to decrease. The research conducted by Adhikara, MF, and Nur Diana (2022) has revealed that the performance of management is influenced by the unpredictability of the environment.

The study's main goal is to assess how top management's quality practices, along with demand and technology uncertainty and quality

improvement, affect innovation performance and market competitiveness. Additionally, it explores the mediating role of organizational learning and the moderating impact of firm size.

### 2. Literature Review Variable Definitions

Table 2.1 provides an overview of the variables included in the research model for this study, offering their respective roles, definitions, and references.

Table 2.1: Variable definitions

Variable Name	Role	Definition	References
Quality practices of top management	Independent	Practices by top managers related to continuous improvement, customer focus, and data-driven decision making	(Kaynak, 2003)
Demand uncertainty	Independent	Unpredictability in customer preferences, desired product features, and market trends	(Calantone, Garcia, & Dröge, 2003; Gerwin, 1993)
Technology uncertainty	Independent	Unpredictability in the process of technological change	(Song & Montoya-Weiss, 2001)
Quality improvement	Independent	Initiatives to improve product/service quality and process efficiency	(Kaynak, 2003)
Organizational learning	Mediator	Development of new knowledge and insights from experience to enhance organizational practices	(Argote & Miron-Spektor, 2011; Cook & Yanow, 1993)
Innovation performance	Dependent	Development of new products/services and processes	(Alegre, Lapiedra, & Chiva, 2006)
Market competitiveness	Dependent	Firm's competitive position and performance in its markets	(Park & Kwag, 2015)
Firm size	Moderator	Number of employees in the firm	(Trigueiros, 2000)

### Theoretical Background

The Resource-Based View (RBV) provides a powerful theoretical lens to explore the hypothesized links in this research. The RBV theory posits that organisations have the potential to achieve long-term competitive advantage by leveraging resources and talents that possess four key attributes: value, rarity, inimitability, and non-substitutability (Barney, 1991). The possession of unique assets and procedures distinctive to a corporation enables organizations to effectively execute plans that generate value, which are difficult for competitors to imitate.

According to Santos-Vijande, López-Sánchez, and Trespalacios (2012), a number of researchers have proposed that organizational learning possesses the characteristics of a dynamic capability that aligns with the VRIN criteria within the RBV. The process of learning allows organizations to consistently update their capabilities and utilize their knowledge to adapt to evolving circumstances. According to Katila and Ahuja (2002), organizations have the ability to cultivate new goods and processes by engaging in experimentation, reflection, and information transfer. This enables them to effectively adapt and evolve in their respective industries.

The RBV framework suggests that top management's implementation of quality practices, coupled with factors like demand and technology uncertainty, and quality improvement activities, enhances organizational learning. Upper management shapes the learning culture. Uncertain situations require more cognitive processing and knowledge generation. Quality programs facilitate knowledge acquisition and collaborative problem-solving. This learning resource drives product and process innovations, improving company performance.

Organizational learning is conceptualised as a pivotal capability that facilitates the conversion of diverse organisational elements into a source of competitive advantage. Furthermore, the RBV theory recognises that the advantages derived from resources are contingent upon the size and breadth of the organisation (Barney, 1991). Bigger corporations invest in enhancing learning capacities due to surplus resources. Larger organizations benefit more from knowledge because of their scale and complexity. Thus, we hypothesize that firm size positively moderates the impact of learning.

In summary, RBV suggests that organizational learning acts as an intermediary that connects various

organizational factors to performance outcomes. Business size is considered as a contingency factor influencing capability development. The proposed framework clarifies the hypothesized model and its relationships effectively. RBV provides a strong foundation for analyzing the link between organizational learning, innovation, and competitiveness.

### Quality Practices of Top Management and Firm Innovation and Competitiveness

The implementation of quality practises by upper-level management plays a significant role in fostering organisational learning as a dynamic competence. Leaders in organisations develop norms that influence the flow of knowledge and problem-solving capabilities inside the firm by demonstrating a commitment to continuous improvement, customer orientation, and making decisions based on factual information (Singh et al., 2021). The RBV posits that the acquisition of knowledge and skills through learning processes can lead to the development of innovative capabilities and enhanced competitiveness.

The study conducted by Sciarelli, Gheith, and Tani (2020) investigated quality practises across higher education institutions. The researchers discovered that when senior management exhibited strong leadership in relation to quality, it resulted in improved organisational performance by fostering stronger innovative capabilities. The results of this study offer empirical support for the notion that a strong emphasis on top management quality serves as a fundamental catalyst for fostering innovation throughout an organisation. This is achieved through the facilitation of effective organisational learning systems. Singh et al. (2021) conducted a study on Indian enterprises and found that the endorsement of information sharing and active participation in open innovation by senior managers has a positive impact on organisational learning and creativity. Organizations improved innovation by implementing strategies that promoted knowledge sharing, resulting in more innovative products and services. This highlights the importance of leadership's commitment to fostering learning for innovation. Based on the above discourse, the following hypothesis is proposed.

H1: Quality practices of top management have a significant positive impact on innovation performance of firms.

According to Isnaini et al. (2021), their study utilising survey data collected from Indonesian enterprises revealed a favourable relationship between the establishment of a quality-focused organisational culture by leaders and the enhancement of product and service quality. The

establishment of norms by top management pertaining to continual improvement and customer satisfaction significantly influenced the quality of production. The empirical findings validate the notion that placing a strong emphasis on quality within management practises leads to enhanced competitiveness by improving the overall quality standards. The present idea puts up the following hypothesis.

H2: Quality practices of top management have a significant positive impact on the market competitiveness of firms.

### Demand Uncertainty and Firm Innovation and Competitiveness

In situations characterised by uncertainty in the external environment, the importance of knowledge development and flexibility is heightened. The presence of demand uncertainty, which is characterised by unexpected client choices and market trends, necessitates increased levels of innovation and learning. In their study, Li and Zhang (2023) used analytical models to demonstrate that option contracts offer organisations increased flexibility in procurement when faced with supply chain disruptions and demand volatility. The presence of uncertain demand has resulted in an increased emphasis on innovation with a specific focus on enhancing flexibility. According to the findings of Ndubisi et al. (2020), a survey conducted in Malaysia revealed that in situations where enterprises encountered uncertain demand conditions, the presence of complementarity between knowledge and capabilities resulted in increased levels of service innovation. Based on the above discourse, the following hypothesis is proposed.

H3: Demand uncertainty has a significant positive impact on innovation performance of firms.

In their study, Chuang, Oliva, and Heim (2019) did an analysis on retailers in the United States. Their findings revealed that the relationship between demand uncertainty and performance was mediated by leanness. The practise of maintaining minimal inventories necessitated heightened levels of responsiveness, process innovation, and competitiveness in response to fluctuations in demand. The available information suggests that when there is uncertainty in demand, organisations tend to implement process innovations in order to enhance their ability to adapt and be flexible. In their study, Sazvar et al. (2021) conducted optimisation of a pharmaceutical supply chain model and demonstrated that the presence of uncertainty in medicine demand resulted in enhanced levels of creativity and competitiveness. These outcomes were quantifiable through the implementation of green product designs and



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waste reduction activities. The following hypothesis is posited to demonstrate the correlation between uncertainty in demand and competitiveness within the market.

H4: Demand uncertainty has a significant positive impact on the market competitiveness of firms.

### Technology Uncertainty and Firm Innovation and Competitiveness

Existing research provides clear evidence that technical uncertainty stimulates innovation and learning to preserve competitiveness, consistent with RBV logic. Organizations adapt to volatile technology landscapes through knowledge acquisition and innovation. In unpredictable technological progress, updating expertise and consistent innovation are vital for effective adaptation. Nickel (2020) indicated that when faced with technological uncertainty, individuals are motivated to engage in learning activities to better understand the potential repercussions and develop innovative solutions. The empirical study conducted by Bolli, Seliger, and Woerter (2020) provided evidence that the presence of diverse technical knowledge within German firms positively influenced their innovation performance, particularly in the context of technological uncertainty. Organisations utilised diverse knowledge resources in order to produce novel ideas in the face of uncertain technology environments. The following hypothesis is hereby offered.

H5: Technology uncertainty has a significant positive impact on innovation performance of firms.

Dagnino, Picone, and Ferrigno (2021) after conducting an extensive literature review, it was determined that technology turbulence forces firms to engage in rapid innovation and seek temporary advantages during periods of disruption. In the face of technological uncertainty, maintaining competitiveness necessitated a continuous cycle of innovation. Das, Kundu, and Bhattacharya (2020) identified that technology adaptation played a crucial role in the survival and competitiveness of SMEs in developing countries undergoing technical change. Firms that actively embraced and integrated new technologies demonstrated greater resilience in volatile environments. Consequently, it can be hypothesized that:

H6: Technology uncertainty has a significant positive impact on market competitiveness of firms.

### Quality Improvement and Firm Innovation and Competitiveness

Zhu et al. (2023), in their study utilizing data from Chinese firms, observed that environmental regulations enforced

process enhancements that resulted in the development of higher-quality green innovations. The requirement for compliance stimulated alterations that concurrently improved both quality and innovation. Rammer (2022) as indicated in German firm surveys, established that process innovations with a quality-oriented focus led to progressive improvements in product quality over time. The ongoing enhancements in processes, driven by a culture of learning, had a positive impact on product outcomes and were associated with heightened innovativeness. Consequently, it can be hypothesized that:

H7: Quality improvement has a significant positive impact on innovation performance of firms.

According to Hu, Pan, and Huang (2020), the findings indicate that enterprises operating under regulatory oversight demonstrated a higher level of innovation in their efforts to enhance environmental quality. The implementation of constraints led to modifications in the process, resulting in improvements in quality. In a survey conducted by Daengs et al. (2020), it was found that the implementation of quality-focused process changes resulted in enhanced competitiveness for food exporters in Indonesia. The augmentation of process attributes has resulted in an increase in relative advantage. Therefore, it can be postulated that the competitiveness of enterprises may be influenced by enhancements in quality, as postulated in the following hypothesis.

H8: Quality improvement has a significant positive impact on market competitiveness of firms.

### Mediation of Organizational Learning

The phenomenon of organisational learning can provide insights into the relationship between quality practises, uncertainty, process improvements, and their impact on innovation and competitiveness. The RBV theory asserts that learning is a dynamic capability that has the power to convert many organisational inputs into performance outcomes. Numerous empirical investigations have demonstrated the role of organisational learning as a mediator. In their study, Shuaib and He (2023) examined the impact of overall quality management practises on innovation through the mechanism of learning. The research was conducted within the context of Nigerian manufacturing enterprises. The acquisition of information derived from high-quality programmes facilitated the development of novel goods and processes. In a study conducted by Masoudi (2021), it was demonstrated that the implementation of total quality management practises in Iranian small and medium-sized enterprises (SMEs) resulted in a significant improvement in innovation

outcomes. This improvement resulted from increased organizational learning, driven by a commitment to ongoing enhancement that promoted knowledge exchange and innovation.

The study conducted by Makhloufi et al. (2021) provided empirical evidence on the relationship between entrepreneurial orientation and innovation capability in Algerian enterprises. The findings of the study revealed that entrepreneurial orientation positively influenced innovation capability by enhancing absorptive capacity and organisational learning. The acquisition of knowledge through the act of taking risks, along with a propensity for invention, served as catalysts for subsequent advancements. Do et al. (2022) studied Vietnamese enterprises and discovered that initiatives related to resources and capacities significantly enhanced resilience and fostered innovation by facilitating organizational learning, driven by strategic investments that generated innovation. Ferreira, Cardim, and Coelho (2021) found that dynamic skills significantly impact innovation and performance in the Portuguese hotel industry by facilitating learning processes. Performance improvements are linked to the acquisition of knowledge for reconfiguring capabilities. The study confirms that organizational learning plays a vital role in transforming various organizational aspects, enhancing innovation and competitiveness, aligning with mediation logic.

Based on the RBV framework, organisational learning plays a crucial role in facilitating the adaptation of firms to uncertain demand situations through the augmentation of market knowledge, flexibility, and responsiveness. Amid volatile client preferences, organizations can better grasp customer needs by using learning mechanisms like innovation and process modifications. Aligning products with changing demand signals reveals how unpredictability requires increased innovation. Learning connects demand uncertainty with innovation performance.

H11: Organizational Learning mediates the effect of Demand uncertainty on innovation performance of firms.

Furthermore, the RBV posits that the process of learning enables enterprises to effectively adapt to unpredictable market conditions by facilitating the distribution of market information inside the organisation. This, in turn, enhances the organization's ability to make its operations and products more responsive to the ever-changing demands of the market. This enables the adaptation to changes in customer preferences, hence improving the relative competitiveness within the market. The process

of learning entails the ability to establish a connection between the volatility of demand and the competitiveness of the market.

H12: Organizational Learning mediates the effect of Demand uncertainty on Market competitiveness of firms.

Moreover, the RBV theory argues that the presence of technology uncertainty serves as a catalyst for knowledge generation and learning, enabling organisations to adapt to change and exploit temporary advantages through innovation, so outperforming competitors. In response to the unpredictable nature of technological advancements, companies adopt proactive measures by engaging in signal scanning, information synthesis, and exploration of innovative solutions, facilitated by the process of learning. The facilitation of innovation performance is enhanced in situations where there is uncertainty surrounding technology.

H13: Organizational Learning mediates the effect of Technology uncertainty on innovation performance of firms.

Similarly, the RBV posits that organisational learning plays a crucial role in enabling firms to effectively adjust their offers and processes in response to unforeseen technological advancements. This is achieved through the dissemination of new technical knowledge throughout the whole organisation. The ability to sustain competitiveness in the face of fast change is achieved through the implementation of product and process innovation. The acquisition of knowledge serves as a means to mitigate the disparity between technological ambiguity and market effectiveness.

H14: Organizational Learning mediates the effect of Technology uncertainty on Market competitiveness of firms.

The RBV also posits that the enhancement of processes has a significant impact on results through the integration of learning into operations and services. The implementation of quality initiatives fosters a process of exploring and critical thinking, leading to the acquisition of knowledge in the areas of enhancing products and services, as well as improving overall efficiency. This phenomenon is characterised by the emergence of highly innovative solutions that effectively address the needs and preferences of the market. The acquisition of knowledge establishes a correlation between the emphasis on excellence and the generation of novel ideas.

H15: Organizational Learning mediates the effect of Quality improvement on innovation performance of firms.

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In a similar vein, the RBV theory argues that the acquisition of knowledge derived from a focus on quality serves to embed optimal strategies throughout a company's various functions and product offerings, so improving the consistent provision of value that customers expect. This enhances the level of relative market competitiveness. The acquisition of knowledge and skills plays a crucial role in facilitating the adoption of effective strategies and enhancing competitiveness.

H16: Organizational Learning mediates the effect of Quality improvement on Market competitiveness of firms.

**Moderation of Firm Size**

The RBV theory posits that the value obtained from organisational skills is influenced by factors such as the size and breadth of the enterprise. Larger corporations possess a more advantageous position in utilising knowledge acquisition for the purposes of innovation and performance enhancement, mostly owing to their possession of ample surplus resources. According to the study conducted by Kijkasiwat and Phuensane (2020), it was observed that in Thai manufacturing organisations, the relationship between knowledge and performance was mediated by organisational innovation. Significantly, this phenomenon exhibited greater intensity within medium and large-scale firms. The effectiveness of innovation processes in leveraging learning is enhanced when organisations possess greater resources. The study conducted by Noone,

Lin, and Sharma (2022) utilised data from hotels in the United States to demonstrate that incremental innovation had a favourable impact on performance amongst the COVID-19 pandemic. However, the researchers found that this effect was more pronounced in larger hotels. The ability of hotels to adapt and innovate has been significantly enhanced through the process of learning, particularly when operating at a larger scale. *In a study conducted by Corvino et al. (2019), it was discovered that relational capital has a favourable influence on performance in four European countries.*

Furthermore, the relationship between relational capital and performance was found to be reinforced by business size. Larger corporations experienced more benefits by capitalising on their internal and external ties and knowledge. The empirical evidence substantiates the notion proposed by the RBV that business size has a moderating impact on the linkages between capabilities and performance. Larger enterprises possess a larger capacity to effectively convert acquired information into innovation and competitive advantage when compared to smaller enterprises, mostly due to their enhanced resource base, which enables them to fully leverage their knowledge assets. Hence, the aforementioned hypothesised moderating impact is strongly substantiated.

H17: Firm size moderates the effect of organizational learning on innovation performance of firms.

H18: Firm size moderates the effect of organizational learning on Market competitiveness of firms.

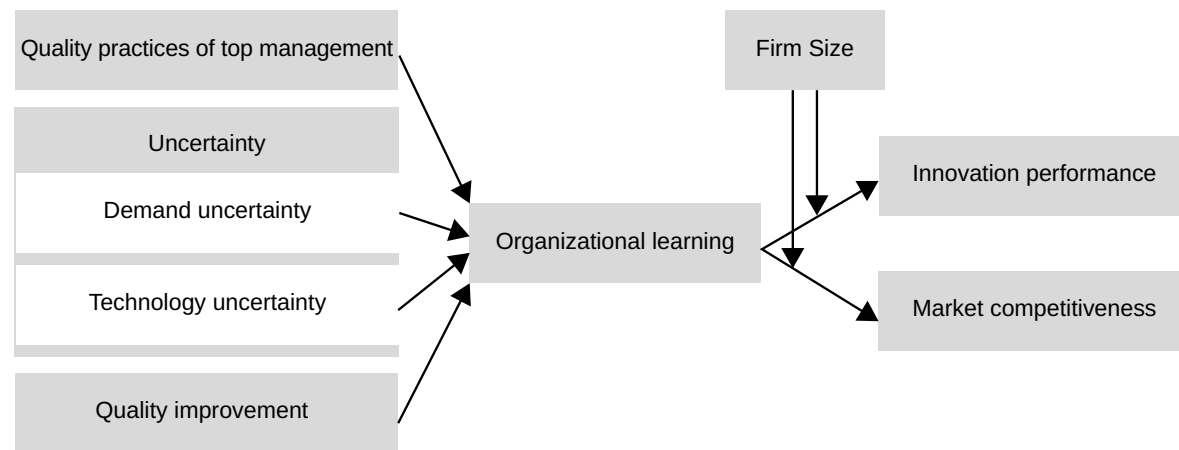


Figure 2.1: Research Model

**3. Method**

**Strategy and Procedure of Sampling**

The study's foundation is rooted in the positivist philosophy, and the researchers have employed a deductive technique to test certain hypotheses. This has been accomplished

through the utilisation of a quantitative primary data gathering methodology. The survey tool developed by the researchers for data collecting has been thoroughly described in the following parts. In order to gather data, the researchers opted for Saudi Arabia as the research

context and focused on the organisational sector as the population pool. The target population consisted of employees within the selected organisations. However, due to the unavailability of information regarding the exact population size, it was not feasible to access respondents from an unknown population. Consequently, the researchers limited the data collection strategy to the utilisation of a non-probability purposive sampling technique, specifically targeting the employees who are qualified to answer the questionnaire in the organizations.

**Method of Data Collection**

The researchers have exclusively utilised online and self-administered data collection methods in order to increase the diversity of replies and ensure the validity of the collected data for generalisation purposes. The utilisation of this particular method of data collecting has additionally enabled researchers to engage with respondents who are otherwise difficult to approach due to their geographical spread across numerous regions inside Saudi Arabia.

**Measures Adopted for the Constructs**

The researchers conducted an extensive review of the literature and identified the following studies from which scales were borrowed for this study:

- TQM was assessed using a set of five items sourced from a previous study (Fotopoulos & Psomas, 2010).
- The measurement scale for quality improvement, which served as the independent variable in this study, was derived from the same aforementioned study. A total of five items were borrowed for this purpose.
- Environmental uncertainty was facilitated with a 7-item scale borrowed from (Chen et al., 2019). The scale has statements like "Customer tended to look for new products all the time in our market".

- To measure the mediating variable of organizational learning in this study, a scale consisting of four items was employed. These scale items were adapted from a study conducted by (Tu & Wu, 2021).
- The moderating variable, firm size, was categorized into three parameters representing small, medium, and large-sized firms. This classification was adopted from a study conducted by (Yang & Wang, 2023).
- The initial dependent variable in this study, which pertains to innovative performance, was measured using a scale consisting of three items obtained from a recent study conducted by (Chai et al., 2020).
- The second dependent variable, focused on market competitiveness, was assessed using a scale comprising five items borrowed from a very recent study conducted by (Adomako & Tran, 2022).

**4. Analysis Descriptive Statistics**

In order to confirm the normality of data and examine the presence of outliers, descriptive statistics were examined (Shukor, 2021). Descriptive statistics play a crucial role for researchers in organizing and summarizing complex datasets, facilitating a more comprehensible and meaningful understanding of the data. Generally, descriptive statistics test includes values of "minimum, maximum, mean, standard deviation and skewness". The results of descriptive statistics are provided in table 4.1 below. The minimum values of OL, TQM, QIM, INN, MC, DU, TU and FS are 1.20, 1.20, 1.00, 1.00, 1.00, 1.00, and 1.00. Their maximum values are 5.00, 5.00, 5.40, 5.00, 5.00, 5.00, and 3.00. The values of mean of OL, TQM, QIM, INN, MC, DU, TU and FS are 3.79, 3.73, 3.44, 3.44, 3.43, 3.53, 3.89 and 2.21. The values of standard deviation of OL, TQM, QIM, INN, MC, DU, TU and FS are 0.92, 0.87, 0.86, 1.08, 1.25, .098, 0.88 and 0.63 respectively.

Table 4.1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
OL	200	1.20	5.00	3.7980	.92209
TQM	200	1.20	5.00	3.7380	.87268
QIM	200	1.00	5.40	3.4470	.86402
INN	200	1.00	5.00	3.4433	1.08186
MC	200	1.00	5.00	3.4310	1.25199
DU	200	1.00	5.00	3.5350	.98276
TU	200	1.00	5.00	3.8900	.88924
FS	200	1.00	3.00	2.2100	.63078
Valid N (listwise)	200				

Note: "QIM=quality improvement, TQM= Total Quality Management, DU=demand uncertainty, TU=technology uncertainty, INN IP=innovation performance, MC= Market Competitiveness, OL=organisational learning, FS=firm size."

**Correlation Analysis**

A statistical technique that demonstrates the degree

of association between two variables in a study is described by Aggarwal and Ranganathan (2016). If



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the value of correlation analysis falls between -1 and +1, it is considered to be as a perfect correlation. Results of correlation analysis is provided in table

4.2, from the table it has been observed that the analysed variables are correlated significantly as represented with \*\*.

Table 4.2: Correlation

	FS	OL	TQM	QIM	INN	MC	DU	TU
FS	1							
OL	.374**	1						
TQM	.411**	.757**	1					
QIM	.419**	.703**	.708**	1				
INN	.437**	.602**	.648**	.526**	1			
MC	.069	.330**	.256**	.314**	.165*	1		
DU	.388**	.631**	.653**	.901**	.514**	.284**	1	
TU	.373**	.821**	.873**	.679**	.628**	.281**	.627**	1

Note: "QIM=quality improvement, TQM= Total Quality Management, DU=demand uncertainty, TU=technology uncertainty, INN=innovation performance, MC= Market Competitiveness, OL=organisational learning, FS=firm size."

R-square

The coefficient of determination, commonly referred to as R-square, quantifies the proportion of variance in the dependent variable that can be explained by the predictors (Adeboye, Fagoyinbo, & Olatayo, 2014). The study has examined the r-square (coefficient of determination) for both models; one with predictors as (Constant), TU, DU, TQM, QIM and other with predictors as (Constant), MC, TU, DU, and QIM. The results of the R-squared analysis are displayed in Table 4.3. The variance in model 1 accounts for 44.7% of the observed data, while in model 2, the variance explains 78.7% of the observed data.

Table 4.3: R-square

R	R Square	Adjusted R Square	Std. Error of the Estimate
Model 1			
.669 <sup>a</sup>	.447	.436	.81279
Model 2			
.887 <sup>a</sup>	.787	.782	.40702

Hypotheses Testing

The study comprised a total of eight direct hypotheses,

and the analysis of these hypotheses was carried out using SPSS. The outcomes of hypothesis testing are displayed in Table 4.4. In Model 1, the direct hypotheses are presented with the dependent variable being innovation performance, while in Model 2, the direct hypotheses are presented with the dependent variable being market competitiveness. The hypotheses were accepted with a level of significance at 95% i.e., p-value≤0.05. In model 1, the association between TQM and INN is significant (p-value=0.002), and the relationship between TU and INN is also significant (p-value=0.036). However, the association between QIM and INN, and DU and INN were found to be insignificant with their p-values 0.764 and 0.178 respectively.

In model 2, the association between QIM and MC was supported (p-value=0.012), also the association between TU and MC was accepted (p-value=0.000); but the relationship between DU and MC was insignificant (p-value=0.835), and the relationship between TQM and MC was also not supported (p-value=0.617).

Table 4.4: Hypotheses Testing

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta			
Model 1 – dependent variable INN							
1	(Constant)	.177	.272			.650	.516
	TQM	.450	.143	.363		3.147	.002
	QIM	-.050	.165	-.040		-.300	.764
	DU	.183	.135	.166		1.353	.178
	TU	.285	.135	.235		2.117	.036
Model 2 – dependent variable MC							
1	(Constant)	.235	.141			1.668	.097
	QIM	.207	.082	.205		2.525	.012
	DU	.014	.068	.016		.209	.835
	TU	.715	.044	.729		16.087	.000
	TQM	-.012	.024	-.018		-.501	.617

Note: "QIM=quality improvement, TQM= Total Quality Management, DU=demand uncertainty, TU=technology uncertainty, INN=innovation performance, MC= Market Competitiveness, OL=organisational learning, FS=firm size."

Mediation Analysis

The mediation analysis was performed in two phases using SPSS. In the first phase, model 1 was analysed with dependent variable as MC, and in the second phase model 2 was examined with dependent variable as INN. Results of mediation analysis are presented in table 4.5 below. In model 1, the mediating impact of OL on the relationship between TU and MC was supported (lower-bound=0.78, upper-bound=0.92), the mediation of OL was accepted between DU and MC (lower-bound=0.48, upper-bound=0.67), the mediating role played by OL on the association between TQM and MC was significant (lower-bound=0.17, upper-

bound=0.56) and lastly the mediation of OL was accepted between QIM and MC (lower-bound=0.26, upper-bound=0.64).

In model 2, the mediation of OL was found to be significant between TQM and INN (lower-bound=0.69, upper-bound=0.94), OL significantly mediates the relationship between TU and INN (lower-bound=0.63, upper-bound=0.89), the mediation of OL was supported between DU and INN (lower-bound=0.43, upper-bound=0.69), and lastly OL significantly mediates the relationship between QIM and INN (lower-bound=0.53, upper-bound=0.81).

Table 4.5: Mediation Analysis

Relationship	Total-effect	Direct effect	Indirect effect	Confidence Interval		t-statistics	p-value	Conclusion
				Lower-bound	Upper-bound			
Model 1								
TU → OL → MC	.8565	.7551	.1014	.7893	.9236	25.1512	.0000	Supported
DU → OL → MC	.5794	.2575	.3219	.4851	.6737	12.1172	.0000	Supported
TQM → OL → MC	.3676	.0214	.3461	.1732	.5619	3.7296	.0003	Supported
QIM → OL → MC	.4555	.2363	.2192	.2627	.6483	4.6595	.0000	Supported
Model 2								
TQM → OL → INN	.8195	.5546	.2649	.6970	.9420	13.1941	.0000	Supported
TU → OL → INN	.7646	.5008	.2638	.6319	.8972	11.3680	.0000	Supported
DU → OL → INN	.5660	.2455	.3205	.4337	.6983	8.4353	.0000	Supported
QIM → OL → INN	.6776	.2590	.4186	.5371	.8181	9.5100	.0000	Supported

Note: "QIM=quality improvement, TQM= Total Quality Management, DU=demand uncertainty, TU=technology uncertainty, INN=innovation performance, MC= Market Competitiveness, OL=organisational learning, FS=firm size."

Moderation Analysis

In the current research, it was observed that the moderating effect of FS had a significant impact on the

relationship between OL and INN. (LLCI=-.13, ULCI=.22). Similarly, it was found that FS significantly moderates the relationship between OL and MC (LLCI=-.55, ULCI=-.01).

Table 4.6: Moderation Analysis

Model 1: Moderation of FS between OL and INN							
	coeff	Se	t	P	LLCI	ULCI	Conclusion
constant	.5070	.6477	.7828	.4347	-.7703	1.7843	UnSupported
OL	.5371	.1849	2.9052	.0041	.1725	.9016	
FS	.2418	.3344	.7231	.4705	-.4177	.9012	
Int_1	.0456	.0900	.5071	.6126	-.1318	.2231	
Model 2: Moderation of FS between OL and MC							
constant	.0149	.9882	.0151	.9880	-1.9339	1.9637	Supported
OL	1.0260	.2821	3.6374	.0004	.4697	1.5822	
FS	.8865	.5102	1.7375	.0839	-.1197	1.8926	
Int_1	-.2833	.1373	-2.0639	.0403	-.5541	-.0126	

Note: "OL= Organizational Learning, INN= Innovation Performance, MC= Market Competitiveness, FS= Firm Size."

5. Discussion and Conclusion of this Research Discussion of Key Results

The preceding section provided an overview of the outcomes pertaining to the approved and rejected

hypotheses. This study has revealed a statistically significant positive relationship between technology uncertainty, TQM, quality improvement, firm inventive performance, and market competitiveness. Furthermore,

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the findings of this study also reveal the noteworthy and statistically significant role played by organisational learning and firm size as mediators and moderators. Several previous research were selected from the existing body of literature and utilised to support and validate the findings of this investigation. A research study conducted by He, Ma, and Zhang (2020) examined the influence of uncertainty on firm innovation. The findings of the study indicated that uncertainty has a significant positive impact on a firm's financial flows. Moreover, the study revealed that uncertainties support firms in enhancing their innovation growth indicator. These results provide strong support for the notion that uncertain environments encourage firms to adopt more robust, advanced, and competitive strategies to foster innovative and competitive growth.

Ahinful et al. (2023) conducted a study to examine the influence of quality improvement and quality management on the innovative performance of the banking industry, with the aim of establishing a substantial correlation between these variables. The researcher utilised this study to confirm the significance of TQM and quality management as constructive factors for the creative performance and market compatibility of enterprises. Additionally, Obeso et al. (2020) did a study to examine the mediating effect of organisational learning on the relationship between knowledge management and organisational performance. The findings of the study demonstrated the beneficial and facilitating function of organisational learning. Furthermore, a recent study conducted by Shuaib and He (2023) has provided further insight into the relationship between TQM and business innovation. This study specifically examined the mediating role of organisational learning in this link. The findings of this study revealed that organisational learning plays a substantial mediating role between TQM and innovation.

The validation of the concept that organisational learning enhances the speed of innovation and company market compatibility through the mediation of organisational learning was supported by the empirical evidence found in the referenced studies. A recent study has examined the moderating effect of firm size on the relationship between a firm's dynamic capabilities and its organisational economic performance. The findings of this study, conducted by Yang and Wang (2023), indicate a significant and positive influence of firm size in this moderating role. Based on the aforementioned recent study, it has been established that the size of a firm plays a crucial role in determining the level of organisational learning, which in turn influences the firm's market competitiveness.

### Conclusion of the Study

The study aimed to explore the relationship between TQM, environmental uncertainty, quality improvement, inventive performance, and market competitiveness in Saudi organizations. It also examined the moderating role of organizational learning, considering company size. Data analysis, conducted using SPSS, revealed that TQM, quality improvement, and environmental uncertainty significantly influence creative performance and market competitiveness. Organizational learning was found to play a crucial role in enhancing innovation and competitive advantage by fostering creative thinking and improving processes. Company size was also shown to enhance compatibility within Saudi organizations.

### Implications of the Study Theoretical Implications

This study has elucidated the relevance and importance of the factors under investigation and has successfully achieved its primary objective of offering valuable insights into the existing body of literature. This study has examined the impact of TQM, quality improvement, and environmental uncertainty on firm innovation and compatibility, taking into account the catalyst of organisational learning and the external factors of firm size. The study has demonstrated the correlation and significant integration of these variables within a single research investigation. Furthermore, this study contributes to the existing literature by examining the significance of TQM and quality management improvement in enhancing the innovative performance of firms. Additionally, the study identifies organisational learning as a facilitator for firms to enhance their processes and structures in a more innovative manner, thereby empowering them to develop a stronger competitive advantage.

Furthermore, this study has shed light on the positive aspects of environmental uncertainty and has made a valuable contribution to understanding its impact on organisational effectiveness. The findings suggest that fluctuations in the environment prompt organisations to prioritise the exploration and exploitation of innovative and compatible strategies. This proactive approach enables them to overcome market barriers, enhance their competitiveness, and improve overall performance. This study has contributed to the existing body of knowledge by examining the moderating role of firm size in Saudi organisations. The findings indicate that firm size has a significant role in enhancing both the amount of innovation within enterprises and their market compatibility.

### Practical Value

In addition to its theoretical implications, this study offers practical value by providing various suggestions, contributions, and approaches for managers, policymakers, and other decision-making entities inside organizations. This study has provided insights into the effects of TQM, quality innovation, environmental uncertainty, and organizational learning. It has enhanced our understanding of how firms that priorities quality factors and quality management can achieve positive outcomes. Additionally, the study highlights the importance of effective catalysts for organizational learning, which can empower and enhance the productivity, competitiveness, and innovation capabilities of firms. This study additionally posited that organizations ought to view environmental unpredictability as a potential avenue for growth. By identifying and addressing weaknesses inside the firm, organizations can effectively enhance their organizational structure in innovative and compatible areas.

### Research Limitations

Notwithstanding the numerous contributions made by this research, it is essential to acknowledge its associated limitations. Firstly, this study is limited in terms of the targeted sector, as it focused on a broad organizational sector in Saudi Arabia without specifying a particular sector, such as manufacturing, service, hospitality, or industrial. Secondly, despite employing both online and offline data collection methods, the study was constrained by a relatively modest sample size of 200 valid responses, constituting its second limitation. Thirdly, the constructs of TQM and environmental uncertainty, although utilized in the study, were treated in a general manner. The research also observed certain determinants or subcategories of these variables during data exploration that were not explicitly examined in this study, marking another limitation. Lastly, this study derived its findings primarily from the perspective of employees. However, it is possible that managers and higher-ranking authorities within organizations possess a more comprehensive understanding of performance levels and market dynamics. Unfortunately, this research lacks input from their viewpoint, which could have further bolstered the validation and applicability of the study's results within organizational contexts.

### Future Research Indications

The researchers have identified limitations and suggests future research directions. These include focusing on specific sectors like manufacturing or services, expanding the sample size using more robust methods for better generalizability, and exploring different forms of environmental uncertainty, such as market and technology

turbulence. The variable of TQM can be assessed through its various sub-categories, including leadership, process management, innovation, and analysis.

Furthermore, future research endeavours may adopt a mixed-method approach, encompassing the collection of quantitative data from employees, which may then be corroborated through interviews with managers or other higher-level organisational entities. The empirical model of this study has the potential to be applied in contexts beyond Saudi Arabia. It can also be employed in comparative analyses to examine the characteristics and impacts of the variables of interest in different regions, thus making broader contributions to the constructs under investigation.

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### References

- Abimbola, B., Oyatoye, E., & Oyenuga, O. (2020). Total quality management, employee commitment and competitive advantage in Nigerian tertiary institutions. A study of the University of Lagos. *International Journal of Production Management and Engineering*, 8(2), 87-98. <https://doi.org/10.4995/ijpme.2020.12961>
- Adeboye, N., Fagoyinbo, I., & Olatayo, T. (2014). Estimation of the effect of multicollinearity on the standard error for regression coefficients. *Journal of Mathematics*, 10(4), 16-20. <http://dx.doi.org/10.9790/5728-10411620>
- Adhikara, A., MF, M., & Nur Diana, M. B. (2022). Organizational Performance in Environmental Uncertainty on the Indonesian Healthcare Industry: A Path Analysis. *Academic Journal of Interdisciplinary Studies*, 11(2), 365-377. <https://doi.org/10.36941/ajis-2022-0058>
- Adomako, S., & Tran, M. D. (2022). Sustainable environmental strategy, firm competitiveness, and financial performance: Evidence from the mining industry. *Resources Policy*, 75, 102515. <https://doi.org/10.1016/j.resourpol.2021.102515>
- Aggarwal, R., & Ranganathan, P. (2016). Common pitfalls in statistical analysis: The use of correlation techniques. *Perspectives in clinical research*, 7(4), 187-190. <https://doi.org/10.4103%2F2229-3485.192046>
- Ahinful, A. A., Opoku Mensah, A., Koomson, S., Nyarko, F. K., & Nkrumah, E. (2023). A conceptual framework of total quality management on innovation performance in the banking sector. *The TQM Journal*. <https://doi.org/10.1108/TQM-11-2022-0334>



## DRIVING INNOVATIVE PERFORMANCE AND MARKET COMPETITIVENESS THROUGH QUALITY PRACTICES, UN-CERTAINTY AND QUALITY IMPROVEMENT

- Ahmed, A., Bhatti, S. H., Gölgeci, I., & Arslan, A. (2022). Digital platform capability and organizational agility of emerging market manufacturing SMEs: The mediating role of intellectual capital and the moderating role of environmental dynamism. *Technological Forecasting and Social Change*, 177, 121513. <https://doi.org/10.1016/j.techfore.2022.121513>
- Al-Hanawi, M. K., Khan, S. A., & Al-Borie, H. M. (2019). Healthcare human resource development in Saudi Arabia: emerging challenges and opportunities—a critical review. *Public health reviews*, 40, 1-16. <https://doi.org/10.1186/s40985-019-0112-4>
- Alegre, J., Lapiedra, R., & Chiva, R. (2006). A measurement scale for product innovation performance. *European journal of innovation management*, 9(4), 333-346. <https://doi.org/10.1108/14601060610707812>
- Argote, L., & Miron-Spektor, E. (2011). Organizational learning: From experience to knowledge. *Organization science*, 22(5), 1123-1137. <https://doi.org/10.1287/orsc.1100.0621>
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, 17(1), 99-120. <https://doi.org/10.1177/014920639101700108>
- Bolli, T., Seliger, F., & Woerter, M. (2020). Technological diversity, uncertainty and innovation performance. *Applied Economics*, 52(17), 1831-1844. <https://doi.org/10.1080/00036846.2019.1679345>
- Calantone, R., Garcia, R., & Dröge, C. (2003). The effects of environmental turbulence on new product development strategy planning. *Journal of product innovation management*, 20(2), 90-103. <https://doi.org/10.1111/1540-5885.2002003>
- Chai, L., Li, J., Tangpong, C., & Clauss, T. (2020). The interplays of coopetition, conflicts, trust, and efficiency process innovation in vertical B2B relationships. *Industrial Marketing Management*, 85, 269-280. <https://doi.org/10.1016/j.indmarman.2019.11.004>
- Chen, J.-X., Sharma, P., Zhan, W., & Liu, L. (2019). Demystifying the impact of CEO transformational leadership on firm performance: Interactive roles of exploratory innovation and environmental uncertainty. *Journal of Business Research*, 96, 85-96. <https://doi.org/10.1016/j.jbusres.2018.10.061>
- Chuang, H. H. C., Oliva, R., & Heim, G. R. (2019). Examining the link between retailer inventory leanness and operational efficiency: Moderating roles of firm size and demand uncertainty. *Production and Operations Management*, 28(9), 2338-2364. <https://doi.org/10.1111/poms.13055>
- Cook, S. D., & Yanow, D. (1993). Culture and organizational learning. *Journal of management inquiry*, 2(4), 373-390. <https://doi.org/10.1177/105649269324010>
- Corvino, A., Caputo, F., Pironti, M., Doni, F., & Bianchi Martini, S. (2019). The moderating effect of firm size on relational capital and firm performance: Evidence from Europe. *Journal of Intellectual Capital*, 20(4), 510-532. <https://doi.org/10.1108/JIC-03-2019-0044>
- Daengs, G., Istanti, E., Negoro, R., & Sanusi, R. (2020). The aftermath of management actions on competitive advantage through process attributes at food and beverage industries export import in Perak Harbor of Surabaya. *International Journal of Criminology and Sociology*, 9, 1418-1425. <http://eprints.ubhara.ac.id/id/eprint/710>
- Dagnino, G. B., Picone, P. M., & Ferrigno, G. (2021). Temporary competitive advantage: a state-of-the-art literature review and research directions. *International Journal of Management Reviews*, 23(1), 85-115. <https://doi.org/10.1111/ijmr.12242>
- Das, S., Kundu, A., & Bhattacharya, A. (2020). Technology adaptation and survival of SMEs: A longitudinal study of developing countries. *Technology Innovation Management Review*, 10(6), 64-72. [https://www.timreview.ca/sites/default/files/article\\_PDF/TIMReview\\_2020\\_June%20-%206.pdf](https://www.timreview.ca/sites/default/files/article_PDF/TIMReview_2020_June%20-%206.pdf)
- Deng, M., Fang, X., Tian, Z., & Luo, W. (2022). The impact of environmental uncertainty on corporate innovation: evidence from chinese listed companies. *Sustainability*, 14(9), 4902. <https://doi.org/10.3390/su14094902>
- Do, H., Budhwar, P., Shipton, H., Nguyen, H.-D., & Nguyen, B. (2022). Building organizational resilience, innovation through resource-based management initiatives, organizational learning and environmental dynamism. *Journal of Business Research*, 141, 808-821. <https://doi.org/10.1016/j.jbusres.2021.11.090>
- Eastwood, C. R., & Renwick, A. (2020). Innovation uncertainty impacts the adoption of smarter farming approaches. *Frontiers in Sustainable Food Systems*, 4, 24. <https://doi.org/10.3389/fsufs.2020.00024>
- 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. <https://doi.org/10.1007/s13132-020-00655-z>
- Fotopoulos, C. V., & Psomas, E. L. (2010). The structural relationships between TQM factors and organizational performance. *The TQM Journal*, 22(5), 539-552. <https://doi.org/10.1108/17542731011072874>
- Gerwin, D. (1993). Manufacturing flexibility: a strategic perspective. *Management science*, 39(4), 395-410. <https://doi.org/10.1287/mnsc.39.4.395>
- Haarhaus, T., & Liening, A. (2020). Building dynamic capabilities to cope with environmental uncertainty: The role of strategic foresight. *Technological Forecasting and Social Change*, 155, 120033. <https://doi.org/10.1016/j.techfore.2020.120033>
- He, F., Ma, Y., & Zhang, X. (2020). How does economic policy uncertainty affect corporate innovation?—Evidence from China listed companies. *International Review of Economics & Finance*, 67, 225-239. <https://doi.org/10.1016/j.iref.2020.01.006>
- Hu, J., Pan, X., & Huang, Q. (2020). Quantity or quality? The impacts of environmental regulation on firms' innovation—Quasi-natural experiment based on China's carbon emissions trading pilot. *Technological Forecasting and Social Change*, 158, 120122. <https://doi.org/10.1016/j.techfore.2020.120122>
- Hwang, G.-H., Yoon, H. J., & Choi, M. (2020). Soft TQM practices and employee outcomes: a mediational analysis. *Quality Management Journal*, 27(3), 147-158. <https://doi.org/10.1080/10686967.2020.1767007>
- Isnaini, D. B. J., Danilwan, Y., MANSUR, D. M., ILYAS, G. B., MURTINI, S., & Taufan, M. Y. (2021). Perceived distribution quality awareness, organizational culture, TQM on quality output. *Journal of Distribution Science*, 19(12), 1-14. <https://doi.org/10.15722/jds.19.12.202112.1>
- Kafetzopoulos, D., Psomas, E., & Skalkos, D. (2020). Innovation dimensions and business performance under environmental uncertainty. *European journal of innovation management*, 23(5), 856-876. <https://doi.org/10.1108/EJIM-07-2019-0197>
- Katila, R., & Ahuja, G. (2002). Something old, something new: A longitudinal study of search behavior and new product introduction. *Academy of management journal*, 45(6), 1183-1194. <https://doi.org/10.5465/3069433>
- Kaynak, H. (2003). The relationship between total quality management practices and their effects on firm performance. *Journal of operations management*, 21(4), 405-435. [https://doi.org/10.1016/S0272-6963\(03\)00004-4](https://doi.org/10.1016/S0272-6963(03)00004-4)
- Khalfallah, M., Ben Salem, A., Zorgati, H., & Lakhal, L. (2022). Innovation mediating relationship between TQM and performance: cases of industrial certified companies. *The TQM Journal*, 34(3), 552-575. <https://doi.org/10.1108/TQM-01-2021-0019>
- Kijkasiwat, P., & Phuensane, P. (2020). Innovation and firm performance: The moderating and mediating roles of firm size and small and medium enterprise finance. *Journal of Risk and Financial Management*, 13(5), 97. <https://doi.org/10.3390/jrfm13050097>
- Laguir, I., Gupta, S., Bose, I., Stekelorum, R., & Laguir, L. (2022). Analytics capabilities and organizational competitiveness: Unveiling the impact of management control systems and environmental uncertainty. *Decision Support Systems*, 156, 113744. <https://doi.org/10.1016/j.dss.2022.113744>
- Li, X., & Zhang, Y. (2023). Managing Emergency Procurement Using Option Contract under Supply Disruption and Demand Uncertainty. *Mathematical Problems in Engineering*, 2023, 6516689. <https://doi.org/10.1155/2023/6516689>
- Makhloufi, L., Laghouag, A. A., Ali Sahli, A., & Belaid, F. (2021). Impact of entrepreneurial orientation on innovation capability: The mediating role of absorptive capability and organizational learning capabilities. *Sustainability*, 13(10), 5399. <https://doi.org/10.3390/su13105399>
- Masoudi, E. (2021). The impact of total quality management on innovation in small and medium-sized enterprises with the mediating role of organizational learning. *Quarterly journal of Industrial Technology Development*, 19(43), 77-92. <https://doi.org/10.22034/jtd.2021.244744>
- Ndubisi, N. O., Dayan, M., Yeniaras, V., & Al-hawari, M. (2020). The effects of complementarity of knowledge and capabilities on joint innovation capabilities and service innovation: The role of competitive intensity and demand uncertainty. *Industrial Marketing Management*, 89, 196-208. <https://doi.org/10.1016/j.indmarman.2019.05.011>
- Nickel, P. J. (2020). Disruptive innovation and moral uncertainty. *NanoEthics*, 14(3), 259-269. <https://doi.org/10.1007/s11569-020-00375-3>
- Noone, B. M., Lin, M. S., & Sharma, A. (2022). Firm performance during a crisis: effects of adhocracy culture, incremental product innovation, and firm size. *Journal of Hospitality & Tourism Research*, 10963480221086846. <https://doi.org/10.1177/10963480221086846>
- Oakland, J. S., Oakland, R. J., & Turner, M. A. (2020). *Total quality management and operational excellence: text with cases*. Routledge. <https://api.taylorfrancis.com/v4/content/books/mono/download?identifierName=isbn&identifierValue=9781315561974&type=previewpdf>
- Obeso, M., Hernández-Linares, R., López-Fernández, M. C., & Serrano-Bedia, A. M. (2020). Knowledge management processes and organizational performance: the mediating role of organizational learning. *Journal of Knowledge Management*, 24(8), 1859-1880. <https://doi.org/10.1108/JKM-10-2019-0553>
- Park, E.-Y., & Kwag, D.-G. (2015). The study on the market competitiveness reinforcement for convergence industry. *Journal of the Korea Convergence Society*, 6(5), 99-106. <https://doi.org/10.15207/JKCS.2015.6.5.099>

## DRIVING INNOVATIVE PERFORMANCE AND MARKET COMPETITIVENESS THROUGH QUALITY PRACTICES, UN-CERTAINTY AND QUALITY IMPROVEMENT

- Rammer, C. (2022). Measuring process innovation output: Results from firm-level panel data. *ZEW-Centre for European Economic Research Discussion Paper*, (22-002), 44. <https://doi.org/10.2139/ssrn.4031893>
- Santos-Vijande, M. L., López-Sánchez, J. Á., & Trespalacios, J. A. (2012). How organizational learning affects a firm's flexibility, competitive strategy, and performance. *Journal of Business Research*, 65(8), 1079-1089. <https://doi.org/10.1016/j.jbusres.2011.09.002>
- Sazvar, Z., Zokaee, M., Tavakkoli-Moghaddam, R., Salari, S. A.-s., & Nayeri, S. (2021). Designing a sustainable closed-loop pharmaceutical supply chain in a competitive market considering demand uncertainty, manufacturer's brand and waste management. *Annals of Operations Research*, 1-32. <https://doi.org/10.1007/s10479-021-03961-0>
- Sciarelli, M., Gheith, M. H., & Tani, M. (2020). The relationship between soft and hard quality management practices, innovation and organizational performance in higher education. *The TQM Journal*, 32(6), 1349-1372. <https://doi.org/10.1108/TQM-01-2020-0014>
- Shuaib, K. M., & He, Z. (2023). Mediating effect of organisational learning and moderating role of organisational culture on the relationship between total quality management and innovation among manufacturing companies in Nigeria. *Total Quality Management & Business Excellence*, 34(7-8), 894-929. <https://doi.org/10.1080/14783363.2022.2138313>
- Shukor, M. Y. (2021). Outlier and Normality Testing of the Residuals from the Carreau-Yasuda Model in Fitting the Rheological Behavior of the Non-Newtonian fluid TF2N. *Bioremediation Science and Technology Research*, 9(1), 20-26. <https://doi.org/10.54987/bstr.v9i1.593>
- Singh, S. K., Gupta, S., Busso, D., & Kamboj, S. (2021). Top management knowledge value, knowledge sharing practices, open innovation and organizational performance. *Journal of Business Research*, 128, 788-798. <https://doi.org/10.1016/j.jbusres.2019.04.040>
- Song, M., & Montoya-Weiss, M. M. (2001). The effect of perceived technological uncertainty on Japanese new product development. *Academy of management journal*, 44(1), 61-80. <https://doi.org/10.5465/3069337>
- Trigueiros, D. (2000). A theoretical definition and statistical description of firm size. *Proceedings of the Annual Conference of The British Accounting Association, Exeter, UK* (pp. 1-27). [http://home.iscte-iul.pt/~dmt/publ/2000\\_A\\_theoretical\\_definition\\_and\\_statistical\\_description\\_of\\_firm\\_size.pdf](http://home.iscte-iul.pt/~dmt/publ/2000_A_theoretical_definition_and_statistical_description_of_firm_size.pdf)
- Tu, Y., & Wu, W. (2021). How does green innovation improve enterprises' competitive advantage? The role of organizational learning. *Sustainable Production and Consumption*, 26, 504-516. <https://doi.org/10.1016/j.spc.2020.12.031>
- Verma, P., Kumar, V., Mittal, A., Gupta, P., & Hsu, S. C. (2022). Addressing strategic human resource management practices for TQM: the case of an Indian tire manufacturing company. *The TQM Journal*, 34(1), 29-69. <https://doi.org/10.1108/TQM-02-2021-0037>
- Yang, X., & Wang, J. (2023). The relationship between sustainable supply chain management and enterprise economic performance: does firm size matter? *Journal of Business & Industrial Marketing*, 38(3), 553-567. <https://doi.org/10.1108/JBIM-04-2021-0193>
- Yusr, M. M., Mokhtar, S. S. M., Perumal, S., & Salimon, M. G. (2022). The impact of customer knowledge management, TQM and marketing capabilities on product innovation performance of Malaysian SMEs: an empirical study. *International Journal of Innovation Science*, 14(2), 316-338. <https://doi.org/10.1108/IJIS-03-2021-0053>
- Zhu, Y., Gao, H., Hu, Y., Ding, Q., & Tang, Y. (2023). Can local environmental constraints improve enterprise's green innovation quality? Evidence from Chinese-listed firms. *Environmental Science and Pollution Research*, 30(1), 389-406. <https://doi.org/10.1007/s11356-022-22161-2>

### Appendix: Scale Sources

Name of variable	Source of Items	No of items
Quality innovation	(Fotopoulos & Psomas, 2010)	5
TQM	(Fotopoulos & Psomas, 2010)	5
Environmental uncertainty	(Adomako & Tran, 2022)	7
Organizational learning	(Tu & Wu, 2021)	4
Firm size	(Yang & Wang, 2023)	3
Innovative performance	(Chai et al., 2020)	3
Market competitiveness	(Adomako & Tran, 2022)	5