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Driving Quality Performance through Digitization and Technology Management: Mediating role of Organization Agility

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ABSTRACT

In the competitive landscape, businesses recognize quality as a pivotal competitive advantage. The ongoing digital revolution, spurred by societal shifts, has reshaped industries. However, effectively managing technology in industrialized nations remains a challenge. In this context, harmonizing digitalization, technology, culture, and quality becomes crucial for organizational survival. This study delves into the relationship between digitalization, technology management, and their impact on Total Quality Management (TQM) performance within Pakistani businesses. Employing a quantitative survey approach, senior executives from both public and private sectors participated, yielding a response rate of 88%. Utilizing SMART PLS 3 for data analysis, PLS-SEM revealed that digitalization and technology management significantly enhance TQM performance. Additionally, the findings highlight that digitization fortifies TQM performance by fostering connections between TQM principles and an organization's agility. This research underscores the imperative for businesses to strategically leverage digitalization and effective technology management as catalysts for augmenting TQM performance, emphasizing the role of agility in this transformative process.

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Introduction

Consumer market dynamics have been significantly altered by the advent of digital technology, impacting how firms communicate their value propositions and showcase their products. Around 34% of banking and insurance operations have undergone digital transformation, while around 37% are expected to use telehealth services. The most recent outbreak has significantly accelerated the digital transformation by an impressive increase of 15 percentage points. An analogous trend has been seen in Bika's electronic commerce industry in the year 2020. Furthermore, there is ongoing discussion about the use of fresh criteria for business acumen. Analog information is transformed into digital data sets via the use of digital technology. Digital transformation enables the comprehensive rebuilding of cultural, environmental, and economic systems at the system level. Brennen and Kreiss (2016) are relevant to this situation. Digitalization refers to the conversion of an organization's processes into electronic data. Digital adoption pertains to the process by which enterprises, regions, and other entities incorporate and use digital or computer technology. In the current global economy, corporations engage in intense competition. Consequently, the corporation must possess the capability to fulfill all the requirements and anticipations of its clientele. To fulfill these standards, firms must enhance processing speed and efficiency. Continuous improvement is crucial for enhancing the company's goods, services, and procedures. Furthermore, it is necessary to modernize their infrastructure and business processes in order to effectively incorporate new technologies. The effectiveness of Total Quality Management (TQM) may be enhanced by using digitalization in an organization. For organizations operating in highly competitive sectors on a worldwide scale, it is of utmost importance to effectively oversee their infrastructure and guarantee that their quality control methods are comprehensive.

Organizational agility (OA) is a prudent strategy to address these transformative dynamics and advancements. The OA model is the latest and most successful framework for engineering businesses. Sherehiy (2008) asserts that organizational agility (OA) is crucial for the survival of a business. It involves providing workers with up-to-date knowledge, advanced skills, and leveraging the latest technology to implement complete quality management and organizational processes. Companies that prioritize sustainability has a strong and resilient corporate culture. Organizational agility is crucial for enhancing a company's efficiency in today's fiercely competitive business landscape. Empirical research suggests that a company's ability to succeed may be enhanced by promptly adapting to market changes and using creative measures. Ferrier (2001). The process of digitalization has a significant influence on both the external operating environment and internal operations of the firm. By permitting digitization, firms may enhance overall quality control performance, hence facilitating the achievement of their goals. Digitalization generates novel prospects, altering the roles of supply chain participants and leading to the demise of established companies.

Technology and Total Quality Management (TQM) are essential for enhancing corporate productivity and fostering expansion in a rapidly changing global market. Comprehensive quality management and technology are crucial factors that significantly influence the performance of

businesses and organizations. The integration of digitalization and technology management yields a complete performance in quality control. The advent of digital technology in organizational growth has facilitated this effort compared to prior years.

Total Quality Management (TQM) is a managerial methodology that has the potential to improve the caliber of human capital and the efficiency of the business. It enhances the company's competitive advantage via many means. Efficient use of technology and digitalization helps achieve optimal performance in quality control. Zwain, Lim, and Othman conducted a study in 2017. Due to the advancements in technology, social dynamics, politics, and the environment in recent decades, it has become more challenging to achieve and sustain a competitive edge via organizational agility. Altering the culture of a company in order to generate long-lasting advantages is one of the most formidable challenges in the field of business administration. Kaynak (2003) emphasizes the importance of a company's culture in attaining Total Quality Management (TQM) performance and enhancing market competitiveness. The process of digitalization is largely driven by the need for organizational optimization, using technology to address various organizational challenges in order to remain competitive with other companies. The integration of digitalization and effective management of technology is essential for attaining success in Total Quality Management (TQM). The whole business is experiencing substantial transformation, and maintaining organizational agility is crucial in order to effectively adapt to these changes and sustain a competitive edge. Organizational agility plays a mediating role in the interaction between digitalization, technology management, and overall quality control performance.

In order to maintain competitiveness within the industry, it is essential that all divisions within a business align their efforts towards a common set of goals. It is important to acknowledge that every employee and their activities have an impact on others. The company aims to enhance its competitiveness by exerting more control over all responsibilities and processes. The firm has implemented rigorous quality control measures and cutting-edge technology to ensure its continued operation. While we have achieved significant success in the areas of quality and technology management, it is worth noting that the integration of these disciplines is not often practiced. Therefore, it is necessary to sufficiently clarify the exact nature of the links between these notions.

2.0 Literature Review

2.1 Digitalization

Digitalization and subsequent digital transformation are the driving force behind the business revolution to build new Internet-based inventions that affect society. Kiron et al. (2017). digitalization explains the transformation of analog and noisy information into digital data. Brennen and Kreiss (2016) use digitalization to explain organizational changes and enhance organizational quality performance. According to Autio (2017), digitization can affect entrepreneurship in two ways: first, by altering the economic market picture, and second, by altering company behavior. Describes the disruptive impact of developing technologies and infrastructure on business, economy, and social activity using the term "digital revolution." This digital transformation enables organizational growth and globalization. Digitalization will alter labor demand, capacity needs, union membership, income volatility, and tax bases. Jepsen &

Drahokoupil (2017). To expand business in the digital era, workers and businesses require new skills. Kohli (2017) argues that digitization will impact overall quality control performance by modifying the development of market intelligence, the dissemination of market intelligence, and the capacity to respond to such market knowledge. Digitalization has accelerated, simplified, and reduced the cost of market intelligence generation, while new technologies have enriched and improved methods for disseminating business intelligence. Innovations make it simpler for firms to respond swiftly to consumer and competitive feedback. Digitalization influences the success and atmosphere of a business.

2.2 Technology management

Technological management is the integration of disciplines that enables enterprises and nations to build and enhance their technology capabilities to gain a competitive edge and maintain control over their technology base. Modern technology management (TM) appears to be an exception, yet it has been a requirement throughout its existence and learning it makes it more helpful. Cyert & Kumar (1994). According to Kouzes and Posner (2006), technical developments encourage sustainable growth and substantially impact corporate environmental changes. Technology management prepares, develops, and implements technical capabilities to create and realize corporate strategy and objectives by Linking engineering, scientific, and managerial disciplines. Qureshi and Jalbani (2014) acknowledged that technology management is the objective of product-producing technical experts. Technology may be detrimental to a firm. Thus technology management is becoming increasingly crucial. Daim, Meissner, & Carayannis (2019). Certain competitive technology management necessitates the management of processes that enable resource development, acquisition, usage, conservation of natural resources, and the contribution of numerous other aspects to quality and performance. Gregory (1995) proposed that technology management should include five conventional measures: identification of technologies that are essential to the business, selection of innovations that the company should be promoting, acquisition decisions are about choices between buy-collaborate- make options as technologies that can be created internally, in a partnership, or purchased from peripheral developers, and technology exploitation to generate a profit or other advantages.

Organizational agility (OA)

Yusuf, Sarhadi, and Gunasekaran (1999) discovered four concepts of OA through a comprehensive literature review: core competence management, capability for reconfiguration, knowledge-driven enterprise, and virtual enterprise. The definition of agility in management theory needs a solid foundation. The primary objective of OA is to enhance quality and performance. Bernardes & Hanna (2009);Bottani (2009);Cao & Dowlatshahi (2005);Yusuf & Adeleye (2002);Zandi & Tavana (2011). In a highly competitive market, nimble growth is sustained by swift and effective responses to expanding demand. Agile focuses on responsiveness and adaptability as the defining features of an agile company.

The manufacturing process can accommodate consumer requests (product strength, competitive advantage, services, and responsiveness). By merging reconfigurable and knowledgable techniques, the effective development of strategies (strength, diversity, quality,

originality, Etc.) is nimble, enabling the provision of consumer goods and services in a quickly developing environment. Khalfallah, M., & Lakhal, L. (2021). According to Kodish, Gibson, and Amos (1995), businesses must rapidly integrate technology, human resources, and management into their communications infrastructure in order to meet rising customer demand in a business environment that is always evolving. Alavi, Abd. Wahab, Muhamad, and Arbab Shirani (2014) discovered a correlation between organizational learning and workforce flexibility. They conceptualized workforce agility as a component of organizational agility in terms of proactiveness, flexibility, and resilience. Workforce agility relates to human factors and their impact on agility collectively. Additionally, agility enables businesses to take advantage of growth opportunities and strategic measures, resulting in improved financial and operational performance. Yang et al. (2014) Khalfallah, M., & Lakhal, L. (2020).

Research hypotheses

H1. Digitalization has a significant positive relationship with TQM performance.
H2. Technology management has a significant positive relationship with TQM performance.
H3. The connection between digitalization and TQM performance is mediated by organizational agility.
H4. The organization's agility mediates the relationship between technology management and TQM performance

3.0 Methodology

The study utilized a cross-sectional quantitative survey methodology with closed-ended questions to gather unprocessed data from diverse companies' administrative personnel. Data collection involved leveraging social media professional groups engaged in management activities within organizations. The choice of survey method was a crucial aspect, shaping the study's direction and objectives, aligned with prior research by Muneer, Basheer, Shabbir, Zeb (2019); Waseem-Ul-Hameed, Ali, Nadeem, Amjad (2017), and considerations from Goddard and Melville (2004) regarding empirical research philosophy. Following a causal research process based on established theories, this quantitative study employed a cross-sectional analysis with the individual as the unit of analysis. Ethical considerations were paramount, treating all gathered data from employees confidentially. Utilizing scales and questionnaires from existing literature, a 5-point Likert scale facilitated data collection, maintaining confidentiality and ethical standards. Measures for digitization, technology management, and organizational agility were based on recognized scales from previous studies. For instance, the Likert scale, affirmed by Hutchinson (2021), comprised seven items adapted from Jayachandran, Sharma, Kaufman, Raman (2005). The technology management measure adopted the 7-item TM scale developed by Bergeron, Raymond, Rivard (2001). Similarly, the scale for organizational agility, with seven items, was sourced from Tallon & Pinsonneault (2011). The sampling strategy employed was convenient, targeting administratively engaged employees from various company classifications and functions. Out of 500 distributed questionnaires, 440 were returned with complete responses. The sample size aligns with Flick's (2011) indication that a sample of 500 is considered excellent, reflecting a diverse cultural representation within the gathered data.

4.0 Results

Measurement Model

Table 1 shows that all the data on the indicators has spread suitably for further data analysis. The values of SD, kurtosis and skewness are in the required threshold ranges. We conducted the data analysis in two primary phases. The measurement model is evaluated based on factor load, Cronbach, composite reliability (CR), Average Variance Extracted (AVE), composite reliability, and discriminant validity. The evaluation of the measurement model findings is shown in Table 4. Cronbach's Alpha is greater than the minimum allowable value of 0.7 Cortina (1993). The instrument reliability alpha value is likewise satisfactory. The load factor is higher than 0.5. AVE has a positive convergence effect because its value is greater than 0.5. (Peterson & Kim, 2013).

Table 1. ***Factor loadings, Cronbach Alpha, CR, Average Variance Extracted (AVE)***

Constructs	Indicators	Loadings	α	CR	AVE
Digitalization	D1	0.53	0.721	0.795	0.694
	D2	0.66			
	D3	0.67			
	D4	0.79			
	D5	0.68			
	D6	0.57			
Organizational Agility	OA1	0.54	0.715	0.807	0.723
	OA2	0.68			
	OA3	0.65			
	OA4	0.66			
	OA5	0.65			
	OA6	0.63			
Technology Management	TM1	0.65	0.723	0.806	0.738
	TM2	0.64			
	TM3	0.54			
	TM4	0.61			
	TM5	0.66			
	TM6	0.57			
	TM7	0.57			
TQM performance	QM1	0.59	0.729	0.757	0.513
	QM2	0.76			
	QM3	0.77			

Tabel 2: Discriminant Validity Fornell-Larcker Criterion Test.

Constructs	1	2	3	4
1. TQM performance	0.716			
2. Digitalization	0.391	0.628		
3. Organizational agility	0.373	0.527	0.642	
4. Technology management	0.388	0.562	0.502	0.5

The validity of the scales is demonstrated in table 2. The evaluation of the structural evaluation model served as the basis for the second part of the data analysis. In this investigation, we first examine the measurement model and then investigate the structural model, as depicted in Figure 2. In this direction, the PLS bootstrap method was implemented, and 440 examples were analyzed to determine the significance of the structural model. This method uses a wide range of

Table 3 Results Mediation Analysis

Path	(M)	(STDEV)	T Statistics	P Values	Result
OA -> D->TQM P	0.533	0.041	20.81**	0	Mediation
OA -> TM-> TQM P	0.511	0.049	13.438**	0	Mediation

research conducted by Waseem-Ul-Hameed et al. (2017) in the field of education.

Table 4
Hypothesis Test

Indicators	(M)	(STDEV)	T Statistics	P Values	Results	F-square	R-square
H1; D -> TQM P	0.251	0.057	4.397**	0	Accepted	0.052	0.43
H2; TM -> TQM P	0.261	0.061	4.217**	0	Accepted	0.057	
H3; D -> OA	0.358	0.05	7.114**	0	Accepted	0.083	
H4; TM -> OA	0.307	0.054	5.678**	0	Accepted	0.034	

Total effect (TM > TQM)		Direct effect (TM > TQM)		Indirect Effects of TM on TQM					
Coefficient	P-value	Coefficient	p-value	Path	Coefficient	SD	T state	P Values	Bias (2.5%; 97.5%)
0.390	0.000	0.267	0.000	H: TM>OA>TQM	0.122	0.031	3.956	0.000	0.003 (0.060;0.182)

Total effect (Dig > TQM)		Direct effect (Dig> TQM)		Indirect Effects of Dig on TQM					
Coefficient	P-value	Coefficient	p-value	Path	Coefficient	SD	T state	P Values	Bias (2.5%; 97.5%)
0.381	0.000	0.253	0.000	H: Dig>OA>TQM	0.128	0.034	3.750	0.000	0.002 (0.061;0.190)

The results are shown in Table 3, which may be found in the section above. The acceptable t-value in the table above is greater than 1.96, and the acceptable p-value is less than 0.05. Each of these outcomes is entirely satisfactory. This indicates that the four hypotheses (H1, H2, H3, and H4) are valid. In addition, it demonstrates that not only does digitalization have a good impact on TQM performance, but also technology management does as well. The management of technical resources has a positive effect on an organization's adaptability. Moreover, digitalization has a positive effect on organizational flexibility. Both Hypotheses 4 and 5, which explain the role of organizational capacity as a mediator between digitalization and TQM performance and the relationship between organizational capacity and digitalization, are similarly accepted

An investigation of the role that OA plays as a mediator in the connection between TM and TQM was conducted utilizing a mediation analysis. According to the findings, after considering the mediating effect of OA, the Total effect of TM on TQM had a statistically significant impact (H1: β= 0.390, t =8.240, p = 0.000). The influence of TM on TQM was shown to be statistically significant (β=0.267, t =4.647, p =0.000). It was determined that there was a substantial (β= 0.122, t =3.956, p =0.000) indirect effect of TM on TQM brought about by OA. This demonstrates that OA has a role in mediating the connection between TM and TQM to some extent. A mediation study was conducted to evaluate digitalization's impact on TQM through OA. After accounting for the mediating effect of OA, we discovered that the total effect of digitalization on TQM was statistically significant (H1: β= 0.381, t =8.458, p = 0.000). The association between TM and TQM was statistically significant (β=0.253, t =4.420, p 0.0001). It was revealed that OA had a strong indirect influence (β= 0.12, t =3.750, p = 0.000) on the relationship between TM and TQM.

Conclusion

We explored the relationship between digitalization and TQM performance and the relationship between technology management and TQM performance. According to the results of our research, digitalization, and technology management are essential information sources for achieving TQM success. Total quality management (TQM) aims to increase customer loyalty by improving product and service quality while minimizing resource demands. Qasrawi et al (2017). According to the results of our study, organizational agility can also function as a regulator for the relationship between digitalization, technology management, and TQM performance. With the assistance of digitalization, OA has the flexibility to respond to anticipated changes (Van Oosterhout et al., 2006).

Our findings suggest that organizational culture may enhance the relationship between

digitization and TQM success. In order to attain TQM performance, organizational agility is now a requirement for organizational and technology management. If the corporate culture is supported and developed simultaneously in digitalization and technology management, businesses can efficiently achieve their objectives and become more competitive (Elliot, 2009; Melville, 2010; Schein, 2010).

Even if digitalization may impact the company environment, managers continue to accord it great importance. Nonetheless, managers now understand the nature and trajectory of digitization. Administrators need to deepen their understanding of digitization in the first place. The achievement of TQM performance is facilitated greatly by digitalization and technology management. Managers have a vital role in achieving TQM's aims in the modern era. Second, it plays a significant role in the performance relationship between intermediate digitalization, technology management, and overall quality control to increase the connection between intermediate variables and organizational agility. The significance deepens this relationship plays in this performance relationship. Large and medium-sized companies need to commit to their own corporate cultures.

Saima Yosufzai: Problem Identification and Model Development
Muhammad Zulqarnain Siddiqui: Literature Review and methodology

Conflict of Interests/Disclosures

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