Barriers of Digitalizing the Business Process among Yemeni Enterprises: Empirical Investigation

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ABSTRACT

This study aims to gain a perspective on the barriers faced by small and medium enterprises in Yemen in terms of adopting digitalization in their business process. With the help of data of 330 enterprises, the results indicate the severity of the environmental barriers among enterprises (Mean = 4.26, S.D. = 0.732), followed by operational barriers (Mean = 3.76, S.D. = 0.994), technical barriers (Mean = 3.54, S.D. = 1.04) and finally economic barriers (Mean = 3.51, S.D. = 1.13), while individual barriers are not found effective barriers (Mean = 2.27, S.D. = 0.7.38). Further, the proposed model to measure these barriers is found fit ($\chi2/df$ = 3.63, GFI = .993, AGFI = .988, CFI = .994, RMSEA = 0.08, RMSR = 0.07). The study suggests providing official support, training programs to SMEs owners and managers. It adds to the scant literature related to least developed economies.

Keywords: Digitalization, Enterprises, SMEs. Digital Transformation, Yemen

1. Introduction

Digitalization is known as a continuous evolving process which is a key challenge at the same time (Carcary, et al., 2016). This implies continuous investments in the field of digital transformation where the determination to adopt it is based on the perceived benefits of owners and managers (Hussein, et al., 2017). Research indicates that around 70% of the digitalizing initiatives do not reach their goals, which means that huge investments are expected to go in vain. Steven Zobell (2018) attributes the failure of digital transformation to the absence of teamwork in business transformation and the absence of system of work records.

Digital technologies would cause whether new business opportunities or new vulnerabilities for businesses (Satalkina & Steiner, 2020), where business exposure, along with institutional pressure, can play a significant role in developing entrepreneurial experience (Zaman, et al., 2020), therefore, more business exposure and more institutional pressure result in determining the usage of information systems in the business process (Arshad, et al., 2019). Digital transformation is not centered only on technology, it is also more related to talent and people. Because technology can be bought but adopting and utilizing it in a sufficient manner is mainly based on the development of talents and skills in the human capital (Frankiewicz & Chamorro-Premuzic, 2020). Therefore, the success of digital transformation is based on developing talents in four main domains which are technology, data, process and organizational change capability (Davenport & Redman, 2020) along with social capital (Dost, et al., 2018).

With the breakout of COVID-19 and the expansion of lockdown as well as isolation of countries worldwide, digitalization has been the only way out to sustain the business continuity, this is the point where some organizations were already prepared for such tough times in the business world, on the other hand some organizations were hindered mainly due to the lack of integrating digital transformation in their business (Sharma, 2020; Swisher, 2020).

The effect of the absence of digital transformation is severe in low and lower income countries. Governments and institutions aim for maintaining green image by adhering to green practices (Alshebami, 2021), while in lower income economies, survival is a crucial accomplishment, this maximizes the attention towards the role of digitalization in transforming the business process during and after the pandemic. Due to facing tremendous challenges, least developed countries have not benefited from the technological advancement and artificial intelligence (AI) (Utoikamanu, 2019), which led to creating gaps between developed countries where scientific research and innovation have always played a key role in encouraging the economic development (Mowery & Oxley, 1995) and least developed countries as there are significant gaps in respect to science, technology, and innovation where training and education could play a significant role in shaping entrepreneurial goals among individuals (Raza, et al., 2021; 2020; Alshebami, et al., 2020). Taking into consideration the widespread of small and medium enterprises in underdeveloped economies and their role in employment and income generation. Further, the lack of research directed towards the support and development of small and medium enterprises in these economies, maximizes the need for further research and investigation of the aspects of the SMEs sector and its chances to develop and contribute to the GDP growth and enhancement of economic welfare. This study attempts to gain a perspective on the barriers that hold enterprises to adopt digitalization to promote their business process in an underdeveloped economy e.g., Yemen with the help of primary data drawn from enterprises in two Yemeni cities namely Sanaa and Aden.

2. Literature Review
2.1 The Concept of Digital Transformation
The term digitalization was first used in 1971 in an article discussing its impact on the society in the context of human assisted research in humanities (Brennen & Kreiss, 2016). It has been defined as the use of data and technology to create revenues. It is also known as the changes brought into the business models and operations through gaining new knowledge by value-added digitization initiatives (Schallmo & Daniel, 2018). There is no single commonly accepted and used definition of digital transformation, hence it is defined differently in the literature based on different research purposes, as it has been described as consistent networking, fundamental transformation in the business, digital evolution, Business reinvention and the complete networking of business sectors (Schallmo & Daniel, 2018).

2.2 Digital Transformation in the Business Process
Bouwman, et al., (2018) investigated the experience of SMEs in adopting technologies to develop their innovativeness and concluded that external technology turbulence, innovation-related and strategic motives play a crucial role in the decisions of enterprises to use big data and social media, which leads to improving their performance. Further, Carcary, et al. (2016) stated that for organizations to move towards digital transformation; they are in need to focus

on the basic capabilities pertaining to developing a transformative digital business strategy; preparing a digital culture, talent and leadership skills; therefore, an effective digital transformation among organizations relies on developing these capabilities among other various capabilities that lead to effective transformation.

Bouwman, et al. (2019) state that small firms differ from large firms in regard to rethinking business models for digital transformation as the enterprise's performance is enhanced through business model experimentation and strategy implementation. The innovativeness of such enterprises helps in maintaining the continuous improvement. Therefore, they are required to take different routes to improve their performance and rethink their business models for the sake of digital transformation.

Garzoni, et al. (2020) identified four approaches for the process of technology adoption, the first approach is related to digital awareness about the possibility of digital transformation among SMEs, the second approach is related to the digital enquirement where solutions are presented and discussed through appropriate sessions, the third approach is the digital collaboration which involves the activities of SMEs to explore the implications and benefits of adopting the digital transformation to their business, and the last approach is the digital transformation which is the highest step of engagement and showing interest to transform digitally.

Moreover, et al. (2019) concluded three domains that comprise business model innovation in the process of digital transformation which are new digital products and services; the market share and segments; and the third domain is the key partnership. They further identified data management, firm size, work agility and the ability to change mindsets as key challenges for the transformation towards business model innovation. In addition to this, Vadana, et al., (2019) linked the extent of value chain digitalization among companies with the internationalization opportunity, as the ability of such companies to increase their share in foreign markets and leverage the internationalization opportunities get better and improved with the more use of the web infrastructure.

2.3 The Impact of Digitalization in Business:

Hagberg, et al. (2016) reported that digitality, if adopted in the business model as well as the strategy of the organization, contributes towards enhancing the value creation which leads to generating business benefits and improved performance among organizations. They concluded that retail settings, offerings, and retailing exchanges are influenced by digitalization. Further, digitalization is extensively affecting the transformation of the retailer-customer interface.

The digitalization can influence the long-lived firms to develop and transform digitally due to its role in improving the effectiveness and efficiency of the business process, the transmission of knowledge entrepreneurially, increasing the awareness about heritage of firms, the development of design skills for digital platforms, and improving the understanding of the customer experience (Rossato & Castellani, 2020).

Financial development indicators are positively related to the achievement of economic development (Hussein, et al. 2020), therefore, cointegration of domestic investment, imports and exports with economic growth, coupled with a digitalized business process could lead to inclusive development and economic welfare (Raza, et al., 2020).

2.4 Digitalization Barriers:

Bollweg, et al., (2020) indicated a high uncertainty among SMEs in terms of the process of moving towards digitalization while the positive attitude of owners is a major driver for the same. However, the major challenges faced by SMEs in the process of digitalization include lacking resources and limited availability of technology in the enterprise as digital development could be promoted through the use of applications and tools for marketing and administration. Further, Irma, et al. (2016) identified the factors that affect technology adoption among SMEs as owner/manager support, lack of resources act as internal factors affecting their technology adoption, while external factors include the market industry, trading partners, and lacking government assistance, however, IT infrastructure on the other hand, was not found as a key factor defining the adoption of technology among SMEs.

Lerch & Gotsch, (2015) identified the key factors affecting the industrial service digitalization which are service complexity, infrastructure, integrating upstream as well as downstream value chain partners, the share of exports, digitalization product and its complexity, and the size of the enterprise. Moreover, Rachinger, et al., (2019) concluded that competences of employees as well as capacities of organizations act as future obstacles to the process of digital transformation, as digitalization determines the possible options for organizational business model innovation.

Further, Vogelsang, et al., (2019) grouped the digital transformation barriers into interrelated groups of barriers which are: lacking skills and knowledge about decision; technical barriers such as dependency on technology and available infrastructure; organizational barriers such as lacking strategy, vision, time and resources; environmental barriers in lacking laws and standards; and finally individual barriers such as fearing job loss and control loss as well. Further, Alraja, et al. (2021) indicated that technological, organizational and environmental factors are significantly influential as barriers for SMEs in developing economies.

In the context of least developed countries, the literature is very scant in respect to the process of digital transformation among SMEs in such economies, even though digitalization in developing countries (Matthess & Kunkel, 2020), Sub-Saharan Africa as well (Myovella, et al., 2020; Mazzoni, 2019), has been investigated in the literature, yet it is poor when it comes to covering the aspect of SMEs in least developed countries. For instance, in Bangladesh, the literature pertaining digitalization is focused on the emerging of digitalization culture in the country (Hussain, 2015); attitudes of individuals towards digitalization (Rana & Ali, 2016); the state of digitalization in the urban areas (Billah, 2015); using and adopting ebXML (Electronic Business XML) (Rahman, 2014); working through sustainability in digital business (Alam & Khalid, 2020), which indicate less research dedicated to the digital transformation in regards to small business sector. Similarly, in Tanzania, which is also a least developed country, the literature is investigated the contribution of electronic business practices (Matekere, 2019), digitalization in the health sector business process (Luogaa, et al., 2019), digital financial inclusion in the country (Mas, et al., 2011), and the lack of digital economy (Haji, et al., 2017). In Rwanda, e-government and its challenges as well as improvement (Twizeyimana, et al., 2018; Hakizimana & Muhe, 2019; Mukamurenzi, et al., 2019; Content, 2016) is the focus of the available literature. In Yemen, adopting and measuring e-business have been investigated (Abdullah, et al., 2015; Abdullah, et al., 2018; Saleh & Manjunath, 2020b), while other aspects

such as the tendency and ability as well as the challenges of SMEs to digitalize their business is not fully investigated. Taking these few examples into consideration, SMEs in these countries, being a significant component in the economies, are left without much attention by researchers which at the same time creates an earnest need to dedicate some research to the challenges/barriers to digitalize the business process among SMEs in lower income countries, in our case, the republic of Yemen.

2.5 Background of the Yemeni Context:

Yemen is one of the least developed countries having the poorest economy in the MENA Region. The population of Yemen in 2019 as estimated by the United Nation is 29.49 million, the urban population in Yemen is around 37% of the total population. Less than eight million individuals are considered internet users in Yemen in 2020 (around 27% of the population), while around 60% of the population (17.82 million) are mobile users in Yemen during 2020, as for social media use in the country, around 2.50 million individuals are active users in 2020 which is around 8.5% of the total population.

Small and medium enterprises in Yemen are functioning under economic and political instability in the country that has been active since 2011 (Saleh & Manjunath, 2020), further, they face a plethora of challenges which can be grouped into historical challenges pertaining to the business environment and temporary challenges pertaining to the currently witnessed instability in the country (Saleh & Manjunath, 2020a).

Small and medium enterprises constitute the majority of business sectors in Yemen, around 300,000 enterprises account for 97% of the business sector in Yemen (ILO, 2018). According to the comprehensive industrial survey in 2010, the industrial enterprises are 48,069 enterprises functioning in manufacturing sector relating to food processing, energy, and mining. Further, Sanaa City shares the highest employment in the service sector, while Aden hosts a predominant share of small industrial sector (ILO, 2016).

2.6 Research Problem and Question:

The digitalization is a continuous process which is a key challenge of it (Carcary, et al., 2016), however, adopting digital transformation is assumed to be the goal of every business, therefore, extra challenges and barriers face small and medium enterprises to embrace the digital change and achieve a competitive advantage. Such challenges differ among countries, sectors and businesses. Even though studies have investigated the barriers of digital transformation among enterprises (Bollweg, et al., 2020; Irma, et al., 2016; Lerch & Gotsch, 2015; Rachinger, et al., 2019; Vogelsang, et al., 2019), due to the contextual difference of every country, questions can be raised about the same in relevance to Yemen. Hence the study about barriers to adopt digital transformation among enterprises in the Yemeni context is initiated seeking to answer the raised question which is "what is the extent of the barriers for the digitalization among small and medium enterprises in Yemen and what particular barriers are more critical in hampering the ability of SMEs to transform their business process digitally".

2.7 Research Objective:

To investigate the barriers hindering the tendency of technology adoption and the digitalization process among small and medium enterprises in Yemen.

2.8 Need for the Study:

In the era of industry 4.0, digitalization becomes a significant terminology in organizations as well as in economies, therefore, preparing for digitalization whether in knowledge, efforts and adoption is considered a necessity among individuals, enterprises and organizations. During tough times like the Covid-19 pandemic time, adopting digitalization played a significant role in easing business transaction and provided less interrupted services, while lacking digitalization put organization as well as economies in tougher times due to resources shortage. Lower income countries are more hit during this pandemic due to the gaps between developed countries and least developed countries in terms of artificial intelligence and technological advancement as well as better resources owned by developed countries. This creates a need to investigate the ability of least developed countries to adopt digital transformation in the business sector, more particularly the SME sector due to being a significant component in the least developed economies. Digitalization in developed countries has been investigated in the literature while in respect to least developed countries, research has been directed towards digital economy and e-government which leaves the barriers of SMEs to adopt digitalization and digital transformation untapped area of research. This study is focus on identifying how such barriers hold the ability of SMEs in least developed countries, Yemen in particular, from adopting digitalization in the business process.

3. Methodology

The descriptive-analytical method is adopted for this study. The descriptive method is used to provide a descriptive investigation of the digitalization process in the literature and focuses on the context of least developed countries and Yemen in particular. The analytical method is used to analyze and interpret the data collected from the surveyed enterprises and present evidence of the barriers to the digitalization.

3.1 Sample Design and Measurement:

Non-probability sampling technique is followed to collect responses based on the accessibility to prospective respondents. A number of 370 questionnaires were distributed, out of the 342 filled out questionnaires, 330 are included in the analysis. In order to provide accurate information about what managers believe to be barriers for their tendency to digitalize their business process. The targeted respondents in SMEs are selected to be the managers in these SMEs, one manager in top management is selected, further, because majority of enterprises are micro and small enterprises, a top manager in such enterprises has been reached out for the questionnaire.

The questionnaire was developed based on reviewing the available studies in the academic literature, the measure used is five point Likert scale starts with "Not at all a barrier" = 1 and ends with "Sever barrier" = 5. The result of Cronbach Alpha test for the reliability of the questionnaire is 0.702 which is in the acceptable range (Ursachi, et al., 2015).

The barriers to digitalizing the business process among SMEs has been investigated in the literature, scales have been chosen from relevant literature (Shakir, et al., 2007; Zakaria & Janom, 2011; Vogelsang, et al., 2019; Saleh & Manjunath, 2020b; Cichosz, et al., 2020) in

order to empirically assess the barriers to digitalizing the business among SMEs in a least developing country e. g. Yemen.

Table 1: Items Adopted to Measure Barriers of Adopting Digitalization in the Business Process

Variables		Source
Economic	Unconvincing benefits to the enterprise.	(Shakir, et al., 2007) (Zakaria & Janom, 2011) (Vogelsang, et al., 2019) (Saleh & Manjunath, 2020b) (Cichosz, et al., 2020)
	High cost of Internet connectivity and technology adoption	
	Limited resources in terms of finance, software and hardware	
Operational	Lack of qualified staff to develop, implement and support digitalization.	
	Concerns about the changes expected in the business process	
	Enterprises' readiness (strategy, vision, and governance)	
	Technology adoption	
Environmental	Power, electricity and infrastructural supply.	
	Inadequate communication, transportation and delivery networks.	
	Lack of developed legal and regulatory systems.	
	Complexity of logistics	
Technical	Lack of online payment gateways and processes.	
	Limited availability of Online Banking Services	
	Low level of technology usage among enterprises.	
	Lack of government support towards digital transformation.	
	Security barriers (data exchange)	
Individual	Low level of literacy among SME owners	
	Owners' fear of loss during digitalization	
	Low attitude of owners towards digital transformation	
	Resistance to change	

We used descriptive statistics to identify the level of barriers among small and medium enterprises in Yemen such as the mean and standard deviation. We used frequency and percentage to present the demographic characteristics of respondents, we also listed the most challenging barriers according to the respondents. Further we applied exploratory factor analysis for the purpose of dividing the barriers into subgroups as assumed in the literature. The output is five subgroups which are economic, operational, environmental, technical, and individual barriers. Three items were deleted because they were problematic in in their contribution towards the relevant factors. Then we applied confirmatory factor analysis (CFA) in order to confirm the output extracted by exploratory factor analysis and ensure the reliability and validity of the model as well as the model fir indices which show that the model is possible to be used to measure the barriers that face small and medium enterprises when heading

towards digitalizing the business process. The data analysis was carried out using the "Lavaan" package in R version 4.0.5 through the environment of RStudio Version 1.4.1106.

4. Results and Findings

This section presents the results and findings of the analysis of the barriers of digitalization among SMEs. The mean, standard deviation and the ranks of the factors are arranged as illustrated in the tables below. It begins with profile analysis of respondents, then the analysis of the barriers is presented thereafter.

4.1 Profile of the Respondents

As illustrated in the charts below, a number of 187 of the sampled enterprises are located in Sana'a city (56.7%), and 143 enterprises (43.3%) are in the city of Aden. 136 enterprises (41.2%) belong to the trade sector, 125 (37.9%) are in the manufacturing sector and 69 (20.9%) are in the service sector. 100 enterprises (30.3%) have been established for less than a year, while 98 (29.7%) enterprises have existed for two to five years, 34 (10.3%) enterprises have been established for six to ten years, and 98 (29.7%) enterprises have been established for more than ten years. The majority of the sampled enterprises (39.7%) employ one to nine workers, 106 (32.1%) enterprises employ ten to nineteen workers, and 93 (28.2%) enterprises employ twenty to twenty-nine workers. 130 (39.4%) enterprises are engaged in the domestic scope of operation, 131 (39.7%) enterprises are engaged in the national scope of operation, and 69 (20.9%) enterprises are engaged in the international scope of operations.
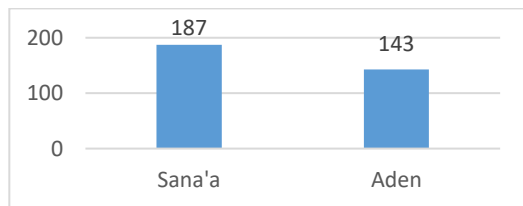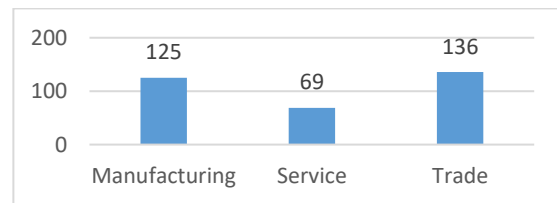

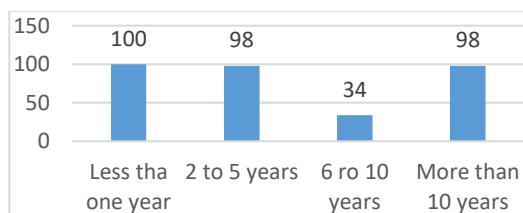Figure 1: *City of Enterprise*

Figure 2: *Field of Activities*
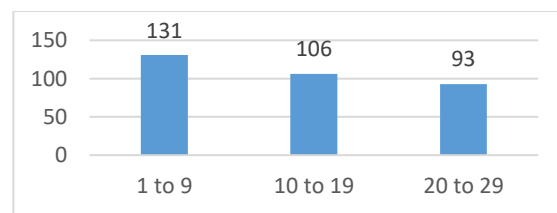

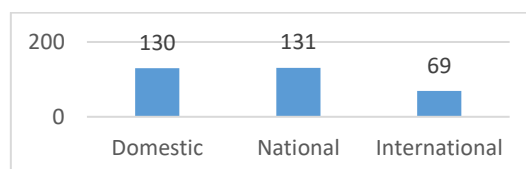Figure 3: *Age of the Enterprise*

Figure 4: *Number of Employees*

Figure 5: *Scope of Operation*

4.2 Descriptive Statistics:
4.2.1 Barriers of Business Process Digitalization among Yemeni SMEs:

Large section of Yemeni enterprises perceives digitalization as relevant to bringing unconvincing benefits to enterprises (Mean = 3.44 and S.D. = 1.322). The majority of enterprises are hindered to digitalize their business by the high cost of the process (Mean = 3.44 and S.D. = 1.292). They also observe the lack of resources as a major barrier towards digitalizing their business process (Mean = 3.49 and S.D. = 1.195). Overall, the resource limitation is seen as the major economic barrier the digitalize the business process.

Lacking a skilled workforce is perceived as a major digitalization barrier by most Yemeni enterprises (Mean = 3.78 and S.D. = 1.155), and the change caused to the business by the digitalizing process is thought of as a concern SMEs (Mean = 3.66 and S.D. = 1.137). Only a moderate section of enterprises considers their readiness as a positive factor for their business digitalization (Mean = 3.83 and S.D. = 1.183). Further, technology adopting for digitalizing the business process is seen by Yemeni SMEs as a serious barrier (Mean = 3.83 and S.D. = 1.180).

Moving towards digitalizing is severely challenged by the lack of power supply among Yemeni SMEs (Mean = 4.50 and S.D. = .760), and the absence of appropriate networks is challenging the growth and the tendency of digitalizing the business process among SMEs (Mean = 4.13 and S.D. = 0.870). The majority of SMEs in Yemen are challenged by the absence of governance and active regulatory policies when it comes to considering business digitalization (Mean = 4.13 and S.D. = 0.888). Further, complexity of logistics is barely a concern according to SMEs in Yemen (Mean = 3.51 and S.D. = 1.31).

Lacking the online payment gateways is very challenging to digital transformation for Yemeni enterprises (Mean = 3.54 and S.D. = 1.225). The limited availability of online banking services is challenging for SMEs to seek for digital transformation (Mean = 3.37 and S.D. = 1.251). Heading towards digitalization is challenged the low usage of technology (Mean = 3.62 and S.D. = 1.199). Other barriers include lacking the official support of the government towards digital transformation (Mean = 3.48 and S.D. = 1.250) and data security concerns (Mean = 3.64 and S.D. = 1.221).

The low level of literacy is not a barrier for most Yemeni enterprises to promote and digitalize their business process (Mean = 2.14 and S.D. = 0.918). Majority of Yemeni SMEs are not challenged by the owners' fear of loss in terms of adopting digital transformation (Mean = 2.22 and S.D. = 0.832). Almost all enterprises are not challenged by the overall attitudes of owners towards digital transformation of SMEs (Mean = 2.43 and S.D. = 0.904). According to a minor portion of SMEs resistance to change is one of the barriers to opt for digitalizing the business process (Mean = 3.37 and S.D. = 1.275).

4.3 The Most Challenging Barriers:

Respondents were asked to identify one barrier which they consider the most challenging barrier among all barriers included in this study. The majority of respondents 181 (54.8%) chose an environmental barrier which is the inadequate networks of communication, delivery and transport. While the second most challenging barrier is lacking the governmental support towards digital transformation according to 115 respondents (34.8%). The third most challenging is the limited availability of online banking service as per 31 respondents (9.4%) and lacking online payment gateways according to 3 respondents (0.9%). The same is illustrated in the chart below.
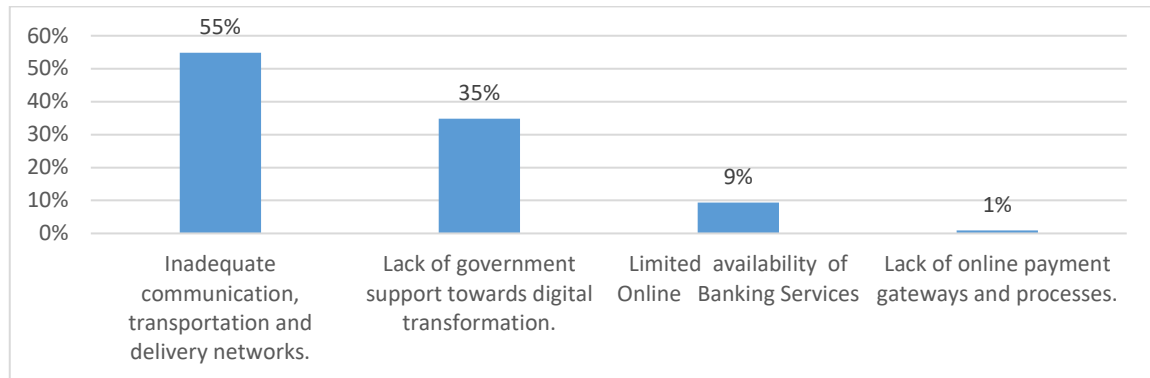
Figure 6: *The Most Challenging Barrier among All*

4.4 Exploratory Factor Analysis:

We applied exploratory factor analysis (EFA) to identify the factors by grouping the twenty-statement gathered from the literature. The result of applying Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.753, df = 136, and p < 0.001 which indicate that the sample size is adequate for applying exploratory factor analysis. Further, assessed the total variance explained of the extracted variables, as seen in table2, the total variance explained by the five extracted factors is 66.80% which is considered satisfactory (> 50%).

Table 2: Total Variance Extracted Based on Eigenvalues

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
Technical barriers	3.319	0.195	19.50%
Economic barriers	2.134	0.126	32.10%
Individual barriers	2.091	0.123	44.40%
Environmental barriers	1.980	0.116	56.00%
Operational Barriers	1.834	0.108	66.80%

As shown in the table below, the result of EFA yielded five factors which are technical barriers, economic barriers, individual barriers, environmental barriers and operational Barriers. Three items were deleted for not being correlated with specific factors. It is also observed that factor loading yielded from exploratory factor analysis are found satisfactory as they range from 0.715 to 0.955, except the third statement in individual barriers where its loading is 0.394, however it was not dropped because it was correlated to its relevant factor and because our sample is sufficient to keep factor loadings as low as 0.394 (Hair, et al., 2019).

Table 3: Factor Loadings of the Factors Extracted. Uniqueness = (1 - communalities)

Items	Factor Loadings	Uniqueness
Economic barriers		
Item1	0.923	0.143
Item2	0.796	0.356
Item3	0.764	0.367

Operational barriers		
Item1	0.766	0.382
Item2	0.789	0.369
Item3	0.767	0.401
Item4	Dropped	-
Environmental barriers		
Item1	0.715	0.484
Item2	0.939	0.118
Item3	0.750	0.301
Item4	Dropped	-
Technical barriers		
Item1	0.805	0.345
Item2	0.789	0.366
Item3	0.829	0.293
Item4	0.763	0.413
Item5	0.855	0.264
Individual barriers		
Item1	0.955	0.088
Item2	0.933	0.127
Item3	0.394	0.824
Item4	Dropped	-

4.5 Confirmatory Factor Analysis:

We used the "Lavaan" package in R language to run confirmatory factor analysis due to the ability to process ordinal data in confirmatory factor analysis with applying maximum likelihood technique to confirm the result extracted from running exploratory factor analysis, the results yielded are considered satisfactory.

4.6 Assessment of Reliability and Validity:

Reliability measures are assessed to ensure that the scale is reliable to measure the barriers facing small and medium enterprises to move towards digitalizing their business process. These measures Cronbach's Alpha where the result for the whole scale is 0.702, 0.875 for economic barriers, 0.821 for operational barriers, 0.839 for environmental barriers, 0.906 for technical barriers and 0.780 for individual barriers.

Composite reliability of all construct is assessed, its values range from 0.826 to 0.914which is higher than the threshold limit (> 0.70), this means that every statement is contributing sufficiently to its relevant construct (Hair, et al., 2016; Hair, et al., 2020). , Similarly, Average Variance Explained (AVE) is examined and found satisfactory as it ranges from 0.613 to 0.776 which is satisfactory as it is higher than the threshold limit (>50) (Hair, et al., 2020). ,

Discriminant validity is investigated through using the Fornell and Larcker's criteria in which the value of under root of AVE on the diagonal of all constructs is higher than the interitem correlation (Fornell & Larcker, 1981), to ensure that every construct is different from

other constructs and that every statement is not highly correlated with statements in other constructs. As shown in table4, the results are found satisfactory and according to the criteria. Further, we applied the Heterotrait Monotrait criteria measure the discriminant validity by ensuring that values should be lower than 0.85 (Hair, et al., 2017).   As shown in table5, the result confirms that discriminant validity is established.

This indicates the convergent reliability has been established for the factors in our study. This also leads to concluding that this measurement is valid and reliable to measure the barriers facing small and medium enterprises in the Yemeni context to head towards digitalizing their business process.

Table 4: Convergent Reliability and Discriminant Validity of Constructs

#	Variables	CA	CR	AVE	MSV	1	2	3	4	5
1	**Economic**	0.875	0.890	0.733	0.006	**0.856**				
2	**Operational**	0.821	0.826	0.613	0.040	-0.039	**0.783**			
3	**Environmental**	0.839	0.912	0.776	0.018	0.027	-0.03	**0.881**		
4	**Technical**	0.906	0.914	0.679	0.040	-0.076	0.201	0.021	**0.822**	
5	**Individual**	0.780	0.877	0.727	0.018	-0.033	-0.055	0.133	0.034	**0.852**

Note: †= p < 0.100; *= p < 0.050; **= p < 0.010; ***= p < 0.001

CA = Cronbach's Alpha, CR = Composite reliability, AVE = Average variance extracted, MSV = Maximum Shared Variance

Table 5: Discriminant Validity According to the Heterotrait Monotrait Criteria

Barriers	Economic	Operational	Environmental	Technical	Individual
Economic					
Operational	0.054				
Environmental	0.054	0.068			
Technical	0.091	0.198	0.054		
Individual	0.053	0.096	0.216	0.057	

Table 6 illustrates the statistics related to the values of estimates where unstandardized estimates are presented as well standardized estimates which range from 0.416 to 1.078 at a significance level less than 0.01 which indicates a satisfactory output

Table 6: Unstandardized and Standardized Estimates of the Model

Variables			Estimate	S.E.	C.R.	Standardized Estimates
Env1	<---	Environmental	1			0.855
Env2	<---	Environmental	1.104	0.052	21.118	0.943
Env3	<---	Environmental	0.984	0.032	30.583	0.841
Ind1	<---	Individual	1			0.919
Ind2	<---	Individual	1.172	0.096	12.237	1.078
Ind3	<---	Individual	0.452	0.051	8.912	0.416

Tech1	<---	Technical	1			0.822
Tech2	<---	Technical	0.982	0.047	21.106	0.808
Tech3	<---	Technical	1.035	0.041	25.535	0.851
Tech4	<---	Technical	0.941	0.046	20.514	0.774
Tech5	<---	Technical	1.05	0.04	26.251	0.863
Op1	<---	Operational	1			0.81
Op2	<---	Operational	0.982	0.074	13.216	0.795
Op3	<---	Operational	0.916	0.078	11.708	0.742
Eco1	<---	Economic	1			0.992
Eco2	<---	Economic	0.794	0.045	17.632	0.788
Eco3	<---	Economic	0.778	0.045	17.465	0.771

Figure 7 shows the model investigated with standardized values which shows low correlation among latent variables as well as satisfactory standardized regression weights. This indicates the proposed model in our study is fir to measure barriers facing small and medium enterprises to head towards the adoption of digitalization of the business process in the context of a least developed economy.
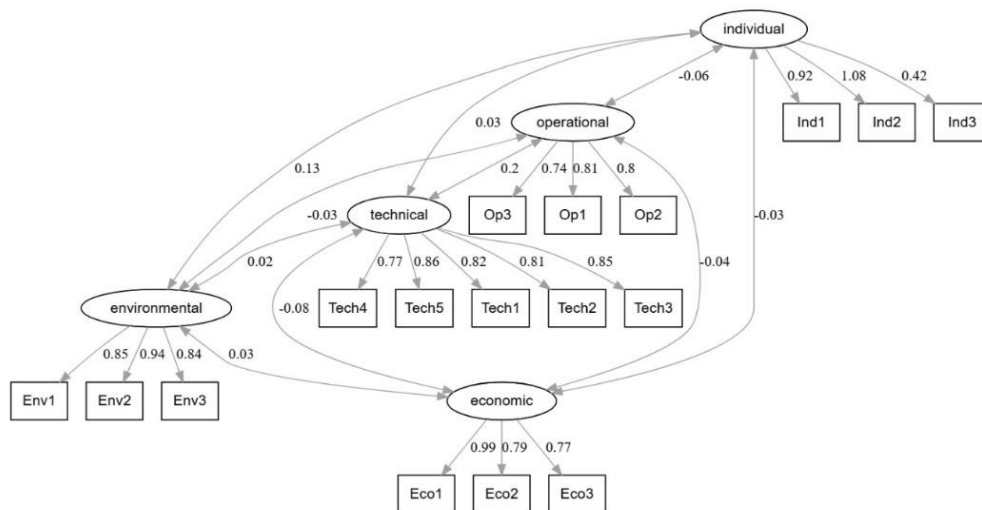

Figure 7: *Diagram of the Model with Standardized Values*

Several indexes are assessed to identify the fitness of the model, these indexes are χ2/DF: Minimum Discrepancy Function by Degrees of Freedom divided; chi-square (χ2); Goodness of Fit Index (GFI); Adjusted Goodness of Fit Index (AGFI); comparative fit index (CFI); normed fit index (NFI); Standardized Root Mean Squared Residual (SRMR); and root mean square error of approximation (RMSEA). Tabl7 shows the fit indices of the model measuring barriers of adopting digitalization in the business process among Yemeni SMEs. As seen in the table, all values are in the satisfactory range which indicates that the model fits the data, however, RMSEA is ranged in the threshold limit (RMSEA = 0.08).

Table 7: Model Fit Indices with Cut off Values and References

Index	Cut off Values	References	Model Fit
χ^2	-	-	396.546
df	-	-	109
χ^2/df	< 5	(Hair et al., 2010)	3.638
p	> 0.5*	(Forza & Filippini, 1998; Awang, 2012)	0.000
GFI		(Baumgartner and Homburg, 1996; Doll, Xia and Torkzadeh, 1994; Forza & Filippini, 1998; Greenspoon & Saklofske, 1998)	0.993
AGFI	> 0.8		0.988
CFI	> 0.9	(Hair et al., 2010; Awang, 2012)	0.994
NFI	>0.8	(Forza & Filippini, 1998)	0.992
SRMR	< 0.08	(Hair et al., 2010; Awang, 2012)	0.072
RMSEA	< 0.05		0.089

* = the p value is sensitive to sample size where it is rare to find a higher p value with a high sample, therefore, it is considered satisfactory.

4.7 Relevance of the Barriers in the Yemeni Context:

As shown in the table below and based on the above analysis. The relevance of the barriers in the Yemeni context is observed in economic, operational, environmental and technical barriers. No relevance is observed in factors related to individual barriers to digital transformation.

The results show, as illustrated in the table below, that environmental barriers have been significantly the most barriers to Yemeni SMEs in terms of digitalizing the business process with a weighted mean (4.26) S.D. (0.73). The second group of barriers that is most relevant in the Yemeni context is the operational barriers with a mean score of 3.76 (S. D. 0.99). The third most relevant group is the technical barriers with a weighted average (3.54) S.D. (1.04). And the least relevant group is the economic barriers that scored a weighted average (3.51) S.D. (1.13). However, individual barriers scored the lowest mean 2.27) S.D. (0.73), indicating their irrelevance to the Yemeni context.

Table 8: Barriers to Digital Transformation among Yemeni SMEs

Barriers	Mean	Std. Deviation	Rank
Economic Barriers	3.51	1.137	4
Operational Barriers	3.76	0.994	2
Environmental Barriers	4.26	0.732	1
Technical Barriers	3.54	1.048	3
Individual Barriers	2.27	0.738	5

Environmental barriers have been significantly the most challenging due to the poor infrastructure in the country which is even worsened during the recent five years within the current instability in the country. The technical barriers are severe among SMEs which can be

attributed to the condition of the economy being an underdeveloped economy where technology is less adopted by the government to achieve economic growth and development. The disagree score over the individual barriers reflect the tendency of SMEs owners to develop their enterprises and achieve a competitive edge, regardless of the other barriers encountered by enterprises, individual barriers are not significant in the Yemeni context.

Regardless of the little efforts made during the last two decades, the business environment is not yet encouraging to render the barriers and challenges into benefitable opportunities for SMEs to grow and develop in functions to contribute towards economic growth and welfare (Saleh and Manjunath, 2021). This makes the challenges and barrier sever to encounter particularly with the absence of a supervising authority that leads, manages and support the sector of SMEs in Yemen to possess the basics for achieving competitive advantage and realize their desired growth. By looking at the overall mean of the barriers for digitalization facing SMEs in Yemen (Mean = 3.47), to answer the research question, it can be observed that the extent of barriers is moderate, further, environmental barriers are critical barriers hampering their ability and tendency to adopt digitalization in the business process. On the other hand, individual barriers do not show any severity in affecting enterprises' ability to adopt digitalization as they were not agreed upon compared to other challenges.

4.8 Research Implication:

The implication of this research can be summarized by being a study that adds to the scant literature in least developed countries in general and Yemen in particular. It shows the aspects where policy makers and the government should direct their effort in providing the SME sector with a conducive business environment to increase entrepreneurial activities and economic development.

5. Conclusion

The study aimed to investigate the barriers faced by small and medium enterprises in Yemen in their pursuit of digitalizing their business process. Based on the analysis results, the study concludes that most of the barriers identified for this study affect the tendency of Yemeni SMEs to adopt digital transformation. The environmental barriers were ranked the first in their severity. While individual barriers are not ranked as effective barriers in the context of Yemen. However, the severity of the environmental barriers is alarming as they may lead to a complete termination if not a slowdown in the adoption process. Further, the proposed model to measure the barriers for moving towards digitalization among SMEs fits the data in the Yemeni context.

5.1 Suggestions and Limitation

The study aimed to investigate the barriers faced by small and medium enterprises in Yemen in their pursuit of digitalizing their business process. Based on the analysis results, the study concludes that most of the barriers identified for this study affect the tendency of Yemeni SMEs to adopt digital transformation. The environmental barriers were ranked the first in their severity. While individual barriers are not ranked as effective barriers in the context of Yemen. However, the severity of the environmental barriers is alarming as they may lead to a complete termination if not a slowdown in the adoption process. Further, the proposed model to measure the barriers for moving towards digitalization among SMEs fits the data in the Yemeni context.

Based on the results, the study presents the following suggestions that would contribute to providing sustainability and growth for the functions of small and medium enterprises in Yemen:

- Official support by the government and its international development partners for preparing and maintaining a conducive business environment.
- Creating a competitive environment for domestic SMEs to compete towards achieving objective goals in terms of adopting technology, lean manufacturing, and serving customers.
- Providing training programs for SMEs managers and owners in regard to digital transformation which would encourage their tendency to compete in the market through modernization.

The limitation of this research is that it sampled only two cities in Yemen namely Sana'a and Aden, which creates the need for future research to focus on more spread sample for the purpose of generalizing the research result among SMEs in the country.

Conflict of Interest
The authors declared that they have no conflict of interest.

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