



Readiness of institutional setting to address the competitive technology challenges of SME sector in Sri Lanka: Perceptions of officers in local settings

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Abstract

In the era of economic globalization, many challenges arose for Small and Medium Enterprises (SMEs) due to the rapidly intensified competition. In that, many of them cease within the few years of their commencement. Technology challenges are recognized as one of the main challenges retarding growth and reducing their potential contribution to the national economy. Therefore, SMEs must adopt survival strategies and strategic methods to survive to face various technological challenges. Hence, this research aims to address the apparent lack of research on the relative perception of DS-level officers on institutional support towards SMEs in facing technology challenges. The investigation used a qualitative, case study-based methodology. A series of key informant interviews were held using purposive sampling with 13 DS-level officers in the Agribusiness sector in Sri Lanka. Data gathered from the interviews were analysed using an in-depth thematic area analysis to identify five technology challenges: innovation-utilization of new scientific discoveries, business collaboration through networking, information communication technology, technology transfer with large-scale companies, and productivity-enhancing technologies. The findings of the study sorely revealed the association between SMEs' technology challenges and the prevalence of numerous institutional defects. Finally, the study provides recommendations to develop existing institutional support concerning the agribusiness sector development in Sri Lanka. The study will help the government and related policymakers shape SMEs' competitive strategies and policy adjusting and reforming processes.

Keywords: *Economic globalization, ICT, SMEs, survival strategies, technology challenges.*

1. Introduction

The economic globalization era has activated a financial order, indicating how business concepts and events are organized worldwide. Thus, it amounts to a peculiar wide opening of national borders for economic activities (Scholte, 2000). Therefore, the era is acknowledged as an opportunity for both developed and developing countries to inflate economic prosperity by enhancing their global market participation. In this era, small and medium enterprises (SMEs) are recognized as the foremost driver of sustainable economic development in both developed and developing countries (Prasanna et al., 2019; World Trade Report, 2016). Similar to most developing countries in the region, the SME sector of Sri Lanka plays a remarkable role in the economy in terms of contributing to GDP, reducing unemployment, mobilizing domestic savings, diminishing poverty, contributing to export earnings, and dispersing income (Vijayakumar, 2013). The SMEs in the rural areas in Sri Lanka is recognized as the primary source of employment and food generation. Therefore, the sector accounts for the Sri Lankan rural villagers' livelihood (Gamage, 2003).

Globalization has created many challenges for SMEs recently due to the rapidly intensified competition. Despite the potential benefaction to the national economy, the sector is affected by the classical constraints of lack of technology usage in the production processes, low skills of human resources, and capital acquiring (Rahayu, Maksun, & Kusumawardhani, 2018). In a similar vein, Apulu, Latham, and Moreton (2011) revealed that under such phenomena as globalization, decreasing investments and funds, internationalization of local markets, increased volatility of financial markets, and rapidly changing consumer demand have multiplied the pressure on the SME sector. Therefore, the downfall rate of SMEs is enormously increased after a short period of its commencement (Ahmedova, 2015; Gamage et al., 2020; Hammer, 2019). According to Markovics (2005), competitiveness is defined by a company's capability and occurs in relation to the environment in which it operates. Moreover, he emphasizes competitiveness as the liability and strength for market contention and the strength for position gain and permanent commitment indicated by expanding business prosperity, profitability, and market share. In that, SMEs need to adopt survival strategies and strategic methods to survive and succeed in this dynamic, competitive, and challenging business environment and take appropriate measures to mitigate these various changes (Gamage et al., 2020; Jayasundara et al., 2019).

Given these facts, Vijayakumar (2013) reported many SMEs' failures to occur in Sri Lanka. According to Priyanath and Premaratne (2014), 70% of SMEs have ceased their businesses within three years of commencement, and 60% of them within the first year of commencement. This is particularly due to the less potential of the SMEs to address the three competitive challenges in this current globalized economy. They are technological challenges, sustainability challenges, and global challenges (Auwal Mohamed, Shamsudin, Sharifuddin, & Ali, 2020; Noe, Hollenbeck, Gerhart, & Wright,

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2017; World Trade Report, 2016). Among these three competitive challenges, many existing studies revealed technological challenges as one of the foremost growth retarding components of SMEs, which is the main focus of this study.

The improvements or advancements in technology or technological progress refer to recognizing new methods or techniques or improvement of existing methods or techniques used in the production process of firms, sectors, and economies (Noe et al., 2017). As demonstrated in many endogenous and neoclassical growth theories, technological advancement is the compulsory condition for the growth of a distinct economy sector or the whole economy. It enhances the social benefits of economic activities (Guan, Yam, Mok, & Ma, 2006). However, many scholars emphasize the low level of utilization of improved technologies by firms as a critical obstacle tackling SME growth, especially in developing regions like Sri Lanka (Asare, Akuffobe, Quaye, & Atta-Antwi, 2015; Prasanna et al., 2019).

Given these facts, existing literature has proposed the importance of institutional support in terms of government cooperation as an aspect of overwhelming the challenges faced by the SME sector (Kang & Park, 2012; Songling, Ishtiaq, Anwar, & Ahmed, 2018). Accordingly, this research aims to address the noticeable lack of research work on the DS-level officers' readiness and their relative perception of institutional support towards facing technological challenges of SMEs in Sri Lanka. The study supports the existing literature by furnishing empirical evidence on DS-level officers' readiness to face technology challenges. Afterward, the study highlighted the DS-level officers' relative perception of institutional support towards Agro-based SMEs in the country, facing those challenges. Hence, the survey asks the following main research questions:

What are the main technological challenges and constraints faced by SMEs in Sri Lanka?
What are the readiness and relative perceptions of DS-level officers on institutional support towards facing those technology challenges?

The study plan was as follows: Section 2 gives a brief review and background of the aforesaid research area, Section 3 describes the methodology adopted by the research, Section 4 concerns with the empirical findings, Section 5 discusses the key points highlighted in the result part, and finally, Section 6 provides the concluding remarks and policy considerations.

2. Review of literature

Definitions of SMEs

Different countries define SMEs differently, based on the number of employees working, the amount of capital invested, and the amount of turnover or type of the business (Jayasekera & Thilakarathna, 2013). As Watkins (2016) stated, the different SME definitions are influenced by the geographical location of SMEs and country-specific

legislation. The IFC (2011) found that most nations classified enterprises with employees from 10 to 50 as small-scale and 50 to 250 as medium-scale, based on 132 economies' definitions of SMEs. According to the recent Enterprise Survey conducted by the World Bank using the employment size of firms, SMEs and large firms can be defined as 5-19, 20-99, and 100+ as small, medium, and large, respectively (World Bank, 2017).

Technology challenges faced by SMEs

Despite worldwide technical developments, small firms are still hampered by a lack of technological application. These small firms would struggle to compete and expand without these technological advancements (Sitharam & Hoque, 2016). The existing research in the SME field identified technical advancement as one of the most critical factors in preventing SMEs from failing, particularly in developing countries. As Prasanna et al. (2019) emphasized, it leads to increased productivity and efficiency of production components such as land, human resources, capital, and other resources, and it entails a foreseen process of innovation and invention. Moreover, he stated that the term "innovation" refers to the use of novel scientific advances to commercialize items, where "invention" refers to the scientific breakthroughs needed to improve a manufacturing system. According to Schumpeter's idea of entrepreneurship, innovation requires entrepreneurial abilities to organize current or new resources in the production process to meet new scientific discoveries (Prasanna et al., 2019). Das, Kundu, and Bhattacharya (2020) examined the problem of building technical environments for the benefit and sustainability of SMEs and discovered that both institutional and external capabilities are essential variables in establishing sustainable technological environments for entrepreneurs. Furthermore, both "institutional capabilities" and "external capabilities" define the technological environment.

Several academics have reached a consensus on the limits of SMEs in adapting to new technologies. As Prasanna et al. (2019) emphasized, lack of initial capital required to acquire new technology (the limited economic base), insufficient information, lack of trained labor force and appropriate technology utilization strategies, technical know-how, and basic utilities, low adoption of innovative production and marketing strategies, lack of training and modern managerial skills, and uncertainty are among them (Prasanna et al., 2019). According to Shaikh, Kumar, Syed, Ali, and Shaikh (2021), the five crucial challenges SMEs face when adopting technology are as follows. They lack technical skills and efficiency, the high cost of technology and infrastructure, acceptance issues, a lack of organizational support, and government support. A poor financial condition, for example, may stymie technology upgrades, growth of production capacity, and production efficiency, as well as the firm's ability to invest in new and advanced technologies and personnel training and development to boost productivity (Athambawa, Wickramarachchi, & Puspakumara, 2017). According to Prasanna et al. (2019), even if SMEs have a solid financial foundation for adopting new technologies, they may be doubtful of the potential benefits, so management may not use them in areas like training and development, research, and new product creation. Thus, adoption becomes much

difficult for them. As a result, institutional readiness is vital for SMEs to be aware of the potential benefits of new technologies, especially in the context of globalization.

Institutional support

According to Sinnathurai and Sedláček (2012), supports from responsible institutes, governments and other sections of societies are essential factors to permit the SMEs' growth and thereby to strengthen their contribution to the national economies of developing nations. Haresankar, Galappaththi, and Perera (2018) stated the importance of obtaining assistance from leading institutes such as universities and the government bodies in order to build a strong platform for SMEs in developing countries like Sri Lanka. Since most developing regions limit technical innovation, the institutional structure in terms of government assistance plays a vital role in affecting SME performance through various techniques (Thongsri & Chang, 2019). Several previous studies have used the institutional environment reasoning to claim that gains in institutional support for business are linked to improved performance because government institutions regulate and encourage the conduct of actors in a given environment (Dunning & Lundan, 2008). They have a tendency to influence the character of a company's activities and improve performance from a variety of angles. As a result, institutional support for business support services and allied industries, such as tax exemptions, loans, information technology, product development help, and financial capital, will boost company performance in the long term (Athambawa et al., 2017). Almawishir (2018) discovered that not all SMEs had taken advantage of institutional support due to a lack of awareness or a refusal to consider it for various reasons, including debt avoidance, trust concerns, being previously supported, or insufficient support in terms of time and cost.

Hence, any nation's management should prioritize economic growth by establishing preferential policies and institutional services, with a particular focus on technological advancement in the SME sector. Moreover researchers, have come to many conclusions about the institutional arrangements of countries that promote SMEs. As a result, Hurmerinta-Peltomdki and Nummela (1998) divided business support services into "reactive" and "transitional" approaches, with the "reactive" approach referring to businesses acquiring support services to address short-term operational issues, and the "transitional" approach referring to the use of assistance programs to achieve long-term strategic objectives.

According to Bennett (2008), policy strategies can benefit these small firms in finance, information, professional advice, and training and development. Other forms of institutional support include direct financial assistance in the form of loans, grants, and subsidies; public-private-producer partnerships that allow for long-term success training services provided by a variety of private and public sector organizations and business collaboration and networking systems among SMEs with the same or different industries (Athambawa et al., 2017). Many countries have made significant efforts to encourage SMEs because of their favorable impact on economic progress (Vijayakumar, 2013).

Therefore, it is crucial to pay more attentiveness to SMEs' growth and success, which calls for the supportive institutions and government to divert their support in developing this important sector (Forkuoh, Ampadu, & Osei, 2016). As a result, successive administrations in Sri Lanka have taken several initiatives in recent years to create a favorable environment for small and medium-sized businesses by enacting several policy reforms, regulations, supportive services, and increased incentives (Vijayakumar, 2013).

As Prasanna et al. (2019) highlight, one way of dispensing the effects of technological advancement on the growth of an economy is the shift of production possibility frontier (PPF). Accordingly, Kumara (2019) emphasized that technological advancement leads to shifting the entire frontier right with a given level of production inputs and without bothering about discovering a new resource base. Therefore, the government should focus on attaining effective economic growth by implementing policies and services, mainly focusing on technological advancement in the SME sector. Hence, the readiness of institutional setting is critical for SMEs to be aware of possible benefits from technology advancement, especially in the present era of globalization.

3. Methodology

As previously described, the study focuses on identifying perceptions of DS-level officers on the readiness of institutional setting to address the competitive Technology Challenge of the SME sector in Sri Lanka, intensified in the economic globalization era. As mentioned in the study background, researchers recognized the technological challenges as an utmost pressure in the global economy that has possible influences on altering the SMEs' business atmosphere. Based on the high failure rate of SMEs within few years of commencement of their businesses, an in-depth analysis is essential to determine the DS-level officers' readiness and their relative perception of institutional support towards facing technological challenges of SMEs. The study identified four hierarchical interconnected layers in the institutional settings which establish for SME sector development. They are policy developing and decision-making layer, financial institutions layer, provincial layer, and DS level layer. The officers in the DS-level were focused by the study as it is the primary layer which directly deals with SMEs at the bottom level. These officers are with rich knowledge and experience about the effectiveness and readiness of the institutional setting to address the key challenges facing the SME sector.

Due to the nature of the problem investigated in the study, researchers chose a qualitative, case study-based methodology. The data for this research were collected via in-depth interviews. The qualitative data collection enabled the researchers to investigate new areas and information possibly missed by previous studies or evaluations (Yin, 2009). As interviews are considered as effective data collection methods in case study-based research methodology, researchers conducted a well-organized series of key informant interviews to gather data from the selected respondents. In this connection, a well-developed and pre-tested interview guide was used, as annexed in Appendix 1. In such

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qualitative research, data saturation point could be identified when the researcher perceives that the amount of information needed to investigate the problem is sufficient through experiences in in-depth interviews. Thus, the study reached 13 respondent officers related to the agri-business sector in Sri Lanka in thirteen institutions, recognizing it as the data saturation point of the research. In selecting the sample respondents, researchers used the purposive sampling method, ensuring that respondent officers have at least more than one year of experience in the field, assuming that they have adequate knowledge to expose their perspective on the SMEs' technology challenges and degree of institutional support. The principal researcher conducted all the interviews and they were recorded with the permission of the sample respondents. The interviews lasted for about 50 minutes on average and were performed via face-to-face meetings or over the phone. A trained research assistant was employed to transcribe the recorded interviews. Data coding and triangulation were done by the principal researcher. Table 1 presents the profiles of respondent officers.

The interview guide was prepared mainly using open-ended questions, and the first part divulged the demographic/personal information of the sample respondents. The second part contained the questions related to institutional readiness and relative perception of DS-level officers regarding institutional support towards SMEs facing technology challenges. The researchers carefully conducted an in-depth thematic area analysis and identified the technology challenges faced by SMEs as follows:

- (1) Challenges about innovation-utilization of new scientific discoveries,
- (2) Challenges related to social capital approach,
- (3) Challenges related to information communication technology (ICT),
- (4) Challenges about technology transfer with MNCs/ TNCs/ Large-scale companies, and
- (5) Challenges related to productivity-enhancing technologies.

Table 1
Profile of Sample Respondents

Respondents	Highest education level	Work experience in the current position (Years)
R 01	Higher diploma	10
R 02	Diploma holder	15
R 03	Diploma holder	10
R 04	Degree holder	12
R 05	Degree holder	25
R 06	Degree holder	15
R 07	Degree holder	23
R 08	Degree holder	2
R 09	Master's degree	1.5
R 10	Advanced level	4
R 11	Advanced level	5
R 12	Master of Philosophy	18
R 13	Degree holder	27

4. Results

This section presents the primary findings of the study. Several sub thematic areas were identified under each technology challenge after transcribing and coding the recorded interview data. Table 2 presents the sub thematic areas of the major technology challenges.

Table 2
Major technology challenges and sub thematic areas

	Major Technology Challenges	Description	Sub thematic areas in major challenges
1.	Innovation - utilization of new scientific discoveries	Romer (1986) revealed that technological innovation is one of the crucial factors determining growth sources. Therefore, growth is mainly depending on the amount of allocation to research and development. It ultimately leads to an increase in production and economic output.	New product development Access to human capital Market knowledge
2.	Social capital	According to the social capital theories, social (intangible) capital has a powerful effect on the invention and innovation process in SMEs than physical and financial (tangible) capital (Doh & Kim, 2014). Social relationships enable sharing of skills and technological know-how among the firms.	Business collaboration through networking
3.	Information communication technology	Nugroho, Susilo, Fajar, and Rahmawati (2017) emphasized that adopting information and communication technology (IT) is one of the main areas recommended for firms to face competitive challenges. Accordingly, Prasanna et al. (2019) revealed that ICT adaptation in the firms improves innovation processes and business decision-making.	Using database management systems for quality decision making Using E-Commerce/M-Commerce/E-Marketing
4.	Technology transfer with MNCs/TNCs	MNCs, TNCs, and other large-scale companies play a leading role in transferring technology to the SME sector, enhancing firms to advance their businesses to compete in the globalized market (Tülüce & Doğan, 2014). It ultimately leads to improve the productivity or efficiency of the firms.	Links with MNCs/TNCs/ large-scale companies
5.	Productivity-enhancing technology	The productivity and efficiency of SMEs' business activities become key factors that determine the competitiveness and sustained growth of the firms in the globalized economy (Ahmedova, 2015; Nugroho et al., 2017). Those are among the measures which demonstrate the sustainable profitability of the firms.	Adoption of productivity-enhancing technology

4.1 Innovation utilization of new scientific discoveries

New product development

Interviews with respondents emphasized that some SMEs showed a greater tendency towards product development and innovations. As R 01 mentioned, there is a tendency among young entrepreneurs to come up with new product ideas. “There is a young woman who was selling Aloe Vera, and now she is working on a different side. When she was unable to sell Aloe Vera, she was planning to mix it with milk and make a new product. She came to us seeking assistance after she started the business. Likewise, there are people who interested in producing new products” (R 01). A similar experience was reported by R 13. “There are numerous innovators in the SME sector. When they are having problems, they go to IDB for assistance” (R 13). The statement revealed that SMEs prefer to seek assistance from institutions.

In-depth discussions held with some respondents revealed some obstacles beyond their limit, which diminishes the new product development capacity. R 06 stated that only very few SMEs come up with new ideas due to several impairments. “It is very rare to find SMEs who come up with new product development. I have come across even less than 10% of SMEs who have come up with new business ideas. As I guess, most of the time, financial & social barriers hinder the innovative ideas of SMEs” (R 06). R 05 also reported a similar experience. “There are some which are interested in. Even though they have the interest, they have different issues such as financial difficulties” (R 05). R 07 revealed that the lack of government support is a compelling issue that hinders new product development. “The major problem identified is government support for them is deficient. Hence, most innovators are discouraged. Government has to give a hand for them to commercialize their innovations, especially in policy level” (R 07). Similarly, R 8 stated, “I think, the problem is, they don't have a favorable surrounding for innovations and lack of supportive hands” (R 08).

Analyzing some cases implied that several institutions have already taken some effective actions to solve many of the issues above. As per R 06, “Whenever they are coming to us with new business ideas, we support them to process that until commercialization. And if we don't become aware of the relevant field, we normally get the support from relevant technical specialists in the industry” (R 06). Another effective initiative was revealed by R 07. “...In our Exhibitions, we give our support for them to commercialize their innovations...When they come to us with new ideas, we support them in our capacity, and if they need assistance further, we guide them to relevant authorities. If the innovation is a good one, we award them in our exhibitions to encourage them” (R 07). A similar experience was reported by R 12. “Yes, of course, we encourage them towards innovations and new product development. We give them technical knowhow and our research findings” (R 12). Concerning the discussions held with SMEs, facts indicate that even though some institutions have already taken many provable actions concerning

answering common issues that arose in new product development among SMEs, there are still numerous adverse issues to be answered, distressing their growth.

Access to human capital

Among 13 respondents, only R 12 emphasized that they have taken some positive steps to enhance the innovation capacity of firms. "...our research and new findings help to build the innovation capacity of SMEs" (R 12). Other than that, no institution took any action to enhance the innovation capacity or promote firms to consider employees' ideas when making decisions. This exposed the minus readiness of institutes and relevant officers in promoting access to human capital in firms.

Marketing knowledge

An established strong and long-term relationship between institutions and firms is a key factor in addressing numerous challenges facing SMEs in the marketing of products. For instance, the significance of this strong relationship between institutions and SMEs is indicated by the following statement made by R 06. He revealed that they update SMEs about new market trends and guide them towards new market opportunities. "Yes, we update the SMEs with new market trends where necessary. Sometimes we even call them to give the updates & direct them towards new marketing arenas. Actually, they are fond of entering new markets to earn profits" (R 06). In a similar vein, R 8 emphasized the initiatives taken by them. "Yes... We help them to develop their brand names and products, as well as we guide them to relevant authorities. In our training programs, we provide them market knowledge with the help of relevant specialists" (R 08). Most officers revealed that they are conducting training programs to circulate marketing knowledge among SMEs.

4.2 Social capital

Business collaboration through networking

Discussions with officers indicated that institutional settings have mechanisms to build up a network among the SMEs, enabling them to share business experiences, particularly in a challenging environment. "We formed clusters such as flower associations. We are planning to form a female entrepreneurs association" (R 10). The statement of R 11 revealed their considerable interest, financial support, and activity in the industry-specific clustering process to gain significant economic development in recent times. "We have 29 divisional level entrepreneurs' associations and five industry-based villages. As an example, "Siriketha" in Hingurakgoda is a flower industry-based village. We have given them 16 lakhs to develop the village. Also we have textile, reed, and fishery-based villages" (R 11). Accordingly, R 06 exposed their approach in forming industry-specific clusters. "...we have initiated industry-specific clusters such as floriculture farmers, mushroom farmers, dairy producers, etc. In addition, there is a common pool of clusters of SMEs as well..." (R 06). According to R 12, "Yes, we have prepared some industry-

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specific clusters such as fruit processing regions and rice processing villages. People in those regions build clusters among them” (R 12).

Differently, R 6’s statement disclosed the tragic situation faced by the SME sector due to consecutive contraries that occurred in the past few years, such as Easter Sunday attacks and the COVID-19 pandemic. “...Those clusters properly functioned before Easter Sunday attack. But thereafter due to several reasons such as Easter Sunday attack and COVID-19 pandemic, we couldn’t gather those clusters” (R 06).

4.3 Information and communication technology (ICT)

Using database management systems

According to the discussions held with institutional officers, many SMEs have a low tendency towards using database management systems mainly due to a lack of computer literacy and other conventional issues. As R 12 mentioned, “As most of them are small, medium entrepreneurs, they don’t keep information system; other than that, computer literacy is a major issue for them” (R 12). R 11 revealed that the lack of necessary skills of the older generation could marginalize the accessibility and affordability to use database management systems for their businesses. “Entrepreneurs from the younger generation tend to use computer-based information systems. The problem with elders is the computer literacy” (R 11). According to R 06, even though the SMEs are getting a supportive hand from institutes, they are drowsy to utilize the resources they get. “We have conducted computer courses for those SMEs, and most of the time they have sent their children to those courses on their behalf” (R 06). As revealed by R 02, some SMEs have a tendency to use database management systems to some extent. “They have their systems up to some extent” (R 02).

Only a few officers reported the measures taken to support SMEs to acquire the specific advantage of practicing database management systems in their business process. As R 09 put it, “Yes, we conduct training sessions, and even we have helped some of them making excel sheets” (R 09). R 12 exposed a similar experience. “We give them training and knowledge, and even we keep records regarding them. But it’s up to them to continue those practices” (R 12).

Using E-Commerce/M-Commerce/E-Marketing

Statements of officers regarding using e-commerce/m-commerce/e-marketing also disclosed the same facts reported in using database management systems among SMEs. Opinion of R 05 exposed the ignoring ideology of some officers at the institutional level. “Not really, they are small businesses” (R 05). This revealed that even the officers accept that as some entrepreneurs are functioning at a small level, they are not supposed to use these new technologies. As R 03 reported, there are only a few SMEs using E-marketing in their business activities. “One or two members are using E-marketing” (R 03).

Statement of R 07 exposed that limited computer literacy of adult SMEs inhibits their potential to choose the appropriate technologies and understand the significant benefits it can bring to their businesses. “Most of the SMEs are adults, and their computer literacy is very poor. Even some of them don't know how to use smartphones. It's very hard to guide them to use E-Commerce” (R 07). R 09 revealed their institutional level intervention taken to aware SMEs regarding e-commerce/ m-commerce/ e-marketing. “We encourage them for digital marketing, and we aware them” (R 09). In a similar vein, R 12 emphasized the positive initiatives implemented by them and the Ministry of Agriculture. “We have introduced an app for online marketing for entrepreneurs and aware them about that with relevant specialists in the field. As well as the Ministry of Agriculture is developing apps for online marketing, and we give support for them by giving details of our entrepreneurs” (R 12).

4.4 Links with MNCs/TNCs/ Large-scale companies

Only two officers, R 11 and R 12, revealed that their institutions had recognized the importance of SMEs' business partnerships with large firms. “Yes, in our exhibitions entrepreneurs have opportunities to make contacts with them. Even whenever we get orders from large-scale companies, we link them with entrepreneurs” (R 11). This statement from R 11 revealed that these institutes have already created some platforms to help SMEs to build links with MNCs/TNCs/ Large-scale companies. In a similar vein, R 12 commented that they are conducting knowledge-sharing sessions with the participation of large-scale companies. “Yes, we conduct training sessions with the help of large-scale companies, and thereby we can link them to share their knowledge” (R 12). Except for those two, only R 01 emphasized their possibilities in helping SMEs to build partnerships. “Until now, we are not doing such things. But with this Aloe vera business, we can go for a massive project. Now we are dealing with her in less than a month. We can do such things with her. But still, we are not helping her with that” (R 01). As others evaded the question, it is affirmed that most of the related institutes still have no proper vision to build business partnerships between large firms and SMEs.

4.5 Productivity-enhancing technology

SMEs generally have a restrained ability to make large investments in their business due to the limited financing options. Given the financial pressure, budgets are usually small or non-existent to invest in these expensive technologies. As R 06 exposed, “Yes, SMEs face challenges in reaching to latest technologies due to the high cost of machinery. Especially the tax imposed on that machinery is quite high since most of that machinery are imported from abroad” (R 06). A similar experience was reported by R 12; “Almost all of them are desirous of adapting into new production technologies. Except for financial issues, I don't see any other issues regarding that” (R 12). According to this statement, lack of finance is the key constraint that hinders the SMEs' adaptation to productivity-enhancing technologies.

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Differently, R 01 disclosed how attitudinal defects of SMEs ultimately affect themselves. Moreover, he explained the practices they could initiate at the institutional level to receive the benefits for SMEs by using productivity-enhancing technologies. “They are not accepting. If they are using new technologies in their business, the benefit they can get is high. There needs to be an attitude development for them. If we can turn them into training sessions and changing their attitudes, it is beneficial” (R 01). R 04 emphasized the steps taken by them to persuade SMEs to adapt to these technologies. “We apply new technologies. They like to take those. But some are likely to take those. But after training and field days, they are willing to adapt” (R 04). According to R 08, except for the hesitance of SMEs, there is no other issue in adopting productivity-enhancing technologies. “Since they are willingly adapting into it, I don’t see any issues, and they have our support” (R 08).

5. Discussion

Sub thematic areas identified from the interviews are discussed in this section under five main headings. Table 3 depicts the level of institutional readiness to address the technological challenges from the view point of DS-level officers.

Table 3
Level of institutional readiness to address the technological challenges from the view point of DS-level officers

Technological Challenges	Sub thematic areas	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R 11	R 12	R 13
Innovation - utilization of new scientific discoveries	New product development	*				*	*	*	*				*	*
	Access to human capital												*	
	Market knowledge						*		*					
Social Capital	Business collaboration through networking						*				*	*	*	
ICT	Using database management systems for quality decision making		*				*			*		*	*	
	Using E-Commerce/M-Commerce/E-Marketing			*		*		*		*			*	
Technology transfer with MNCs/TNCs	Links with MNCs/TNCs/ large scale companies	*										*	*	
Productivity-enhancing technology	Adoption of productivity-enhancing technology	*			*		*		*				*	

5.1 Innovation utilization of new scientific discoveries

New product development

The statements revealed that the main intent of many emerging SMEs expecting from the institutional setting is the assistance to continue the new product development process. According to Mosey (2005), as SMEs obtain credibility and experience by transferring their own technologies into new areas, they can then practice trials with sourcing new product development to meet emerging market needs. Hence, in showing the capability and flexibility to learn and adapt to new product development, SMEs can offer a competitive and powerful advantage over their larger rivals. Therefore, improving consulting, education, training, and so on for a persistent new product development among SMEs are vital tasks of the institutional side. Moreover, the cases exposed the importance of government expanded policy-based financial support for SMEs for mitigating the financial constraints. Under an upcoming, great economic recession due to the COVID-19 pandemic, the current financing structure of institutions will not make it any easier for SMEs to acquire the much-needed funding for their new product development process. Hence, to assist in easing these challenges, the government should re-adjust the grant financing policies of institutes which could be in the form of loans, tax incentives, and subsidies. The study emphasized the importance of institutions in creating or acting as a bridge between the firms and the core of the government's framework program to provide financial support, enhance research, development and innovation projects, and the creation of a favorable ecosystem for SMEs to marketing, innovation, and secure their growth. The institutional framework on its own is not suitable and sufficient for the development of such emerging SMEs. It should be supplemented with economic policies, laws, national strategies, and a suitable environment for their effective functioning.

Access to human capital

In the open technology innovation process, the technology exploitation can be used to acquire benefits from knowledge of their non-R&D employees, which leads to spill over of existing technological capacities of firms outside its limits (Lichtenthaler, 2008). The study, however, revealed that there is no single institution that has a proper plan to enhance SME owners to take advantage of their workforce, upskill them, and utilize their knowledge when reaching the firm's business targets. According to Prasanna et al. (2019), the concept of 'Kaizen' could be a solution for firms to apply in both technology exploitation and technology exploration in the technology upgrade process. In-depth analysis of the cases exposed that most institutes did not even focus on innovation capacity building of SMEs and the employees engaged in the SME sector. To overcome these specific issues, the government should broaden the objectives and targets given to institutional officers to create a system that supports firms in achieving improved production efficiency by minimizing the error points or waste of the business process through everyone participating in the firm. Government should seriously consider

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addressing these untouched regions and setting up effective policy changes to re-schedule the specific roles of institutions.

Marketing knowledge

Institutions' affiliation with local markets is very high, and in Sri Lanka, many products are mainly sold in the domestic market for local and foreign customers. So, the institutions can support SMEs to address various issues in marketing such as lack of marketing knowledge and lack of marketing outlets and thereby ensure a stable market to sell products. According to Resnick, Cheng, Brindley, and Foster (2011), marketing is regarded as a distinct, necessary activity within the business process. Still, marketing is an unskilled activity within the SME context that requires little time or training to improve. Hence, institutes should consider building a closer relationship with firms to ensure that SMEs are equipped with skills such as identifying market gaps and brand/product development. Moreover, training and awareness programs on marketing should have more exposure through regular contact with the local and international markets to update SMEs with the latest trends and marketing avenues.

5.2 Social capital

Business collaboration through networking

The cluster approach helps to enhance the ability of firms to survive in the competition through increasing productivity, increasing the firm's capacity for innovation, and prompting higher rates of business formation (Porter, 1998). In-depth analysis of most cases revealed that institutes have recognized the importance of the clustering approach and already created a favorable environment for permitting the growth of those clusters. The industry-specific cluster development approach of these institutions depends on allocating clarified roles to the clusters and the distribution of resources to allow the clusters to develop independently outside the institution's direct control. It also enhances the firm performance at the value chain level, reaching a high stage of differentiation within firms. Therefore, government institutions should identify the strengths, implement more necessary programs and supportive services to develop these clusters with the help of specialists in the field.

The statement of R 6 emphasizes the importance of intercession of the government to establish a supportive environment for SMEs to maintain those clusters in the pandemic at least at a minimal level. We can predict that the emerging economic crisis during the COVID-19 pandemic period is a factor that mainly hits the SMEs. For this reason, institutes must find a solution directly with the government's help to answer SMEs' survival problems.

5.3 Information and communication technology (ICT)

Using database management systems

To remain competitive in the globalized economy, firms have to accept ICT and its related technologies as a business driver, rather than using manual recording and filing systems which is mostly happening in the country (Vijayakumar, 2013). Most significantly, a genuine understanding among officers is necessary regarding the appropriate needs to develop customized business solutions for handling and manufacturing SMEs' specific information requirements. Nevertheless, these cases revealed that officers face significant and unique challenges in the process of adopting SMEs to database management systems. The study exposed that most of the adult SMEs' feckless computer literacy, coupled with the lack of strategic view on ICT, hindered the firms' adoption of using database management systems. This clearly implies the necessity of intensifying the institutions' process of awareness, such as training, to enlighten the SMEs on using these technologies. Therefore, it is necessary to bring forward the SMEs' willingness to adopt database management systems and related technologies by providing guidance required to adult SMEs and encouraging them to benefit by using those systems.

Using E-Commerce/ M-Commerce/ E-Marketing

The willingness of SMEs to adopt e-commerce/ m-commerce/ e-marketing practices depends on how much it can directly enhance their businesses and income. Similar to the previous section, the statements revealed that many adult SMEs are unfamiliar with operating a smartphone or a computer and doubtful of the benefits to their businesses using these technologies. Unfortunately, in-depth analysis of this statement implies that even the respondent officer accepts that they need not practice such technologies as they are small businesses. It exposed that some officers have failed to make accurate decisions in addressing these issues. Using these services can benefit firms in cost-cutting by ameliorating their internal processes, marketing through faster communication with consumers, and better distributing and promoting their products through an online presence. By recognizing these differences and focusing their efforts on removing these constraints, institutes can play a vital role in encouraging SMEs to become more fruitful users of e-commerce/ m-commerce/ e-marketing. The government authorities should focus on enforcing institutional officers with confidence and capabilities in generating tactful solutions. When recruiting DS-level officers to the government service, authorities should focus on the officers' strategic awareness, decision-making capacities, and their perception of the benefits of using ICT within the firms. Cases revealed that some institutions attempt to introduce new mobile apps to cater to expanse SMEs' market in the near future. Therefore, organizing more SME awareness programs early to persuade SMEs to use such novel trends would be more beneficial in the long term.

5.4 Links with MNCs/TNCs/ Large-scale companies

According to Prasanna et al. (2019), MNCs/TNCs/Large-scale companies generate technological externalities to the SMEs, enforcing them for speed adaptation towards rapidly changing competitive market conditions and acquiring an innovative approach in the production and marketing process. The study identified the hesitant nature of officers in linking SMEs with MNCs/TNCs/large-scale companies. Only a few officers have emphasized that they have taken some provable actions to build these linkages. Except three among 13, other officers showed an unawareness and ignoring nature towards the question.

It was noted that officers, on their side, are not ready to build partnerships among SMEs and such companies. Therefore, government authorities must take steps to train, be aware, and encourage officers to promote strong trade relationships between those larger companies and SMEs to permit a smoother technology transfer. With the help of necessary authorities, the officers should take necessary steps to build long-lasting partnerships by ensuring protection with legal trade agreements and contracts which furnish the long-term survivability of SMEs.

5.5 Productivity-enhancing technology

The study identified that the financing problem of SMEs, including the lack of initial capital required in purchasing productivity-enhancing technologies, is one of the leading challenges among SMEs. With the help of policymakers, the government has implemented many different initiatives to broaden access to finance, such as bank lending and grants. Therefore, the government and financial institutes should focus and implement some experiments to identify what financial initiatives work and what does not in different contexts. Thus, the policymakers can evaluate and decide whether those initiatives should be terminated, continued, or changed. It is essential to keep updating SMEs, organize field visits and link them with research institutes; therefore, SMEs can assess and fit the firms' technological requirements. Ultimately, institutes will be able to persuade those arbitrary SMEs to adapt to those technologies. However, the government should establish a specific setup in the institutional setting to support SMEs to upgrade firms' technological base to enhance productivity and efficiency of their production process.

6. Conclusion

This study aimed to address the apparent lack of research work on the relative perception of DS-level officers on institutional support towards SMEs in facing technology challenges. Hence the survey asks the following main research questions: What are the main technological challenges and constraints SMEs face in Sri Lanka? What is the

readiness and relative perception of DS-level officers on institutional support towards facing those technology challenges?

The technological challenges are identified as one of the main constraints delaying SME growth and decrease their potential contribution to the country's economy. Hence the researchers carefully identified the main technology challenges faced by SMEs as follows:

- Challenges about innovation-utilization of new scientific discoveries,
- Challenges related to social capital approach,
- Challenges related to ICT,
- Challenges about technology transfer with MNCs/ TNCs/ Large-scale companies, and
- Challenges related to productivity-enhancing technologies.

Proper acknowledgment of the derived sub thematic areas in the study by policymakers and the relevant authorities in the field is essential to improve the institutional setting, thereby further permitting the sustained growth and decreased failing rate of the SME sector of the country. The association between SMEs' technology challenges and the prevalence of institutional defects reinforces the importance of strengthening government policies that lessen constraints in institutional settings through efforts focusing on these criteria. Efforts have to be implemented to enforce the human resource in the institutions in many ways by a prominence on the restructuring of institutional roles with necessary administrative support and funding, focusing on officers' strategic awareness and decision-making capacities when recruiting. Moreover, to acquire a sustained and long-term declining in SME failing rate, cause-specific alterations and implementation of strategies such as expanding SME access to finance, improved consulting, expanded training, enhanced research activities, making favorable ecosystems, upskill SMEs' workforce, improving management, building closer relationships between firms and institutes, intensifying the SME awareness programs, and establishing a specific set up in institutional setting to support SMEs to upgrade firms' technological base have to be carried out. In terms of strengthening institutes, policy adjustments and reforms are essential according to the present and future needs. Especially the accountable government bodies in Sri Lanka must make substantial involvement in answering these issues. Moreover, the different sub-thematic areas under five technology challenges should be thoroughly investigated so that the institutional readiness to address the competitive technology challenges of the SME sector in Sri Lanka could be further analyzed. Specifically, it would be noted that the study focus is limited to the views of DS-level officers and to the agro-based industries in Sri Lanka. Thus, further researches are encouraged to articulate views of other layers in the institutional setting work for SME sector development in order to give holistic view on the research subject.

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Appendix 1: Interview guide

Main Competitive Challenge	Components of each challenge	Main Questions	Remarks
Technology challenges	T.1. Innovation-Utilization of New Scientific Discoveries	<p>T.1.1: New product development</p> <p>Have you come up with any innovation/new product so far? If yes, can you explain the story from the idea generation to the commercialization of the new product to the market?</p> <p>What type of institutional support did you receive when introducing the product to market? (When commercializing the product into the market)</p> <p>T.1.2: Access to Human capital</p> <p>The extent to which you have focused on encouraging/ directing your employees towards innovations/ new product developments? (Budgetary allocations for R & D, training programs/workshops/innovation capacity building programs)</p> <p>The extent to which you have created a culture within the business place promoting innovations & new product development (Freedom given to employees for innovations)</p> <p>T.1.3: Marketing Knowledge</p> <p>Are you aware of any gaps in the existing market? If yes, how?</p> <p>Have you tried to fill those gaps with new products/ services?</p> <p>Have you been received any institutional support concerning identifying market gaps & brand/product development?</p>	Whether any Institutional support received from Govt, (DS/Provincial/National Level), Private sector, NGO, Banks
	T.2. Social Capital	<p>T.2.1: Links with new trade partners, clusters, and network relationships with SMEs</p> <p>Have you built up any networks/clusters with other SMEs in the industry? How did you get into such relationships? And the Barriers faced?</p> <p>What types of benefits have you received in getting into such relationships?</p> <p>Have you been received any institutional support in building up such relationships?</p>	

T.3. ICT	<p>T.3.1: Using database management systems for quality decision making Are you currently using any computer-based information systems (Ex: SAPP) in your business? If yes, what types of barriers you faced in adapting to database mgt? Have you been received any institutional support concerning database mgt?</p> <p>T.3.2: Using E-Commerce/M-Commerce/E-Marketing Have you adopted E-Commerce/M-Commerce/E-Marketing in business? If yes, what types of techniques have you adopted so far? What types of barriers did you face in adopting E-Commerce? Have you received any institutional support with respect to E-Commerce/M-Commerce/E-Marketing?</p>	Whether any Institutional support received from Govt, (DS/Provincial/National Level), Private sector, NGO, Banks Online orders, online payments, digital & social media marketing
T.4 Links with MNCs/TNCs	Have you been entered into any links/contracts/network partnership programs with MNCs/TNCs? If yes, how? If no, why? If yes, what type of benefits did you receive? What type of institutional support did you receive in getting into such relationships?	
T.5. Adoption of productivity enhancing technology	Have you adopted any new technologies in the production process? If yes, what? If no, why? What types of barriers have you faced in adopting new production technologies? What type of institutional support did you receive when adopting new technologies?	
