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THE IMPACT OF QUALITY MANAGEMENT SYSTEM ON THE PRODUCT QUALITY OF THE MANUFACTURING INDUSTRY IN PAKISTAN

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ABSTRACT

The present study aims to investigate the impact of quality management system on information quality and information quality impact on design, operating, and environmental performance. These performances impact the product quality of the manufacturing companies in Pakistan. The examination of mediating role of design performance, operating performance, and environmental performance among the links of information quality and product quality is also included in the objectives of the current research. This study has executed the quantitative methods and used the questionnaires to obtain the data from respondents and also used the smart-PLS to examine the relationships between the variables. The results exposed that a quality management system has a positive impact on the information quality, and information quality also has a positive impact on the design, operating, and environmental performance, and these performances also have a positive impact on the product quality. The results also exposed that design performance operating performance and environmental performance have positively mediated the links among the information quality and product quality. This study is suitable for the regulators who want to develop regulations related to the quality management system that could increase the product quality.

INTRODUCTION

According to Juran's definition: product quality is to incorporate such features into the products which are likely to fulfill consumers' needs and wants and which gives customer satisfaction by improving products and making them free from any defects or deficiencies. The creation and development of product quality are very significant for the business organization Liu, Lee, and Hung (2017). The success of a business organization and even its survival is dependent on the number of active customers. The number of active customers is determined by the customers' buying ability and customers' buying intention. The quality of the products provided by the organization has effects on the buying intention of the consumers as the quality of products determines the level of satisfaction in the customers. When a company offers products that have high quality, the customers feel more satisfied that the products will meet their needs and wants, and this product will not have any deficiencies or defects. Having high satisfaction towards the products of the concerned company, the customers have the intention to make purchases and remain consistent with the brand. While on the other hand, when a business organization fails to provide high-quality products, the customers don't feel satisfied, and so, they don't intend to buy the products.

Our study aims at examining the role of a quality management system in enhancing the quality of products. A total quality management system is a set of business processes that focus on the constant fulfillment of customers' requirements and increasing their satisfaction. It is corresponding the organization's aim and its strategies. It is expressed as the organizational purpose and aspirations and the policies, processes, information, and resources needed to apply and maintain it Kolus, Wells, and Neumann (2018). This study analyses the information quality (completeness, reliability, and accuracy of information) maintained by the quality management systems and then check its influences on the design performance, operation performance, and the environment, and finally on the product quality. Under the quality management systems, the quality of information acquired about different resources (physical, energy, and human resources), different techniques, production procedures, competitors' strategies, and customers' preferences. After the acquisition of higher quality information, processed to accelerate design performance, operational performance, and environmental performance. The achievement of higher performance leads to higher product quality (Fundin, Bergquist, Eriksson, & Gremyr, 2018).

The current study is aimed at examining the development of product quality due to the change in the information quality, design performance, operation, and environmental performance under the quality management system in the manufacturing industry of Pakistan. The economy of Pakistan is the 22nd largest country in the world in terms of purchasing power parity and 45th largest country in terms of nominal gross domestic product. Pakistan is a lower-middle-income country. As per the statistics of 2020, GDP at current prices is 41,726.683 Billion rupees. Its economy consists of the agriculture, industry, and services sector. The manufacturing industry is one of the major industries in Pakistan (Ikram, Zhou, Shah, & Liu, 2019). Manufacturing is the

most significant sub-sector of the industrial sector. Its contribution to the industrial sector is 64.4%, and the contribution to the GDP accounts for 13.45%. The growth in industrial sector in Pakistan is more than the other sector that is highlighted in Figure 1.

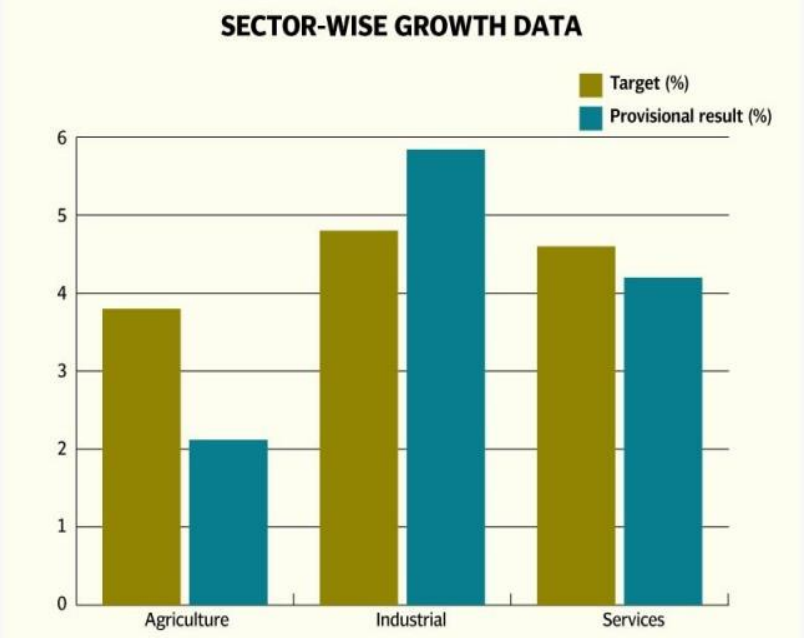

Figure 1: Sector-Wise Growth in Pakistan

Research by Grainger and Zhang (2019) has proved that many manufacturing organizations (both large and small scale) in Pakistan have established proper quality management systems. The manufacturing organizations which are paying attention to the establishment of quality management and the effective implementation of quality management practices have better performance and better-quality products which successfully meet the requirements of customers.

LITERATURE REVIEW

Product quality is the products' capacity to meet all the customers' requirements and needs and products' being free of any deficiencies or defects which may reduce the satisfaction of customers. The product quality can be improved by an effective quality management system as this system facilitates the acquisition of superior quality information, which improves the design performance, operation performance, and environmental performance. The role of a quality management system in the development of products has elaborated by a number of studies like Huang, Lee, and Chen (2019), which shows that an effective management system improves and assures the quality of all the business operations and resources, which leads to the development of high-quality products and promotes market for the products. To show the role of quality management systems and information quality in the development of product quality, the current study cites the following studies.

According to Manatos, Sarrico, and Rosa (2017), quality management aims to maintain a business organization's quality with all the resources, processes, techniques, products, and services. To check the quality, there are some significant practices of quality management: quality analysis, quality planning, quality assurance, control, and improvement of quality. The implementation of all these practices of quality management to maintain the quality affects the quality of information acquisition and processing. For the acquisition of better-quality resources, the quality management tries to seek suppliers who may provide high-quality resources. Similarly, for the production of better quality products and services, quality management collects up-to-date, comprehensive, and reliable information from the market and customers (Sun et al., 2020). In this case, it also tries to collect valid information about techniques and processes which may give quality production. Hence,

H1: Quality Management System Has A Positive Relationship With Quality Information.

The quality of information like completeness, accuracy, comprehensiveness, relevant, and reliable information affects the product design performance. The accurate and exact information about the lacks in the design of already existing products in the market and the current needs of the customers about product design features is helpful to the management to perceive an idea of the development of new design products. For example, the information about the features of earlier computers, which were desktop and the emerging desire of the people to use the computer at any time led to the invention of the laptop, a sort of the computer having the quality of portability (Audrin, Brosch, Chanal, & Sander, 2017).

H2: Quality Information Has A Positive Relation To The Design Performance.

Performance of all the operations like the acquiring of raw- material and physical resources, human resources, management, production of goods and services, and finally, their marketing is dependent on the quality of information acquired. The timely and valid information about the up-to-date quality of raw material and other resources and the place from where these can be acquired at low cost enables the business organization to acquire good quality raw-material and resources. Similarly, the exact and comprehensive information about customer's requirements and also about the techniques used by rival businesses enables a particular business organization to manufacture and market innovation-based superior quality products (Price & Shanks, 2016). Thus,

H3: Quality Information Has A Positive Relation To The Operation Performance.

Cao et al. (2017) states in his literary article that the environmental performance of any business organization, especially a manufacturing organization, is dependent on the superior's information about the standards of environmental regulations, business resources, operation, and production

techniques, and advertising material. An n organization can control the emission of pollutants like carbon emission when it has accurate information about the physical, mechanical, and operating features of the resources like fossil fuels as an energy source. (Nawaz et al., 2020) The reliable information about the invention of such machines or plants which use minimum energy resources and emit the least amount of harmful substances and contaminating wastes is supportive to the organization in the achievement of high environmental performance (Nawaz et al., 2021). Similarly, the accurate and complete information of the ecological friendly resources, processes, and technology facilitates the business organization to arrange periodical training for the employees so that they can use them (Beg, Swain, Rahman, Hasnain, & Imam, 2019). Hence:

H4: Quality Information Has A Positive Relation To Environmental Performance.

The performance of product design is the development of physical and qualitative features in a differentiated product and its improved success in the market. The product design performance influences the product quality. When a product is redesigned, its features also develop. For example, when a company dealing in footwear want to design different products, it not only on physical form but also on its characteristics like durability, flexibility, and reduction in weight, sensing the requirements of the market. Thus, with the development of the new design of products, its quality also develops. Similarly, when a company dealing in digital mobile devices tries to design a differentiated product, besides the physical form, it also focuses only on reliability, working efficiency and battery and storage capacity, etc. (Terdenge & Wohlgemuth, 2016). Thus, with the design performance, product quality also improves. So,

H5: Design Performance Has A Positive Relation To Product Quality.

The performance of all the organizational operations like management, investment, information, physical resources, services of human resources, production procedures, and marketing techniques affects the quality of products. The use of good quality raw-material and other complementing resources in the production provides the organization with high-quality products. If the material used is reliable and durable, the products produced are also reliable and durable. If the owner makes a large investment in the business, the management tries to employ good quality resources (physical and human), which enhance the product quality as per customers' preferences. Similarly, when the resources and the procedures are combined in an efficient manner, the input gives more output at minimum cost (Senaratne, Mobasheri, Ali, Capineri, & Haklay, 2017). Thus,

H6: Operation Performance Has A Positive Relation To Product Quality.

The attempt of a business organization to higher environmental performance affects the resources, procedures, and production of goods and services. When the organization wants to remove the negative impacts from the environment,

it pays serious attention to the quality of the resources used in the business operations; it utilizes such resources as do not produce harmful gases, toxic material, or contaminating wastes which may negatively affect the working environment. The use of such pollution-free resources in production provides pollution-free products, and labor can work more actively and efficiently in a healthy environment. This all leads to the production of high-quality products (Machiels & Orth, 2017). On the basis of the above detail, we can hypothesize.

H7: Environmental Performance Has A Positive Relation To Product Quality.

The quality of available information regarding the different technology, energy resources, human resources, operation and production procedures, market trends, and customers' preferences affects the design performance. The business organization where the management has reliable and accurate information about the market trends and the customers' arising needs and desires about a product of particular. For instance, in the cosmetics industry, the information about the market trends and the needs and of the customers about a foundation that is easy to carry and handle enables the management to conceive a design. On the other hand, when the organization is trying to introduce a new foundation, it adds to its quality along with design like the least oil emission on the face, waterproof, and durable (Jiang & Xiong, 2016).

H8: Product Design Plays A Mediating Role Between Information Quality And Product Quality.

The quality of resources (technology, instruments, energy resources, and labor), processes, and production procedures in the business operations is influenced by the quality of information acquired about the market trends, customers' preferences, and suppliers' locations and catalogs. Accurate and up-to-date information is available about the market trends, and customers' preferences lead to the purchase of resources meeting the modern requirements, the training of human resources according to the up-to-date information, and production processes to fulfill customers' preferences. In this way, product quality also improves as the resources like good quality raw-material, efficient human resources, and better-quality production procedures are used. Thus, the quality information improves the operational performance, which further enhances product quality (Meesala & Paul, 2018).

H9: Operation Performance Is A Mediator Between Information Quality And Product Quality.

The accurate, complete, comprehensive, relevant, and reliable information about the sudden shifts in the business world, market trends, technology, resources, standards of environmental regulators and customers, and general people's environmental requirements helps the business organization to show higher environmental performance by reducing the negative environmental impacts of business operation, resources, and production. When the company tries to improve its environmental performance, it employs pollution-free raw-

material, energy resources, and technology, which enhances the quality of goods produced (Macdonald, Kleinaltenkamp, & Wilson, 2016).

H10: Environmental Performance Is A Mediator Between Information Quality And Product Quality.

RESEARCH METHODS

The current research investigates the impact of quality management systems on information quality and information quality impact on the design, operating, and environmental performance, and these performances impact on the product quality. This research also examines the mediating impact of design performance, operating performance, and environmental performance among the links of information quality and product quality of the manufacturing companies in Pakistan. This study has executed the quantitative methods and used the questionnaires to obtain the data from respondents. The quality assurance-related employees of the manufacturing companies in Pakistan are the respondents. These respondents are selected based on purposive sampling. A total of 620 surveys were sent to the respondents by personal visit. After two months, only 320 surveys were received that have about 51.61 percent rate of response.

This study has used the smart-PLS to examine the relationships between the variables and the measurement and structural model assessment. This study has used the smart-PLS due to the complexity of the framework and large sample size (Hair Jr, Babin, & Krey, 2017). This study has adopted the quality management system (QMS) and information quality (IQ) as the predictors of the study with five and seven items, respectively. In addition, this study has used three mediators such as design performance (DP) with four items, operating performance (OP) with three items, and environmental performance (EP) with four items. Finally, the present study has also taken the product quality (PQ) as a dependent variable with five items. These constructs are shown in Figure 2.

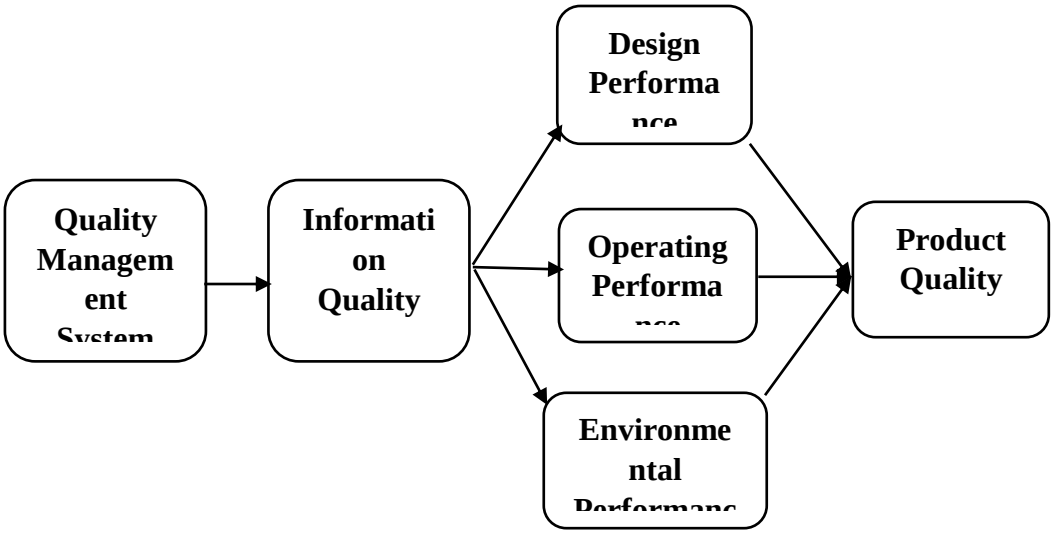

Figure 2: Theoretical Model

Findings

This study has assessed the measurement model by examining the convergent and discriminant validity. Firstly, convergent validity has been examined that shows the association between the items. The statistics have shown that the CR and Alpha values are larger than 0.70, and loadings and AVE values are also larger than 0.50. These figures have shown valid convergent validity and a high association with items. These values are shown in Table 1.

Table 1: Convergent Validity

Constructs	**Items**	**Loadings**	**Alpha**	**CR**	**AVE**
Design Performance	DP1	0.802	0.840	0.893	0.676
	DP2	0.843			
	DP3	0.829			
	DP4	0.813			
Environmental Performance	EP1	0.789	0.773	0.803	0.511
	EP2	0.512			
	EP3	0.749			
	EP4	0.772			
Information Quality	IQ1	0.811	0.869	0.901	0.605
	IQ2	0.728			
	IQ3	0.694			
	IQ4	0.810			
	IQ6	0.794			
	IQ7	0.820			
Operational Performance	OP1	0.850	0.775	0.821	0.605
	OP2	0.744			
	OP3	0.734			
Product Quality	PQ1	0.850	0.849	0.898	0.688
	PQ2	0.838			
	PQ3	0.821			
	PQ5	0.809			
Quality Management System	QMS1	0.857	0.887	0.917	0.688
	QMS2	0.841			
	QMS3	0.860			
	QMS4	0.818			
	QMS5	0.767			

Secondly, discriminant validity has been examined that shows the association between the variables. The statistics have shown that the Heterotrait Monotrait (HTMT) ratios are smaller than 0.85. These figures have shown valid

discriminant validity and low association with variables. These values are shown in Table 2.

Table 2: Discriminant Validity

	DP	EP	IQ	OP	PQ	QMS
DP						
EP	0.727					
IQ	0.728	0.684				
OP	0.737	0.697	0.593			
PQ	0.737	0.711	0.796	0.716		
QMS	0.838	0.677	0.701	0.611	0.675	

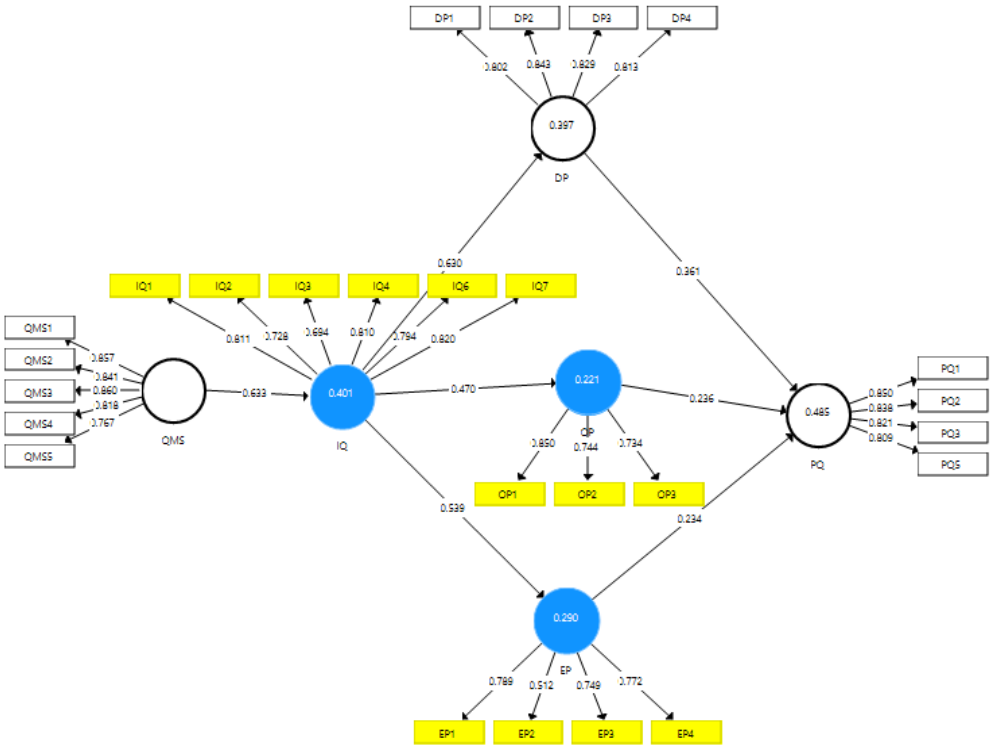

Figure 3: Measurement Model Assessment

Finally, the assessment of the structural model has also been executed by the study, and the results exposed that quality management system has a positive impact on the information quality and accept H1. In addition, information quality also has a positive impact on the design, operating, and environmental performance and accepts H2, H3, and H4. Moreover, these performances also have a positive impact on the product quality and accept H5, H6, and H7. Finally, the results also exposed that design performance, operating performance, and environmental performance have positively mediated the links among the information quality and product quality and accepts H8, H9, and H10. These links are highlighted in Table 3.

Table 3: Path Analysis

Relationships	Beta	S.D.	T Statistics	P Values	L.L.	U.L.
DP -> PQ	0.361	0.035	10.461	0.000	0.302	0.425
EP -> PQ	0.234	0.034	6.860	0.000	0.182	0.302
IQ -> DP	0.630	0.022	28.227	0.000	0.592	0.672
IQ -> EP	0.539	0.027	20.080	0.000	0.494	0.597
IQ -> OP	0.470	0.028	16.921	0.000	0.414	0.521
OP -> PQ	0.236	0.040	5.919	0.000	0.154	0.302
QMS -> IQ	0.633	0.023	27.017	0.000	0.583	0.682
IQ -> DP -> PQ	0.228	0.026	8.611	0.000	0.185	0.278
IQ -> EP -> PQ	0.126	0.023	5.536	0.000	0.091	0.173
IQ -> OP -> PQ	0.111	0.022	4.994	0.000	0.075	0.152

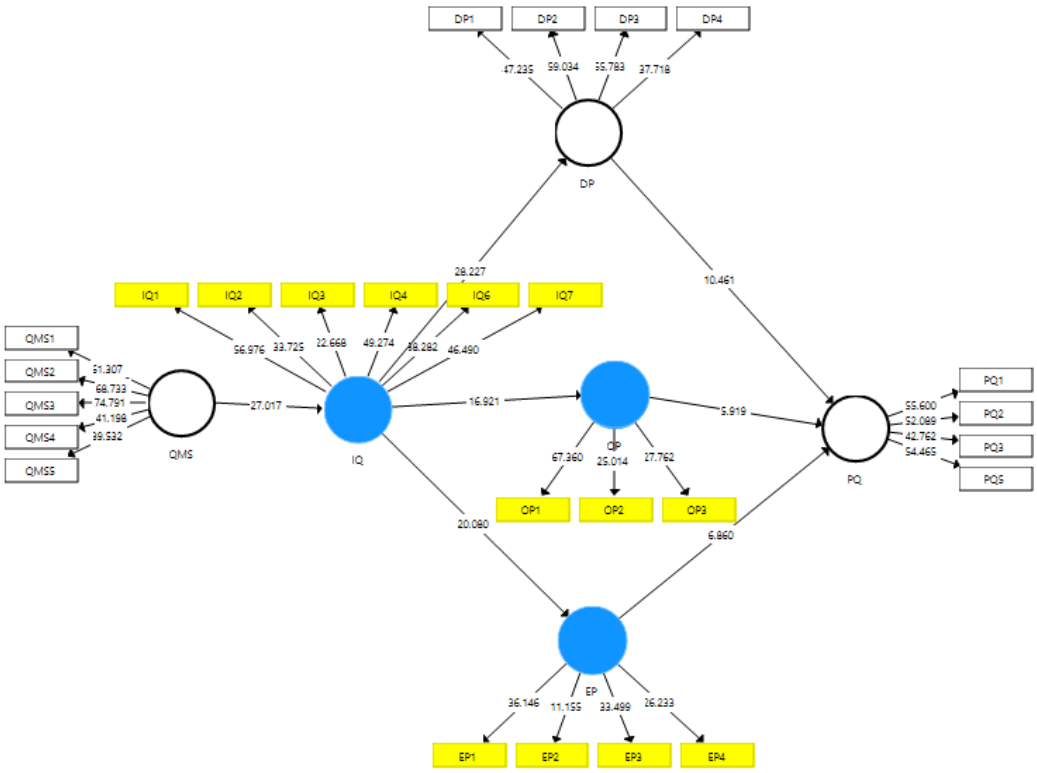

Figure 4: Structural Model Assessment

DISCUSSIONS AND IMPLICATIONS

The study results have revealed that the quality management system has a positive relationship with information quality. These results are in line with the past study of Siva et al. (2016), which shows that the goal of quality management is to maintain the quality of all the areas within an organization.

The quality of different areas like resources, operations, production, and marketing procedures can be affected by the change in the quality of information collected. Thus, quality management tries to acquire complete, comprehensive, accurate, and valid information. The study results have also revealed that then information quality has a positive impact on the product design performance. These results are approved by the past study of Aquilani, Silvestri, Ruggieri, and Gatti (2017), which shows that the organization where the business management collects and processes high-quality information in the development of product design presents good product design which gets successful popularity among the customers. The study results have also indicated that information quality has a positive relationship with operational performance. These results are in line with the past study of Madzík and Pelantová (2018), which indicates that the performance of business operations like the acquisition of good quality raw-material, physical resources, human resources, production, and marketing of products and services, can be improved with the acquisition and processing of quality information.

The study results have also indicated that the quality of information has positive impacts on environmental performance. These results are supported by the past study of Manova and Yu (2017), which shows that a piece of good quality information helps the management to carry ecological friendly programs which mitigate the negative environmental impacts of the business. The study results have indicated that the design performance is positively linked with the product quality. These results are in line with the past study of Huq et al. (2016), which shows that the active companies sense the market requirements and try to redesign their products to respond to the market requirements. When companies try to introduce new product designs, they also create some new features in their products. Thus, the design performance improves the product quality. The study results have shown that operational performance has positive impacts on product quality. These results are in line with the past study of Chen, Liang, Yao, and Sun (2017). The study results have revealed that the environmental performance of the business organization has a positive relation to product quality. These results are approved by the past study of C.-x. Liu et al. (2017), which indicates that the companies which show high environmental performance successfully introduce high-quality products.

The study results have indicated that the design performance is a significant mediator between the information quality and the product quality. These results are approved by the past study of Zare, Croq, Hossein-Arabi, Brunet, and Roquelaure (2016), which indicates that the design performance is improved by the acquisition of better quality information, and in this way, the product quality is also improved. The study results have revealed that operation performance is a significant mediator between information quality and product quality. These results are approved by the past study of Ali and Raza (2017), according to which the operational performance, which is improved by the information quality, further brings improvement in the product quality. Moreover, the study results have indicated that environmental quality is a perfect mediator between information quality and product quality. These results are approved by the past study of W.-K. Liu et al. (2017), which

reveals that information quality improves the information quality, which in turn brings improvement in the product quality.

The current study makes theoretical as well as empirical implications. The study has great theoretical significance as it adds a lot to the economy-based literature. It sheds ample light on the influences of the implementation of quality management practices on product quality development in different ways. In this regard, this study analyzes the contribution of quality management practices to the acquisition of quality information which improves design performance, operation performance, and environmental performance. It makes a large contribution to the literature as it introduces three mediators between quality information and product quality. The study is very important to the business entities as it guides on how to improve the product quality with the better implementation of quality management practices. Thus, the improvement in the information quality accelerates the design, operation, and environmental performance, and product quality.

CONCLUSION AND LIMITATIONS

The study analyses the influences of the implementation of quality management practices on the development of product quality. The study examines that with the effective implementation of quality management practices, better quality information (complete, comprehensive, up-to-date, accurate, and valid information) can be improved. When complete, comprehensive, up-to-date, accurate, and valid information is available to the business organization, the differentiated product designs can better be developed. And the higher design performance leads to the improvement in the product quality. Similarly, in case the business management has comprehensive, innovative information about different physical resources, human resources, business techniques, and market requirements, the business organization has the superior operational performance. Moreover, having the availability of exact, accurate, and up-to-date information about the environmental authority, the environmental issues, and solutions to them, quality management can improve the environmental performance. The operation and environmental performance accelerated in this way improve the quality of products.

The present study has many limitations which must be filled by future scholars with literary capabilities. First of all, a single source has been used to collect data for the current study, and this data does not give comprehensive detail about the topic. The scholars in the future are recommended to adopt more than one way for the acquisition of data for this study. Moreover, data in support of this study on the development of product quality have been acquired by the author from the economy of Pakistan, which is an emerging economy. This country has different economic conditions and different cultural demands from others. So, the study based on the quantitative data which has been received from the Pakistan economy is limited in scope and validity. For the required validity in the developed country, future scholars must analyze the product quality development.

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