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Article: **The Effect of Common Facility Centre (CFC) Support Program on SMEs' Digital Transformation: Mediating Role of Sensing Capabilities**

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Effect of Common Facility Centre (CFC) Support Program on SMEs' Digital Transformation: Mediating Role of Firm Sensing Capability

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Abstract

Despite the growing interest of policymakers and scholars in SMEs' support programs, theoretical information concerning how support programs contribute to SMEs' digital transformation remains scarce in the existing literature. Building on the dynamic capability theory, this study aims to investigate the role of the Common Facility Centre (CFC) support program in SMEs' digital transformation through the mediating mechanism of firm sensing capability. Multi-time and multi-source data were collected from 230 SMEs through a self-administered survey questionnaire. The findings indicate that the use of the CFC support program has a positive effect on SMEs' digital capability and digital adaptation (two dimensions of digital transformation). However, the variable firm sensing capability does not mediate the relationship between CFC program usage and firms' digital transformation.

Keywords: Common Facility Centre (CFC) program, digital transformation, dynamic capabilities, SMEs (small and medium-sized enterprises)

Introduction

The small and medium-sized enterprises (SMEs) sector is a foundation of economic and social growth of the developed as well as the developing economies (Bianchi et al., 2017; Shahzad, 2020). SMEs are highly valued in context of Pakistan as there are around 3.2 million SMEs in this country that directly contribute to the employment generation, Gross Domestic Product (GDP), balance-of-payment, innovative products and services, and general living standards of the country (Mui et al., 2018; Shahzad, 2015). Despite the acknowledged contribution of SMEs in multiple sectors and overall economic development, these enterprises face competitiveness challenges mainly due to technological and digitalization advancements

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(Soomro & Shah, 2019). The small size and the limited financial resources of SMEs make it more difficult for these enterprises to obtain, procure, and retain advanced technological resources to stay competitive (Bellucci et al., 2019; Liñán et al., 2020). Accordingly, it has been a concern for the government policymakers and the scholars to explore these factors and to process them in a way through which SMEs' digital capacity can be enhanced.

The literature on SMEs competitiveness indicates that the provision of external support plays an important role in helping SMEs to achieve and maintain competitive performance (Adam & Lestari, 2017; Kulkarni, 2016; Shahzad, 2020). However, there have been several programs including export promotion programs, technology transfer initiatives, and business/skills development programs. These programs have been launched by governments and international development agencies all over the world. Though, the literature generally establishes a positive impact of support programs on SMEs performance (Cravo & Piza, 2019; Shahzad, 2015), a review of the empirical studies also leads to inconclusive results (Falahat et al., 2020; Pergelova & Angulo-Ruiz, 2014). Similarly, it is not clear in the existing literature that how support programs contribute to the digital capacity building of SMEs. Accordingly, the first objective of this study is to investigate how SMEs support programs contribute to the digital transformation of enterprises.

For the study purpose, we have selected a specific SMEs' support program that has been initiated by the government of Pakistan under the name of the Common Facility Center (CFC) program. The CFC support program envisages the transforming SMEs operations, production processes, and overall business management practices. It also provides them exposure and access to state-of-art production machinery, manufacturing methods, and specialized digital skills and expertise (Seth et al., 2013; Shahzad, 2015; Soomro & Aziz, 2015). However, the government expects that the technological transformation will enable manufacturing SMEs to cope with digitalization challenges. Also, to transform their systems, practices, and overall technological capabilities to improve production capacity and innovation rate to attract international customers (Mubarik et al., 2016). Moreover, the most commonly offered facilities by the CFC support program include production facility, laboratory testing, skills building, and networking opportunities. It further offers unique

resources and capabilities to SMEs and motivate them to develop digital capacity (Shahzad et al., 2019). Accordingly, this particular study intends to investigate the effect of the CFC support program on SMEs' digital transformation.

Furthermore, the literature indicates areas needing advance research to explore the effect mechanism of support programs (Falahat et al., 2020). Scholars assert that firms' ability to sense changes in the environment helps them to understand the digital developments. Accordingly, it helps to transform firms' processes and practices to develop the digital capability which eventually helps to better serve customers in domestic and international markets (Dong et al., 2016; Monteiro et al., 2017). Teece (2014) calls this dynamic capability a sensing capability which is actually the "identification, development, co-development, and assessment of technological opportunities with customer needs" (p. 332). As digital transformation implies changes, it is argued that SMEs' digital sensing capability is the mechanism through which a CFC support program may contribute to a firm's digital transformation.

The current study devotes three important contributions. First, this study theorizes a direct relationship between SMEs support programs and SMEs digital transformation. Scholars and policymakers are interested in measuring the effectiveness of SMEs support programs to know whether these support programs help SMEs to develop their digital capabilities and competitiveness (Hottenrott & Lopes-Bento, 2014; Razumovskaia et al., 2020). However, the related literature does not provide empirical evidence in this area. There is even a greater gap in the Pakistani context, keep in view the previous studies which have focused on the production or market competitiveness of SMEs (Shahzad, 2015; Shahzad et al., 2019; Seth et al., 2012). Second, the current study contributes to the support program's literature by exploring the underlying mechanism through which SMEs support program influences the firm outcomes. The previous research has seldom considered the role of SMEs' dynamic capabilities to understand the effect mechanism of support programs (Catanzaro et al., 2019; Mustaghis-ur-Rahman & Jalees, 2015). Third, the present study extends the literature based on support programs in a developing country, especially, in Pakistan. The most empirical literature on support programs is based on the developed economies. However, the developing economies contain their unique social,

cultural, and governance landscape which may influence the effect mechanism of support programs.

Context of the Study: CFC Support Program

CFC support program is one of the main initiatives of the government of Pakistan to support and develop the capacity and competitiveness of SMEs. It provides them access to advanced technological infrastructure which would not otherwise be possible for SMEs to hold in-house (Seth et al., 2012). The prime objective of the CFC program is to develop knowledge, provide skills, and support the technological up-gradation of manufacturing sector. Besides, it includes SMEs for productivity enhancement, cost reduction, and improvement in quality standards that make them competitive at both local and global levels (Shah, 2018). CFC support program assumes that if SMEs are provided with the advanced and digital production technologies and skills, they can create better customer value, product quality, and human and social capital (Ramanigopal et al., 2013).

Common Facility Centers (CFC) were established under its support programs in different industrial clusters of the country. It was done to provide a shared pool of machinery, testing, inspection, and technology-related services for the collective upgradation of SMEs in respective regions/clusters (Choudhary et al., 2015; Jaware et al., 2011). Moreover, the CFC support program is a method to help those companies and clusters having highest export potential but due to the weak production technologies and technological capabilities, they struggle to compete in domestic and international markets. According to the experts and industry observers, the resurgence of these industries depends on technological modernization, product innovation and diversity, and digital infrastructure improvement (Karki, 2016). The CFC support program accordingly helps SMEs to acquire technical knowledge and resources from the CFC to generate a unique firm-specific resource pool that becomes difficult for the competitors to catch up (Khan, 2005; Al-Hudhaif, 2020). CFC support program offers production facilities, laboratory and R&D services, technical training and consultancy, information about the latest technological and market trends, and networking opportunities in respective clusters. SMEs use these facilities and services on paid basis to strengthen their production systems, improve innovation in processes and products, and enhance competitiveness (Nagayya & Rao, 2012).

Theory and Hypotheses Development

This study mainly draws on dynamic capability theory (DCT) (Teece et al., 1997) to hypothesize that the CFC support program may contribute directly and indirectly to SMEs digital transformation. According to DCT, a firm's competitive performance depends on its ability to transform its process and systems according to the ever-changing business environment. However, the era of the industry 4.0 revolution has marked a greater challenge for enterprises to adopt and utilize digital technologies to provide high-quality, innovative products, and services to the customers. The CFC support program is established specifically to develop the technological capability of SMEs through the provision of digitally advanced production systems and capabilities. In this regard, the DCT provides a rationale to conceptualize that the firms who would use CFC facilities and services are more likely to transform their systems and processes to meet digitalization challenges.

CFC Support Program and SMEs Digital Transformation

The rapid technological advancements have changed the way markets and enterprises develop and maintain competitiveness all around the world. The business world has encountered with one of the critical developments that is called digitalization. Digitalization refers to the adoption of 'digital technologies' ranging from essential elements, that is, usage of the internet, adoption of e-business (Brennen & Kreiss, 2016) to modern technologies (social media platforms including big data and artificial intelligence) (Todorovic et al., 2020). The emergence of digitalization amid the industry 4.0 revolution has drastically changed the way how SMEs can create value and compete in domestic and global markets (Di Maria et al., 2022; Ivanov et al., 2022). Digital transformation is about advanced applications (digitalized business model), virtual reality applications, elements of industry 4.0 such as cloud computing (Aslam et al., 2020), block chain technology, and the internet of things (IoT) (Haghnegahdar et al., 2022). SMEs are especially impacted by the digitalization because these enterprises are more vulnerable to environmental disruptions and technological changes as compared to the large-scale organizations (Matarazzo et al., 2021). It is difficult for SMEs to meet customers' demands and respond to market trends without digital transformation (Del Giudice et al., 2019; Scuotto et al., 2019; Viswanathan & Telukdarie, 2021; Kergroach, 2020). However, SMEs largely lag in adapting digital

technologies and capabilities (Cataldo et al., 2020; Nambisan et al., 2019; Tuselim & Yaacob, 2022; Nakku et al., 2020).

Though, CFC support program provides advanced production technologies, technological knowledge and skills, and networking opportunities to SMEs. Which facilitates SMEs to understand, learn, and eventually replicate the digitally advanced production process and system. Accordingly, the engagement of SMEs with the CFC support program transforms the firm's technologies, processes, productivity, and innovation rate. Similarly, the CFC support program offers managerial and leadership development programs which further develop a quality mindset of organizational and managerial leadership to adopt digital technologies. Moreover, the leadership development programs have been found specifically useful for transforming top management's values, beliefs, and mental models towards the digital adaptation (Eller et al., 2020). CFC support program also provides technical training to develop technologically and digitally capable human capital, to strengthen the institutional capacity of the firm, and to adopt the advanced manufacturing technologies. In the same way, the networking and collaboration-enhancing events organized by CFCs, expand the network of SMEs to learn best practices and information about technologies during the interaction with other firms.

The digital transformation of a firm comprises two important dimensions, that is, digital capabilities and digital adaptation. It is argued that the hard, that is, production and laboratory facilities and soft including training and networking facilities and services of the CFC support program complement their effect on SMEs' digital adaptation and capabilities. Accordingly, it is hypothesized that:

H1a: CFC support program usage positively influences SMEs' digital capabilities

H1b: CFC support program usage positively influences SMEs' digital adaptability

Role of Sensing Capability

Digitalization literature reveals that the digital transformation predominantly depends on organizational capabilities, especially, on digital sensing capability (Ellström et al., 2022) which largely helps SMEs to sense the need for digital transformation, designing digital strategy, and investment decisions. Researchers also highlight that the digital

transformation is not only about the upgradation of technology. Instead, it also encompasses the overall strategy of the organization to transform all the systems and practices by using digital technologies (Cannas, 2021; Dussauge et al., 2000). Accordingly, a high level of sensing capability may facilitate the adoption of digital technologies and the development of digital capabilities (Dong et al., 2016; Pidduck & Zhang, 2022; Teece et al., 1997).

According to DCT, SMEs can compete in the national and international markets by quickly acquiring the technical information and adapting to new product and service demands. SMEs can utilize the new technological exposure and knowledge acquired from the CFC support program to (re)evaluate their existing technological competencies and make the requisite investment in digital transformation. The top management of SMEs conducts needs analysis to identify risks, challenges, opportunities, and potential customer expectations to take strategic decisions (Soluk et al., 2021). Thus, the strategic decisions of SMEs regarding the adoption and implementation of digital technologies may largely be facilitated by the level of sensitivity of the firm towards digital transformation. The CFC support program's facilities and social networking opportunities allow manufacturing sector of SMEs to learn digitally-enabled production systems, to collaborate with local and foreign markets, and to compare with the best practices, (Nasir et al., 2022). Hence, CFC support program uplifts the managerial cognition which helps SMEs to recognize technological opportunities and risks (Matope & Mahove, 2021). Therefore, the sensing capability developed through the CFC support program may work as a catalyst to capture the digital advancements and resultant scanning, evaluation, and adoption of technologies (Jafari-Sadeghi et al., 2022). Accordingly, we hypothesize that;

H2: CFC program usage positively influences the digital sensing capability of SMEs.

H3a: Digital sensing capability mediates the relationship between CFC program usage and digital capabilities.

H3b: Digital sensing capability mediates the relationship between CFC program usage and digital adaptation.

Research Methodology

Sample and Data Collection

The main objective of the current study is to evaluate the effect mechanism of the CFC support program. So, the population for the sampling framework consists of those SMEs that have been using the facilities and services of CFCs all around Pakistan. CFCs maintain a record of the client SMEs, facilities and services they render. However, the list of 20 operational CFCs was obtained from the Small and Medium Enterprise Development Authority (SMEDA), an official government body which was established exclusively for the further development of SMEs in Pakistan. Moreover, a list of around 1000 client SMEs was obtained from CFCs through personal visits and telephonic contact. Later on, a questionnaire containing a cover letter which was briefly describing the objectives and expectations of the survey was sent to SMEs 730 users. Furthermore, it was explained in the participant information sheet that the participation in the survey was voluntary. Also, all the information obtained from the respondents would be used with the professional confidentiality without revealing the identity of any individual or the firm. The information regarding the usage of the CFC support program was obtained from CFCs, whereas the information about the mediating and outcome variables were obtained from user SMEs. In each SME, the information about mediating and outcome variables were obtained from different sources to avoid common method variance. Hence, after one month and three follow-ups, 230 responses were received, forming a response rate of 32%.

In the final sample, 49% of SMEs were having between 51 to 150 employees, whereas 41% of firms were employing between 151 to 250 employees. Most SMEs, that is, 94% were operating in the industry for more than 9 years. 83% of SMEs were family-owned and family-managed businesses, whereas 17 % were being run by professional non-family managers. Furthermore, 82% of SMEs were self-financed and had not availed any external financial grants, whereas 18% of SMEs received financial grants from various financial institutes. 96% of SMEs were involved in export activities. The usage of the CFC program was highest from 2010 to 2018, whereas 61% of firms in the population availed CFC facilities. From 2001 to 2009, almost 37% of firms used the services of the CFC program.

Measures

CFC Usage

The use of the CFC support program was measured directly through the information provided by CFCs. The CFCs administration rated the usage of seven facilities and services by each SME. A questionnaire containing a list of 7 facilities and services was filled up by the project head of each CFC. The project head rated the usage of CFC facilities and services by each SME on a Likert-type scale, where 1= little extent and 7= large extent. This measurement approach is consistent with extant empirical studies (Shamsuddoha, Yunus Ali, & Oly Ndubisi, 2009).

Sensing Capability

The sensing capability of SMEs was measured through 4 items taken from the dynamic capabilities scale of Pavlou and El Sawy (2006). SMEs respondents were asked to indicate their agreement or disagreement with the given statements through the 7-point Likert scale ranging from 1= strongly disagree to 7= strongly agree. A high agreement score indicated a greater prevalence of sensing capability of the firm.

Digital Transformation

Digital transformation was measured against two dimensions, that is, 1) digital capability, and 2) digital technology adoption through 16 items. A 13 items scale by Wielgos et al., (2021) measured the digital capability, whereas 3 items by Gillani et al. (2020) measured the adoption of digital technologies. The respondents of SMEs indicated their agreement or disagreement with the statements on a 7-point Likert scale ranging from 1= strongly disagree to 7= strongly agree. A high agreement score indicated a greater level of digital transformation in the firm.

Control Variables

Firms' age, size, industry, and the use of alternative support programs were considered as the control variables in this study. Most of the extant empirical studies have found these variables potentially related to the effectiveness of both the support programs and the firms' digital transformation.

Construct Validation

To confirm the convergent and discriminant validity of the model, we conducted Confirmatory Factor Analysis. The results indicate that the hypothesized three-factor model fitted the data well compared with the alternative two-factors and one-factor model. However, a few items did not meet the acceptable item-loading criteria and were thus dropped from the model. The remaining model showed a good fit and all items significantly loaded onto their respective factors with > 0.70 item loading. As shown in Table 1, the composite reliability of latent variables ranged from 0.78 to 0.84.

Table 1

Reliability and Convergent Validity

	Cronbach Alpha	Composite reliability (rho_c)	Average variance extracted (AVE)	Factor Loading	VIF
Sensing Capabilities	0.80	0.844	0.58	0.599	1.028
				0.781	2.079
				0.737	2.325
				0.898	1.401
Digital Capabilities	0.797	0.835	0.341	0.785	1.714
				0.827	2.028
				0.691	2.382
				0.623	1.643
				0.341	1.651
				0.176	1.814
				0.303	1.718
				0.553	1.460
				0.606	1.455
				0.544	1.462
				0.613	1.468
Digital Adaptability	0.762	0.748	0.4	0.694	1.501
				0.855	1.453
				0.732	1.330
				0.392	1.330
				0.315	4.742

Discriminant validity was established by comparing bi-variate correlations with the square root of AVE (Fornell & Larcker, 1981). Based on this criterion, to demonstrate discriminant validity, the correlation of a construct with all other variables should be less than its AVE. The heterotrait-Monotrait ratio is a modern and better approach than Fronell-Lecker to determine discriminant validity between the constructs. HTMT examines not only the ratio between-trait correlations but within-trait correlations of two constructs (Sarstedt et al., 2014). Monotrait correlation is a correlation of indicators for a single construct, and Hetrotrait correlation is a correlation of indicators between the two constructs. Discriminant validity has been established between the two reflective constructs if the value of HTMT is below 0.90 (Collier, 2020). Even if the value of this correlation is less than .85, researchers can proceed with further analysis.

Table 2
Discriminant Validity

	Fornell & Larcker				HTMT		
	1	2	3	4	1	2	3
1 CFC Usage	0.503						
2 Digital Adaptability	0.16	0.633			0.163		
3 Digital Capabilities	0.198	0.625	0.584		0.216	0.87	
4 Sensing Capabilities	0.084	0.051	0.092	0.761	0.144	0.072	0.139

Results

The results of the structural model are provided in Table 3. In this study, it was hypothesized that CFC support program usage positively influences H1a) digital capability, and H1b) digital adaptability dimensions of digital transformation. The results indicate that the use of the CFC support program has a positive and statistically significant (coefficient =0.18 and p-value <0.05) effect on SMEs' digital capabilities, thus confirming H1a. The results also confirm that the positive and statistically significant effect of CFC support program use (coefficient =0.12 and p-value <0.05) on SMEs' digital adaptability. Thus, confirming H1b. Hypothesis 2 stated that CFC support program usage positively influences the sensing capability of SMEs. The results did not confirm this relationship as this relationship is insignificant for both digital capabilities and digital adaptability outcomes.

To test the mediating effect hypotheses, we used a bootstrapping technique (Hayes, 2013) with 5,000 bootstrap samples and a 95% bootstrap confidence interval to test the significance of the indirect effect. The results show that the mediating effect of sensing capabilities is not significant for the effect of CFC support program on both digital capabilities (β = 0.003, lower confidence limit = -0.012, upper confidence limit = 0.020, p = 0.727) and digital adaptability (β = 0.004, lower confidence limit = -0.014, upper confidence limit = 0.023, p = 0.668), thus H3a and H3b are rejected. However, our additional analysis indicates that both digital capabilities and digital adaptability have a significant direct effect on SMEs' digital transformation dimensions.

Table 3

Direct and Indirect Effects

	Path Coefficient	*t* statistics	*p* values
Direct Effect			
CFC Usage -> Digital Adaptability	0.121	1.937	0.001
CFC Usage -> Digital Capabilities	0.176	2.793	0.005
CFC Usage -> Sensing Capability	0.047	0.599	0.549
Indirect Effect			
CFC Usage -> Sensing Capability -> Digital Adaptability	0.003	0.349	0.727
CFC Usage -> Sensing Capability -> Digital Capabilities	0.004	0.429	0.668

Discussion

A growing body of literature recognizes that to achieve higher performance, SMEs must transform their operations, practices, and overall systems digitally (Ingley, 2016; Pham et al., 2019) and governments' support programs contribute in this regard (Joo, Seo, & Min, 2018). In this study, an attempt was made to investigate how SMEs support programs help SMEs stray abreast of the digital environment by developing necessary digital capabilities and technological adoption. The findings of this study confirm that the use of the CFC support program positively contributes to SMEs' digital transformation. However, the sensing capability of SMEs does not

play a role in this process. Thus, findings of the current study offer some important insights for the theory and practice.

Theoretical Implications

Findings of the current study contribute to the support program literature by investigating the direct effect of the CFC support program on SMEs' digital transformation. The extant literature has reported the mixed findings about the role of the support program in enhancing the performance outcomes of SMEs. Furthermore, it has not been investigated yet as to how support programs contribute to important outcomes that eventually lead to the firm performance. The current study finds that the use of CFC support programs positively influences the digital capabilities and digital adaptability of SMEs. Thus, it provides support to the theoretical assertion where institutional support, that is, support programs contribute to SMEs' competitiveness (Cravo & Piza, 2019; Pergelova et al., 2014). Moreover, digitalization has become a critical driver of SMEs' success and this study presents support programs as a tool to equip SMEs with digital technologies and capabilities to overcome the performance challenges. Furthermore, this study contributes to the literature that investigates the underlying mechanism of support programs' effects (Falahat et al., 2020). Though, the findings of this study did not confirm the mediating role of sending capabilities in the relationship between CFC program usage and SME digital transformation. Besides, the additional analysis indicates that sending capability relates positively to both the digital capabilities and the digital adaptability of firms. Also, this provides a theoretical point for researchers to investigate why support programs do not develop the cognitive capacity of SMEs to sense digital developments. This finding also leads to some important implications for the government policymakers.

Policy Implications

The finding that the CFC support program enhances SMEs' digital capabilities and adaptability provides logic for the government policymakers to pledge more resources for the establishment and to strengthen the CFC support program. One common agenda of every government is to strengthen its SME sector amid the industry 4.0 revolution (Shahzad, 2020). The current study confirms that the support programs which provide technical support to SMEs, develop the digital capability of such firms to compete successfully both on domestic and international

fronts. However, it is concerning that if sensing capability contributes to digital transformation, then why CFC support program has been failed to develop this dynamic capability among user SMEs.

Furthermore, the policymakers need to reflect and revisit the focus and design of CFCs to pay special attention to the cognitive development of SMEs. Currently, it seems that SMEs are more into programmed learning and replication instead of integrating and configuring their digital capabilities by sensing environmental trends and opportunities. Perhaps, more policy focus is required to ensure that SMEs do not only rely on the technological resources of the CFC program, instead develop their processes and systems to sense technological revolution. To improve SMEs' competitiveness, the government of Pakistan has made extensive investments and efforts. Thus, findings of the current study provide a platform to evaluate the effectiveness of support programs like CFCs.

Conclusion

According to the current research, the business environment has turned into a digital ecosystem where the growth and success of SMEs are largely determined by their digital technologies and capabilities. The engagement of SMEs in support programs as similar to CFCs engagement is an opportunity for SMEs to achieve digital transformation. However, sensing capability being a critical driver of digital success, does not play any role in the relationship between CFC program usage and the digital transformation of SMEs.

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