

Impact of Covid19 on the development of digital service capability for value co-creation: a mediating role of service ecosystem self-adjustment

Service
ecosystem self-
adjustment

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Abstract

Purpose – This study aims to examine the impact of Covid19 on service ecosystem self-adjustment (SES_SA) and additionally to explore the mediating role of SES_SA on the relationship between the Covid19 pandemic and the development of digital service capability (DD_SC).

Design/methodology/approach – Data were drawn from 384 business people with the help of a survey questionnaire. The interrelation of the model was examined with the help of structural equation modeling (SEM) using bootstrapping measures in Smart-partial least square (PLS). Three constructs (Covid19, DD_SC and SES_SA) were found with the help of exploratory factor analysis (EFA). Convergent and discriminant validity were obtained through confirmatory factor analysis (CFA) using statistical package for the social sciences-analysis of a moment structures (SPSS-AMOS)-V.23.

Findings – There is a substantial impact of Covid19 on SES_SA and DD_SC. The investigation also discovered that SES_SA significantly impact DD_SC, whereas, Covid19 impact DD_SC indirectly through SES_SA. Age has a significant favorable influence on fear of Covid19.

Research limitations/implications – There is scant literature linking SES_SA and the DD_SC.

Practical implications – The study promotes understanding of the contribution of Covid19 and SES_SA in the DD_SC among business people to enhance value co-creation. Capitalizing on DD_SC will enhance customer experience, assist customers in decision-making, and foster digital economic growth.

Originality/value – It enlightens on the digital capabilities needed for creating and co-creating value. Most studies in this area are qualitative/conceptually based and have not studied this kind of interrelation. Hence, it's the only quantitative study that has examined the inter-relations among Covid19, SES_SA and DD_SC using SEM. This study also offers comprehension of all theories used in this context by relating Covid19 effects to DD_SC.

Keywords Covid19 pandemic, Service ecosystem self-adjustment, Development of digital service capability, Value co-creation, Value creation

Paper type Research paper

Introduction

Customer value creation is what drives business sales from our market offerings. Value is created by identifying creative solutions to ease the customer buying process and follow up with customers after the sales. The concept of value creation is now opening up a new room for discussion about value co-creation, particularly in this time of Covid19 that has accelerated

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digital transformation. Business people must know that value co-creation determines market formation and reformation in cultural and social settings (Kaartemo, Akaka, & Vargo, 2017). The service sector contributed to about 55% of gross domestic product (GDP) and 45% of employment in emerging economies by 2019; in developed economies, it goes above 75% (Gill, 2021). According to Tanzania economic survey (2019) service sector contributes to about 40.0% of the national economy's GDP (NBS, 2020). The outbreak of Covid19 brought major devastations to economic activities. In the service sector, people could not do business as usual due to the isolation strategy and lockdown measures to contain the pandemic (Alessa, Alotaibie, Elmoez, & Alhamad, 2021; Gu *et al.*, 2021). Because the situation could not withstand it severely destroyed the service ecosystem (Kabadayi, O'Connor, & Tuzovic, 2020).

The creation of value is a cornerstone of the service ecosystem (Vink *et al.*, 2021) therefore; the ecosystem system calls for information systems, people, processes and other infrastructures to work together to create value with the help of digital capabilities to contain the effects of Covid19, which destructed service delivery process. Service ecosystem well-being can be sustained or destructed by behaviors of internal forces like actors or external forces like the present case of Covid19 (Frow, McColl-Kennedy, Payne, & Govind, 2019). Given the unforeseen phases of Covid19, business people demand to be proactive, equip themselves with digital service capabilities and transform their traditional business operations into digital operations models (Kronblad & Pregmark, 2021). Business people have to rethink their digital capabilities as well as their customers for the co-creation of value (Gu *et al.*, 2021). Hence, the Covid19 outbreak has necessitated value co-creation to be in digital form and forced business people to change the modality of delivering value to customers by embracing the ecosystem benefits example, using resources like human talent and agile (Kabadayi *et al.*, 2020).

Due to technological advancement, most devices will be in digital format and connected to other devices and systems (Wulf, Mettler, & Brenner, 2017). The development of digital service capabilities for business people during these moments of Covid19 is inevitable as it will help them work for customers profitably, reshaping customer value proposition and providing a new avenue for social interaction and partnering in value creation (Saunila, Ukko, & Rantala, 2018). The concept of value creation originates from two angles, value-in-use, where producer and customer collaborate in creating value, and value-in-exchange, which transpires during the exchange of goods and services. Therefore, value co-creation today rests on technological capability, which aligns with technical goals 17.6, 17.7 and 17.8 for sustainable development goals that demand structuring scientific capacity and capability (UN SDGs, 2015).

Proposed hypotheses

- H1. Covid19 significantly impacts the development of the digital service capability of business people.
- H2. Covid19 has a significant impact on service ecosystem self-adjustment (SES_SA).
- H3. Service ecosystem self-adjustment significantly impacts the development of digital service capability (DD_SC).
- H4. Service ecosystem self-adjustment mediates the relationship between Covid19 and the development of the digital service capability of business people.
- H5. Small business people's demographic characteristics significantly influence the fear of Covid19.

Contributions of the study

To bring about a coherent theoretical understanding of the proposed model relation by showing that, Covid19 has a significant impact on the DD_SC and also showing how Covid19

can serve as a significant predictor of SES_SA of its well-being and well-being of its actors that eventually serve the purpose of value co-creation. Furthermore, to examine if SES_SA mediates the relation between Covid19 and DD_SC. This role would help comprehend the mediating role in which Covid19 impacts SES_SA and leads to DD_SC. Lastly, there is scant research on how Covid19 and SES_SA impact DD_SC. Thus, this study will supplement the literature on Covid19 and SES_SA and help comprehend the critical role of Covid19 and SES_SA in promoting DD_SC for value co-creation. Furthermore, this study intends to show how Covid19 contributes to SES_SA that leads to DD_SC, which enhances value co-creation between business people, customers and other partners. For that case, this study identifies SES_SA as a separate pathway over which Covid19 is linked with DD_SC.

Literature review

Co-creation of value with digital service capability

Value co-creation means integrating resources, including technology, information and people, to achieve planned customer value (Saunila *et al.*, 2018). Digital service capability allows business people to interact with customers and deliver value through co-creation through digital channels. Yes, Covid19 brought a negative impact on various sectors, specifically in the service sector. However, it also got a positive effect where business people have the opportunity to equip themselves with digital service capability that can assist in co-creating value and rendering services as demanded. Digital services are those in which transactions take place over the internet. Thus, developing digital service capability will offer more room for business people to capitalize on the co-creation of value, like sharing information through interaction in digital channels (Saunila *et al.*, 2018) and hence a competitive advantage.

Covid19 and the development of digital service capability

Covid19 pandemic is a threatening infectious respirational disease emanating from coronavirus. It spreads from direct contact with an infected person through infected air droplets, dirty surfaces and hands. As such, it limits any physical interaction between individuals. Instead, interactions were through digital means (WHO, 2022). Many people died from the flu (Song, Ma, & Cheng, 2021), and many could not access basic needs easily as they were required to maintain social distancing and isolate themselves (Kabadayi *et al.*, 2020). Business people with digital proficiency could interact and undertake business activities with customers and those who were not proficient could not do so.

Digital service capability entails skills and attitudes that business people and customers need to survive from Covid19 effects and digital transformation. Digital service capability has three positions. One is a relationship with customers and responding to their varied needs remotely; the second is a business's competence to act in a turbulent marketplace and develop new products and services that fit the prevailing market situation, particularly of Covid19. And lastly, a service position means examining if culture, marketing strategy and service process are service-oriented given the effects of Covid19. So, digital service capability questions how the business will use technological resources to design and manage its service process to deliver service excellence (Saunila *et al.*, 2018). Therefore, the DD_SC is the ability of small business people to act with agility and partner with others in the ecosystem to develop digital service capability to interact with the customer in service provision for the survival of both the company and customers during and after Covid19.

The mediating role of a service ecosystem

Service ecosystem with digital service capability and value co-creation. Vink *et al.* (2021) define a service ecosystem as a “relatively self-contained, self-adjusting system of resource-

integrating actors connected by shared institutional arrangements and mutual value creation through service exchange.” It is indispensable to think of the service ecosystem at these crucial times of Covid19 and digital transformation as it emphasizes the importance of context in creating value. Service ecosystems view value co-creation as rooted in the exchange process in social and cultural contexts (Vargo & Lusch, 2018). According to Beirão, Patrício, and Fisk (2017) service ecosystem is characterized by three layers micro, meso and macro. Layers have actors interlinked and adaptive to the ecosystem so that they can impact one another within and outside of the levels. The stability and capability of the ecosystem to adjust itself or respond to internal and external forces define its well-being. The ecosystem is fine if ecosystem actors interact and share resources to counter the threat. If actors fail to interact well, then the ecosystem is not in a position to adjust itself or absorb the internal or external forces. So, it will be disrupted by a threat (Frow *et al.*, 2019), and co-destruction of value will transpire due to the failure of actors to collaborate (Echeverri & Skålén, 2021).

Thus, service-ecosystem self-adjustment is the ability of the system to adapt to the changing condition of the Covid19 pandemic by modifying its internal operational process and structure to become resilient to the circumstance. During the hit of Covid19, business people had to change the game’s rules from offering services to customers under traditional channels and turn to an online model. This act was termed by Frow *et al.* (2019) as the reconfiguration of established rules, meaning adapting to new practices. The service ecosystem is grounded on the idea that; customer value creation depends on collective mutual value creation from many actors. Because these actors are major components of the service ecosystem, they have more significant influence on value creation, thus impacting service design that fastens the exchange process.

The effects of Covid19 made the ecosystem respond by adjusting system resources as well as integrating all actors within the system for co-creation of value by fastening DD, SC among business people and customers for easing the exchange process in service delivery (Tan, Dhakal, & Ghale, 2020; Vink *et al.*, 2021). So, under service ecosystem perspectives, value co-creation is the outcome of the collaboration of actors who share tangible and intangible resources among themselves. During the eruption of Covid19, nations of the world shared vaccines with others, granting them the technological right to produce the vaccines to combat the spread of coronavirus. It is termed collaboration of the ecosystem actors. Vink *et al.* (2021) say value creation is a major concern of the service ecosystem. But this will only be possible if all actors, particularly business people, agents and customers, are endowed with the digital capability to facilitate the service offering exchange process for value creation. Therefore, realize the value by introducing new ways of rendering service to customers (Vink *et al.*, 2021). Covid19 necessitated business people to build a digital social network relationship (Kaartemo *et al.*, 2017) to ease the exchange process.

At this point, ecosystem actors must be skillful in using digital networks enabled by digital service capability. The service ecosystem enables actors to have common views, come together and efficiently use available resources (Frow *et al.*, 2019) to build digital capability to enable service delivery given Covid19 effects. The digital capability of business people and customers gains more strength when ecosystem actors come together to co-create value by sharing their resources (Vargo & Lusch, 2016). Service-ecosystem calls for adaptive measures from business people, customers and other partners to join hands through mutual integration of resources and come up with new ways to offer service and create value to customers taking into consideration of Covid19 threat.

Thus, the affect theory of social exchange offers an excellent base to support service-ecosystem views that the exchange process is rooted in a social action whereby the ecosystem actors share resources for the co-creation of value (Kaartemo *et al.*, 2017). This theory explains the effect of social distance resulting from the impact of Covid19 on the co-creation of value. According to Molm (2003), one party of the exchange relationship receives rewards from the

other party. It feels obliged to reciprocate, though the reward's nature and timeframe are not specified. People were required to keep a social distance to prevent the spread of the virus. The interaction between business people and customers was limited in this way, while their interaction is inevitable for social exchange, which is substantial for the co-creation of value (Mustak & Plé, 2020). For example, street gaming shops, street movies show shops, restaurants, gambling centers, retail shops, etc., were limited contact with customers to avoid Covid19 effects (Song *et al.*, 2021). Limited interaction made business people endow themselves with digital service capability to assist them in interacting with customers to co-create value, and through joining hands with other stakeholders in the ecosystem, like integrating their resources with IT experts and app developers to facilitate service provision in digital form.

Protection motivation theory (PMT). According to Westcott, Ronan, Bambrick, and Taylor (2017), PMT is a robust and flexible social theory that can aid people in understanding their behavior response to any danger to become safe by an adaptive response. Rogers put forward the idea in 1975 for health promotion and diseases prevention. The idea has four key features: threat coping, response efficacy and self-efficacy. First, PMT emphasizes the ability of people to be aware of the danger, and secondly, embark on planning measures before the threat is around and work together with other partners to fight against the risk. Considering the view of PMT, it is true that during the hit of Covid19, business people and customers were to isolate and keep their distance from one another to protect themselves from the effects of Covid19. However, because it was not easy to interact, both business people and customers were to join the effort and endow themselves with digital capability that could assist in the service provision process and seek support from other stakeholders from the ecosystem to fight against the challenge brought up by Covid19.

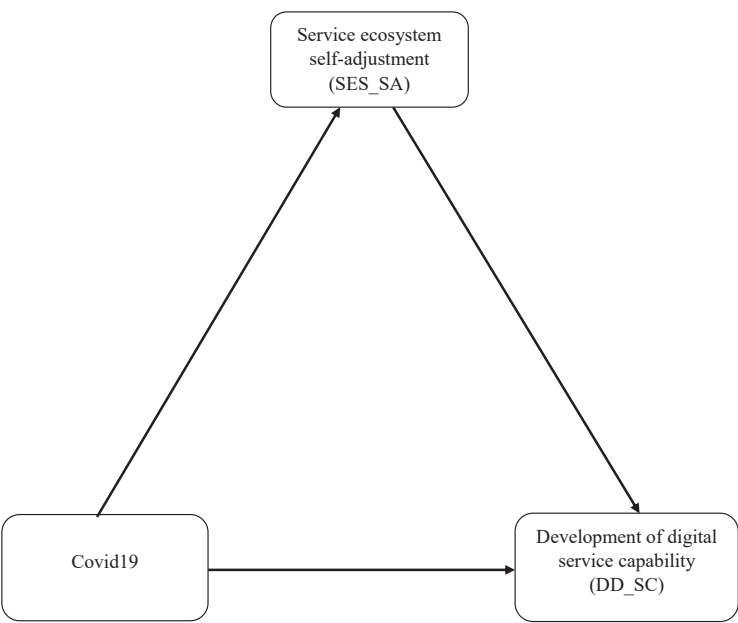
Theory of integrated empowerment. From a service ecosystem perspective, the theory assists in answering the question of how business people will be empowered and empowers their customers to co-create value given the effects of Covid19. Sharing resources is termed as the mutual empowerment of the ecosystem actors to co-create value. Developing digital capabilities among the actors of the ecosystems is also empowerment and is viewed in two ways. One is the traditional approach, and the second is integrated empowerment. Traditionally, business people responsible for the provision of services were motivated by self-interest to realize the economic value and other outcomes which did not satisfy the interest of the service ecosystems perspective. Integrated empowerment focuses on expanding the entire service ecosystem, meaning that ecosystem actors integrate their resources with others to enhance their capability for service provision through the co-creation of value (Barile *et al.*, 2016; Mandlik & Kadirov, 2020) (see Figure 1 and Table 1).

Methodology and materials

This survey targets all Tanzanian small business people in Mbeya City who operate their businesses informally. Survey design is good because it is more informative, cheap and easy (Pagano *et al.*, 2020). The study intends to reap an understanding of small business people about the DD_SC triggered by the hit of Covid19. Small business people were targets because they contact customers daily and traditionally render service. Apart from that, small business people are part of the service ecosystem vulnerable to Covid19 effects due to the scarcity of substantial resources to invest in attaining digital capability. So, the study's concern is how they have prepared themselves to create value for their offer by rendering service to customers with the upcoming phases of Covid19.

The study intended to know if small business people consider Covid19 a catalyst for developing digital capability skills for enhancing value co-creation. And if Covid19 necessitated the change from traditional mode to online mode by integrating resources

Figure 1.
Proposed
conceptual model



between themselves, suppliers and customers to facilitate value co-creation by developing digital service capabilities, the selection of the representatives was through a randomization strategy. The sample size of 384 respondents was in place using Cochran’s formula of 1977, and the sampling strategy followed [Newsom’s \(2020\)](#) recommendation that a sample size must be above 200 for structural equation modeling (SEM) studies.

Questionnaire designing, distribution, collection and data processing

A closed-ended questionnaire was developed in English and later translated to Kiswahili to accommodate respondents unfamiliar with English. The questionnaire had an overview part, respondents’ information and three parts covering the measure of Covid19, the service ecosystem part and the DD_SC part. The items of the study constructs were assessed based on a five-point Likert scale (5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree and 1 = strongly disagree). Questionnaire distribution adopted the drop-off and pick-up approach to collect precisely the stated sample size of 384. Data collection took three weeks in July 2022 and covered three major town centers of Mbeya City (Uyole, Town area and Mbalizi). After gathering, screening for outliers and missing data took place. Assessment of the nature of data distribution to undertake proper analysis was also in place. As a result, five questionnaires were found with faults and were replaced by dropping back questionnaires to some respondents and were recollected for analysis.

Measures

Questionnaire development was made by picking some statements and questions used by other researchers in a similar field in which modification allows for the suitability of the study purpose. Covid19 measures were four, one from [Saputra, Sasanti, Alamsjah, and Sadeli \(2022\)](#) and three adapted measures from [Nasiri et al. \(2020\)](#). Service ecosystem self-adjustment measures were five; one adapted from [Lusch and Vargo \(2014\)](#), one from

	Researches before Covid19	Researches after Covid19
SES	<p>The research focused on the dissimilarity of goods and services and viewed innovation based on goods-dominant logic. Researchers considered improved processes for profit maximization only</p> <p>The research considered markets as being established for value co-creation purposes. Most research studies concentrated on the healthcare ecosystem (Vargo, 2013; Koskela, 2018). But also, most of the research in the service ecosystem was conceptual/qualitative based and far back to 2003</p> <p>The research focused on customers as co-producer and firms as value proposers. Also, it investigated how technology-enabled firms compete in the market (Vargo & Lusch, 2018). Emphasis was on the design of services (Vink <i>et al.</i>, 2021)</p>	<p>They focus on doing away with dissimilarity between goods and services and making innovation concepts relevant to industrial and service sectors. It considers innovation based on service-dominant logic with an emphasis on enhancing value co-creation among actors of ecosystems</p> <p>Markets are a dichotomy of structure linked to management and innovation. And value co-creation is via the integration of resources (Mustak & Plé, 2020). Researchers are moving to a quantitative approach</p> <p>Research considers value to be co-created by many actors. Researchers are studying actors' positions in value creation and proposition with cross-firms' collaboration</p> <p>Similarly, examining how technology enables a firm to survive over the market dynamics by being flexible (Kohtamäki <i>et al.</i>, 2019). Attention is on how institutional arrangements and other inter-dependencies affect service design. Emphasize is on design for service (Vink <i>et al.</i>, 2021)</p>
DD_SC	<p>Digital capability researches were mainly on products-centric business model development. In addition, researchers studied customer interaction with firms (Vargo & Lusch, 2018)</p>	<p>Studies companies' autonomous systems with improved uses of artificial intelligence (AI) and robots, how software mechanisms capture value co-creation, and how digital capability paves the way from product-centric to service-centric business model development. Also, assessing how digital servitization will enable customer interactions and relationship building with firms</p> <p>Researchers are finding out how digital data support customer service and automation of operations for customers to resolve their problems (Kohtamäki <i>et al.</i>, 2019).</p> <p>Business agility, resilience and building of dynamic capabilities essential for survival and grabbing business opportunities in times of crisis with the help of digital capabilities are now areas of priority (Tronvoll, Sklyar, Sörhammar, & Kowalkowski, 2020; Vial, 2019)</p>

Table 1.
Development of service
ecosystem and digital
service capability
research before and
after the outbreak of
Covid19

Roundy, Bradshaw, and Brockman (2018), two items from Gölgeci, Ali, Ritala, and Arslan (2021), and one item from Vargo, Wieland, and Akaka (2016). Development of digital service capability measures were five, four from Guo, Yang, Huang, and Guo (2020) and one from Saputra *et al.* (2022).

Table 2 shows that young people aged 18–33 and middle age from 34–49 are highly involved in business and makeup 94.1% of the population compared to people aged 50 years and above, who are only 6%. Those who are single makeup 47.9% of the population, and are those at a young age level. 45.3% are married, and the remaining clusters of marital status have low involvement, as seen in Table 2. 56.3% of the population are females involved in small businesses. Women are many due to the government and international organizations' motivation to empower women to participate in production activities. Males compose 43.8%

of the population. They are few because most men are doing formal work. Owners who operate their businesses constitute 81.8%, and the rest of 18.2%, are employed to run the business. Educational-wise, those with the college to post-graduate level account for 27.4% of the population, while primary to high school level account for 72.7% of the population involved in business and are people who do not pay good attention to digital development in their business operations.

Analysis and results

SPSS-AMOS V.23 was used to undertake confirmatory factor analysis (CFA) in assessing the reliability of the study’s construct with the master validity tool and model fit measures, as given by AMOS plugins, see Figure 2 and Table 5. Smart-PLS 3.2.8 was also in place to carry out the measurement model.

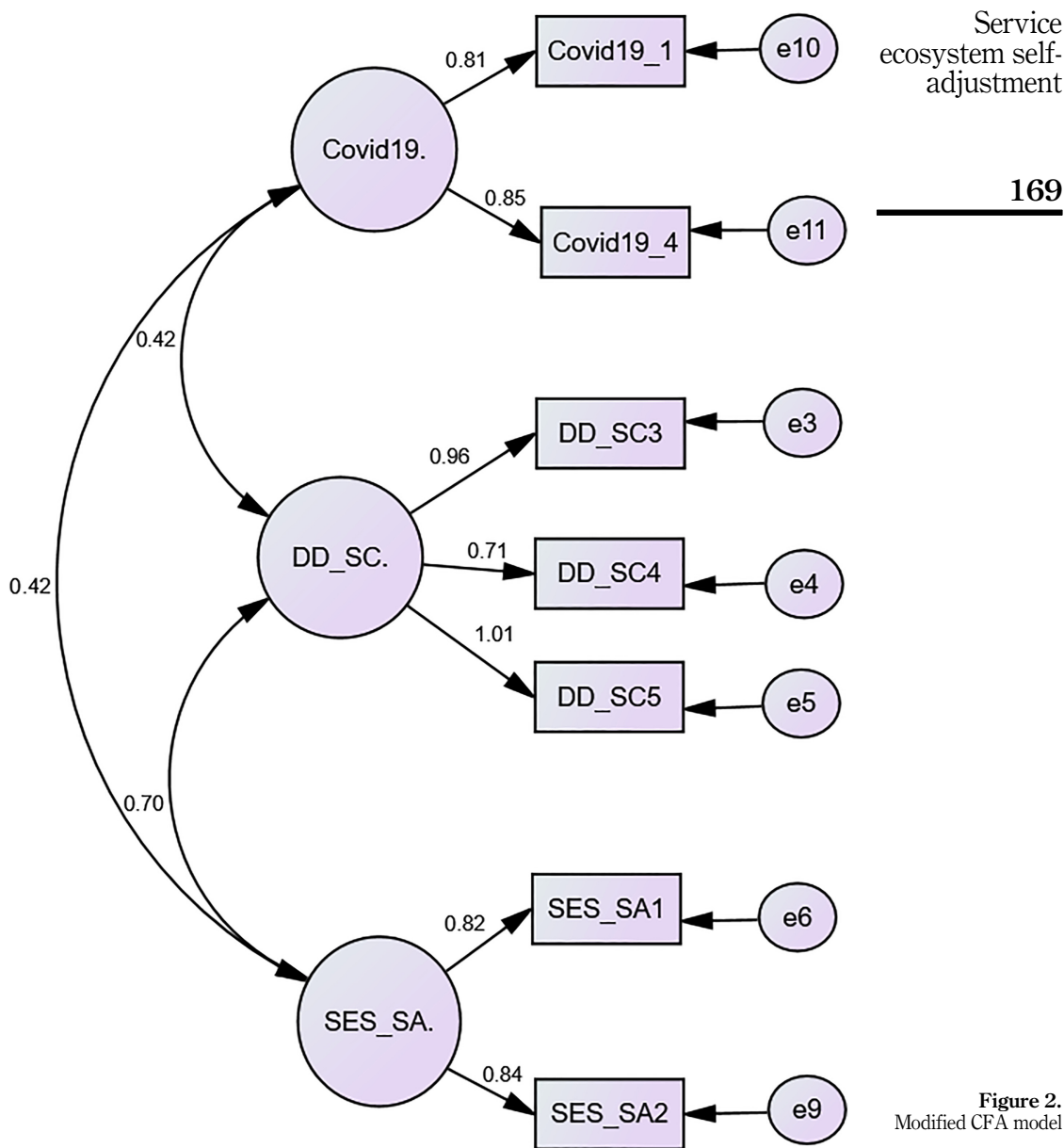
Table 2 provides correlations for model variables. All the variables have a mean value higher than 2.99, indicating a good correlation (Sekaran & Bougie, 2016). As in this case, common method bias (CMB) was undertaken as per Jordan and Troth (2020), using various scales to measure all the proposed variable answers. Harman’s test of a single factor also helps to assess CMB, and one aspect explains about 44.491% of the variance (Dash & Paul, 2021). Figure 3 addresses the issue of CMB.

The variances between standardized regression weights in the presence of “common latent factor (CLF)” and the absence of “CLF” in the models are present, and the variances were within the threshold of 0.2, indicating a lack of common bias (Gaskin, 2012). Skewness and kurtosis assist in examining the normality of data distribution (Xia, Black, Babin, & Anderson, 2019). The values of skewness fall between –2 and +2, indicating normal distribution character, and kurtosis values fall between –7 and +7, which is appropriate for SEM studies (Watkins, 2018); see Table 3.

Varimax rotation helped to bring up three factors, with 11 items from a total of 14 items using exploratory factor analysis (EFA). The study dropped three items (Covid19_2, Covid19_3 and SES_SA5) due to low factor loadings and therefore are not involved in the analysis. Only 11 items flocked well into their respective variable with 0.787 of Kaiser-Meyer-Olkin (KMO) for sampling appropriateness (Kaiser, 1974) and Bartlett’s Test of Sphericity (approx. Chi-Square = 6779.970, degree of freedom = 91, $p < 0.000$) signifying that an identity matrix is different from the correlation matrix. This cut point provides room to conduct factor analysis for testing the scale’s one-dimensionality (Watkins, 2018). Thus, EFA attained construct and convergent validity due to the flocking of all items into their respective variables with good loadings, as seen in Table 4. All three factors account for 64.043% of the total variance, and each aspect formed a distinct element due to a higher eigenvalue of more than 1.0, as seen in Table 4 (Xia, Green, Xu, & Thompson, 2019). The absence of cross-loadings after the last rotation indicates the attainment of discriminant validity (Li *et al.*, 2020).

Table 2.
Demographic
information

Variable	Category	Percent	Variable	Category	Percent
Age	1825	24	Gender	Males	43.8
	2633	21.4		Females	56.3
	3441	30.2	Education level	Primary	23.2
	4249	18.5		Secondary	36.7
	50+	6		High School	12.8
Marital status	Married	45.3		College	12.0
	Separated	2.3	Occupation	Undergraduate	13.8
	Single	47.9		Postgraduate	1.6
	Widowed	3.4		Employed	18.2
	Divorced	1		Self-Employed	81.8



Measurement model

Smart-PLS and SPSS-AMOS using CFA were used to evaluate the measurement model for all latent constructs. Assessment takes place for each item's factor loadings to discover those with low factor loading below 0.50 and high variance above 0.4 so as not to include them in the analysis for modal fit issues (Hair, Hult, Ringle, & Sarstedt, 2022). Withdrawn items are DD_SC1, DD_SC2 and SES_SA3, SES_SA4. CFA was recomputed, and the model fitted the

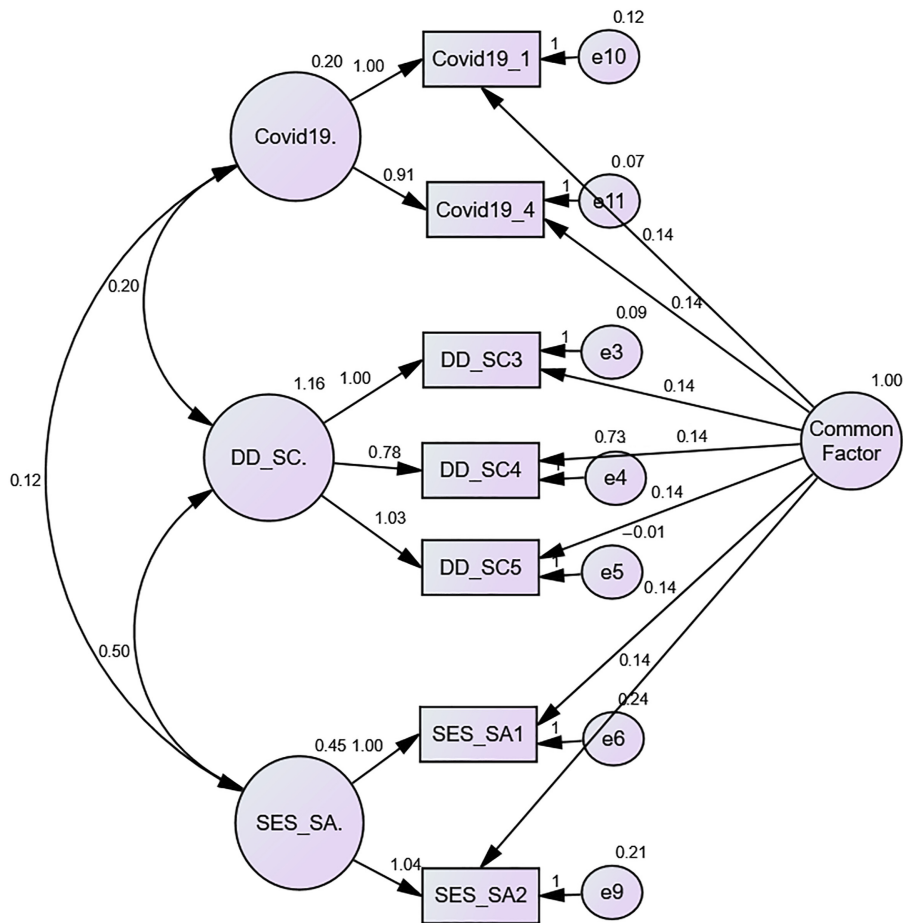


Figure 3.
Common method
biased

Table 3.
Correlations

	Skewness		Kurtosis		Mean	Std. Deviation	1	2	3
	Statistic	Std. Error	Statistic	Std. Error					
SES_SA	−0.409	0.125	0.516	0.248	6.9505	1.68084	1		
Covid19	−1.787	0.125	3.470	0.248	7.3828	1.00485	0.293**	1	
DD_SC	−1.299	0.125	0.745	0.248	12.654	3.19715	0.578**	0.353**	1

Note(s): **, Correlation is significant at the 0.01 level (2-tailed)

data. All factor loadings were significant at 0.001, which means convergent validity is established (Hair *et al.*, 2022).

Several fit measures examined the model, and all values are within the acceptable range (see Table 5. So, the three-factor model revealed the right fit for the data (Garson, 2010; Dash & Paul, 2021; Alamer & Marsh, 2022). The R^2 value shows the dependent variable's predictive capability; Hair *et al.* (2022) suggested that the value of R^2 should be >0.25 , see Table 5. And

<i>N</i> = 384				Service ecosystem self- adjustment	
	Covid19	DD_SC	SES_SA		
Cronbach's alpha	0.809	0.915	0.939	<div>171</div>	
Eigenvalue	1.303	1.434	6.229		
% of variance	9.308	10.245	44.491		
Cumulative %	64.043	54.735	44.491		
Covid19_1	0.886				
Covid19_4	0.848				
DD_SC1		0.663			
DD_SC2		0.789			
DD_SC3		0.850			
DD_SC4		0.716			
DD_SC5		0.811			
SES_SA1			0.862		
SES_SA2			0.868		
SES_SA3			0.873		
SES_SA4			0.859		
Extraction Method: Principal Component Analysis					Table 4. Exploratory factor analysis
Rotation Method: Varimax with Kaiser Normalization					
a Rotation converged in 7 iterations					

Table 4.
Exploratory factor
analysis

Measure	Threshold	First order estimate	Second order estimate	Table 5. Model fit measurement
<i>P</i>	Insignificant	0.000	0.000	
CMIN	–	1630.94	37.418	
DF	–	24	11	
CMIN/DF	Between 1 and 3	67.956	3.402	
GFI	>0.90	0.760	0.975	
AGFI	>0.90	0.551	0.936	
NFI	>0.90	0.732	0.982	
IFI	>0.90	0.735	0.988	
TLI	>0.09	0.601	0.976	
CFI	>0.95	0.734	0.987	
SRMR	<0.08	0.121	0.031	
RMSEA	<0.06	0.418	0.079	
PClose	>0.05	0.000	0.038	

Q2 value is used to show the predictive relevance of endogenous constructs, and its value should be higher than zero (0), as given by [Hair et al., 2022](#), see [Table 5](#) f^2 is used to measure the effect size when explaining the endogenous construct, and the threshold value is as per ([Hair et al., 2022](#)); see [Table 6](#).

Construct reliability assessment is through composite reliability and Cronbach's alpha, whose values for each construct are over the required threshold $\alpha > 0.70$ ([Hair et al., 2022](#)); see [Table 7](#). Also, the MaxR(H) values are over 0.70, and the cut point is as per [Hancock & Mueller, 2001](#) as in [Table 8](#). Composite reliability ranges between 0.813 and 0.916 over the required threshold of 0.70 ([Hair et al., 2022](#)). Thus, construct reliability is attained for each construct of the study.

AVE assists in evaluating convergent validity for each scale item; in this case, all values are over the suggested value of 0.50, which is a sign of convergent validity ([Fornell & Larcker, 1981](#)). See [Table 8](#). Also, the discriminant validity assessment is from the criterion set by [Fornell and Larcker \(1981\)](#) and Heterotrait-Monotrait Ratio (HTMT). According to [Fornell](#)

and Larcker (1981), discriminant validity will be in place only if the square root of AVE for an individual construct is greater than its correlation to another, as shown in Table 8.

According to Heterotrait-Monotrait Ratio (HTMT), the attainment of discriminant validity is possible when the values of HTMT are equal to or below 0.90 (Henseler, Ringle, & Sarstedt, 2015). In this case, all the values of HTMT are below the cutting point of 0.90 see Table 9. Also, one can confirm convergent and discriminant validity by looking at the values of maximum shared variance (MSV), which have to be small compared to the values of AVE's (Hair *et al.*, 2022). For this case, all MSV values are smaller than the AVE values. Hence discriminant and convergent validity are affirmed (see Figure 4).

Table 6.
Testing of hypotheses

	β	(M)	(STDEV)	t	p-values	f ²	Inner VIF	Decision
H:1 Covid19→DD_SC	0.141	0.140	0.055	2.543	0.011	0.035	1.206	Accepted
H:2 Covid19→SES_SA	0.413	0.415	0.081	5.119	0.000	0.206	1.000	Accepted
H:3 SES_SA→DD_SC	0.654	0.653	0.046	14.108	0.000	0.747	1.206	Accepted

Note(s): β = Original Sample (O), (M) = Sample Mean, (STDEV) = Standard Deviation, t = T-Statistics (|O/STDEV|); p = significancy level; f² = Effect size; VIF = Variance inflation factor

Table 7.
Reliability and validity indicators

Construct	Indicators	λ	α	rho_A	R ²	Q ²
Covid19 pandemic			0.813	0.816		
	Covid19_1	0.886				
	Covid19_2	–				
	Covid19_3	–				
	Covid19_4	0.848				
Service ecosystem self-adjustment			0.816	0.816	0.171	0.101
	SES_SA1	0.862				
	SES_SA2	0.868				
	SES_SA3	0.873				
	SES_SA4	0.859				
	SES_SA5	–				
Development of digital service capability			0.921	0.934	0.525	0.122
	DD_SC1	0.663				
	DD_SC2	0.789				
	DD_SC3	0.850				
	DD_SC4	0.716				
	DD_SC5	0.811				

Note(s): λ = Factor loading, α = Cronbach's alpha, rho_A = construct reliability measure

Table 8.
Model validity measures (convergent and discriminant validity)

	CR	AVE	MSV	MaxR(H)	DD_SC	SES_SA	Covid19
DD_SC	0.914	0.686	0.321	0.985	0.828		
SES_SA	0.916	0.739	0.321	0.999	0.567***	0.859	
Covid19	0.813	0.685	0.175	0.815	0.419***	0.319***	0.828

Note(s): Significance of correlations: ***p < 0.001. The italicized diagonal values in shades are the square root of the AVE construct, CR = composite reliability; AVE = average variance extracted; MSV = maximum shared variance and MaxR(H) = maximum reliability, SES_SA = Service ecosystem self-adjustment, and DD_SC = Development of digital service capability

Structural model and test of hypotheses

The structural model tests the proposed hypotheses by showing the relationship of each path of the constructs on the model. The statistical significance of each path was examined by bootstrapping technique with 95% bias-corrected confidence estimates (Hair *et al.*, 2022). H1 examines whether Covid19 has a significant impact on DD_SC. Finding show that, Covid19 significantly impacts DD_SC ($\beta = 0.141$, $t = 2.543$, $p = 0.000$). Thus, H1 is accepted. H2 examines whether Covid19 has a significant impact on SES_SA. The finding shows that Covid19 significantly impacts SES_SA ($\beta = 0.413$, $t = 5.119$, $p = 0.000$). Thus, H2 is also accepted. H3 examines whether SES_SA has a significant impact on DD_SC. The finding shows that SES_SA significantly impacts DD_SC ($\beta = 0.654$, $t = 14.108$, $p = 0.000$). Therefore, H3 is also affirmed. See Table 9 (see Figure 5).

	Covid19	DD_SC	SES_SA
Covid19			
DD_SC	0.41117		
SES_SA	0.41283	0.7167	

Table 9.
Heterotrait-monotrait
ratio (HTMT)

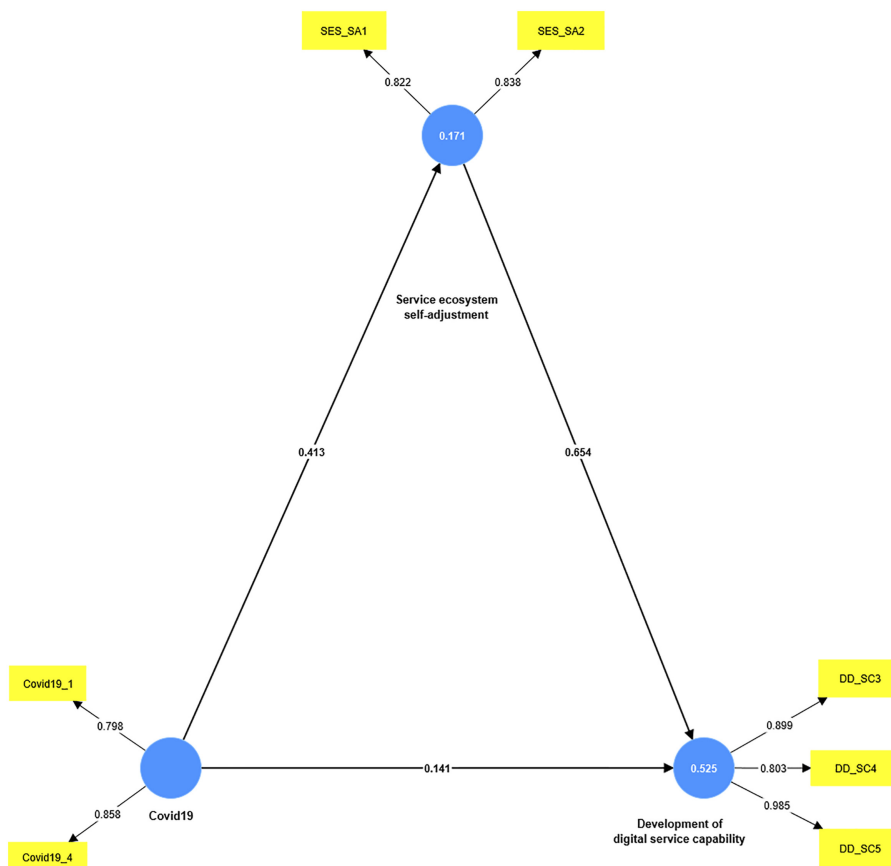


Figure 4.
Measurement model

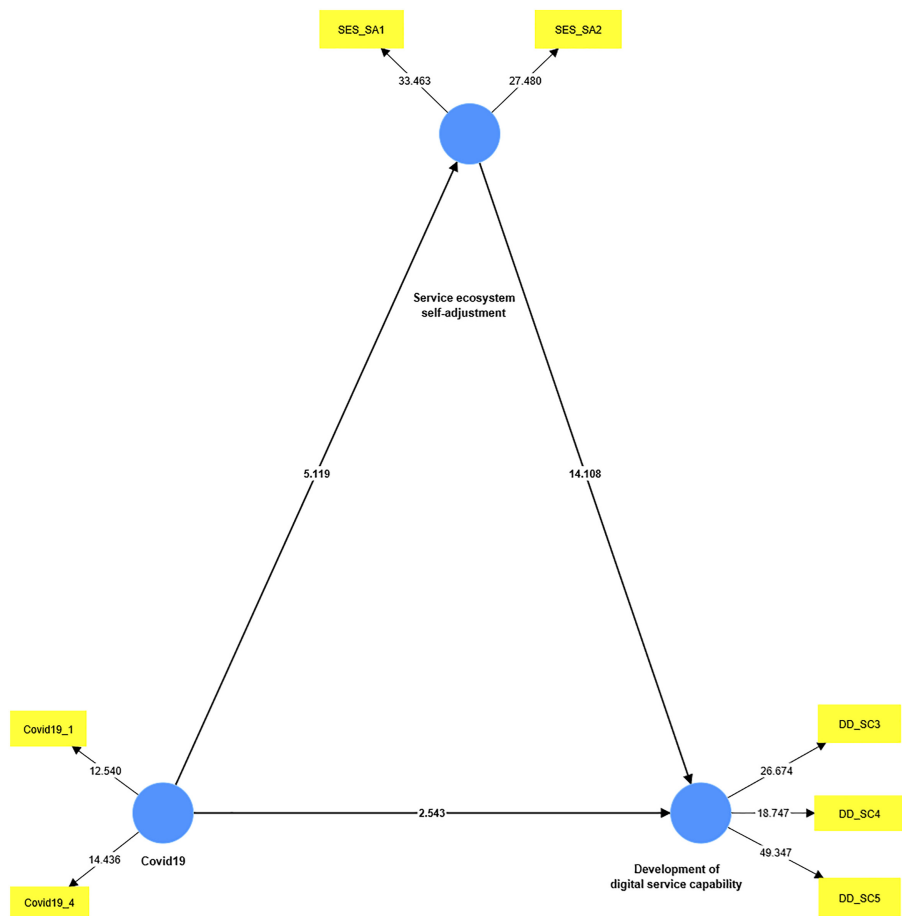


Figure 5.
Structural model

Mediation analysis

The study followed SEM using bootstrapping to test the indirect effect and examine the mediation effect. Bootstrap samples of 5,000 and bias-corrected 95% confidence intervals assist in evaluating the significance level for indirect effect (Hair *et al.*, 2022). So, H4 examines whether SES_SA mediates the relation between Covid19 and DD_SC. The finding indicates that the total impact was significant ($\beta = 0.412, t = 5.779, p = 0.000$). After including the mediator in the model, the effect was reduced, and the direct relationship was still substantial ($\beta = 0.141, t = 2.543, p = 0.011$). After the analysis, the indirect impact on the mediator's presence became significant ($\beta = 0.270, t = 4.825, p = 0.000$). Thus, the finding confirms there is a partial mediation. So, the effect of Covid19 passes partially through SES_SA. Therefore, H4 is also established. See Table 10 for mediation results.

Multiple linear regression tests the effects of small business people's demographic characteristics on fear of Covid19 effects.

The *R*-value from Table 11 shows no strong relation between the independent and dependent variables, and the independent variable explains a tiny part of about (20.7%) of the dependent variable. However, the model is statistically significant, as in Table 12. Age

considerably influences the fear of Covid19 ($\beta = 0.142, t = 3.350, p = 0.001$). The rest of the demographic characteristics do not influence the fear of Covid19. See Table 13.

Service
ecosystem self-
adjustment

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Discussion

This study aims at showing the association between Covid19, SES_SA and the DD_SC. Results of the survey indicate a significant impact of Covid19 on developing digital service capability. Thus, Covid19 has significantly accelerated the DD_SC for business people because it demands people to keep social distance as a preventive measure against the Covid19 effect (Song *et al.*, 2021; Zhang *et al.*, 2021). So, the most accessible means of servicing customers was by familiarizing themselves with digital capabilities that assist online businesses.

Covid19 disturbed traditional operations of companies whereby business people and customers had no direct contact after the hit of the pandemic due to health measures. Covid19

Path	Total effect			Direct effect			Indirect effect			BI [2.5%97.%]
	β	t	p -value	β	t	p -Value	β	t	p -Value	
Covid19→SES_SA→DD_SC	0.412	5.779	0.000	0.141	2.543	0.011	0.27	4.825	0.000	0.159; 0.382

Table 10.
Mediation analysis
results

Model	R	R square	Adjusted R square	Std. Error of the estimate
1	0.207a	0.043	0.03	0.99

Note(s): a. Predictors: (Constant), occupation, age, marital status, sex and education level

Table 11.
Model summary

Model		Sum of squares	df	Mean square	F	Sig
1	Regression	16.578	5	3.316	3.386	0.005b
	Residual	370.15	378	0.979		
	Total	386.73	383			

Note(s): a. Dependent Variable: Covid19

b. Predictors: (Constant), occupation, age, marital status, sex and education level

Table 12.
ANOVA

Model		Unstandardized coefficients		Standardized coefficients		t	Sig
		B	Std. Error	Beta			
1	(Constant)	7.461	0.348			21.451	0.000
	Sex	-0.147	0.103	-0.073		-1.430	0.154
	Marital status	-0.103	0.059	-0.088		-1.741	0.082
	Education level	-0.031	0.037	-0.043		-0.839	0.402
	Age	0.142	0.043	0.171		3.350	0.001
	Occupation	0.017	0.131	0.007		0.133	0.894

Note(s): a. Dependent Variable: Covid19

Table 13.
Coefficients^a

altered the way products and services are delivered. Due to difficulties experienced in providing services, business people have to develop a digital capability to assist in the remote co-creation of value (Saunila *et al.*, 2018). Thus, business people need to organize their activities to create customer value (Saunila *et al.*, 2018).

Also, there is a significant impact of Covid19 on SES_SA. The service ecosystem was affected by Covid19 in an undesirable way (Kabadayi *et al.*, 2020). Because the system is self-adjusting, it made all the social and economic actors of the ecosystem adjust themselves and integrate resources from various stakeholders, which assisted in the co-creation of value during the outbreak of covid19. The DD_SC facilitated the exchange flow between business people and customers (Beirão *et al.*, 2017). Successful DD_SC requires extra effort and internal or external forces to be in place.

Before the hit of Covid19, business people considered technological capabilities a cost-saving mechanism. Still, with the Covid19 situation, technical capabilities are considered a smart move that assists the exchange process to create value for customers and, of course, provide a competitive advantage for business survival. Payne, Peltier, and Barger (2021) propound that service ecosystem actors have a substantial role to play in the co-creation of value via the amalgamation of their exceptional understandings and varied resources. An example of digital service capabilities attained from the ecosystem is the acceptance of mobile banking apps to engage customers in value co-creation roles through self-service technology for service exchange. Covid19 effects have forced ecosystem actors to join their efforts to facilitate the service exchange process to enhance customers' value.

The study also found a substantial influence of SES_SA on developing digital service capability. Vargo, Weiland, and Akaka, (2018), Wulf, Mettler, and Brenner, (2017) and Tan, Dhakal, and Ghale (2020) are in favor of this study's findings. Business people and proactive customers will exploit the ecosystem's power by collaborating innovatively with other actors in the ecosystem to facilitate the DD_SC for the co-creation of value through a social exchange (Vargo *et al.*, 2018). Hence, the service ecosystem allows business people and customers to adapt swiftly by developing digital capabilities to respond to changing situations (Mustak & Plé, 2020; Tan *et al.*, 2020). Digital service capability allows business people to find mechanisms that will have easy social interactions with customers, like using applications to deliver services. Kaartemo *et al.* (2017) and Immonen, Ovaska, and Paaso (2018) say ecosystem actors can mutually share resources like knowledge, a network of relations, social settings and culture for value creation.

Last, this study's findings shed light on the practical comprehension of the indirect effect of Covid19 on the development of digital service capabilities through SES_SA as a mediator. Results show that SES_SA partially mediates the relationship between Covid19 and the DD_SC. Additionally, respondents' age levels significantly influence the fear of the Covid19 pandemic (Caycho-Rodríguez *et al.*, 2021); others have found contradictory results (Bruine de Bruin, 2021).

Conclusion

It was hard to convince people to adopt technological changes brought by technological transformation. But the hit of Covid19 (external force) made the digital transformation possible. So, Covid19 and SES_SA facilitated the DD_SC among business people and customers that assisted in value co-creation. The two could contact remotely with the help of technological means despite strong measures of social distancing to counter Covid19 effects. This study aims at testing the developed model that relates to Covid19 and the DD_SC through the mediating role of SES_SA.

The study contributes to the Covid19 pandemic and SES_SA literature by showing that the Covid19 pandemic can significantly influence the self-adjustment mechanism of the

service ecosystem that has a substantial role in the DD_SC to enhance the co-creation of value via the social exchange process. The study's finding tells that the Covid19 effects have made SES_SA work properly to facilitate the DD_SC amongst people. Policymakers and other actors should find proper mechanisms to facilitate the development of digital service capabilities for their people by highlighting its importance in these eras of digital transformation and Covid19 that have necessitated the establishment of novel ways to interact and serve customers, as well as integrating or sharing resources from the ecosystem to enhance the co-creation of value.

To survive the tremors of Covid19, businesses people have to show agility in improving the inclusiveness of their business models and operations, like adopting online distribution and robotic uses in delivering products or services to customers and using online payment for survival purposes (Mende *et al.*, 2019; Saputra *et al.*, 2022). Adopting innovative digital business models is essential for empowering supply chains to reach customers easily by doing away with intermediaries and going for price transparency and cutting down marketing costs by investing in technological infrastructure as technology is now essential for business continuity and resilience (Kronblad & Pregmark, 2021). Likewise, people can opt for simple technologies and use platforms like social media, mobile devices and computers to enable interactions with customers in the digital environment (Yadav & Pavlou, 2020) as well as partner with other actors who are experts in digital technology to scale-up digital skills like information and communications technology (ICT) skill, data privacy and security management, ability to resolve customers' problems remotely, communicating by electronic means and handling automated system to monitor and control customers actions as well as digital identity (Jisc, 2019; Nasiri *et al.*, 2020) and machine learning to improve service delivery (Hoffman & Novak, 2018).

Implications

The inter-relation of the proposed model enlightens the impact of Covid19 and SES_SA in developing digital service capabilities. So, this study backs up the development of other studies that will associate Covid19, SES_SA and the DD_SC by providing a base to evidence that, Covid19 contributes to digital transformation that necessitates the development of digital service capabilities. And stress the uniqueness of Covid19 in contrast to other factors.

This study also adds knowledge to studies looking for factors that influence the successful DD_SC for co-creating value. Bearing in mind the gap in the literature that addresses the relationship between Covid19 and the development of digital service capabilities, the study fills the gap in the existing research and provides room for further analysis. Apart from that, the study highlights the role plaid by Covid19 in fostering SES_SA in enhancing the co-creation of value by sharing resources that actors can use to facilitate the development of digital service capabilities.

The study also enlightens on the pathway over which Covid19 impact the development of digital service capabilities. The study provides a practical understanding of the factors that may perhaps enhance the development of digital service capabilities, directly and indirectly, that could assist business people in grabbing a competitive advantage in delivering value to customers through the co-creation of value. The proposed model suggests that business people need to integrate their resources in the ecosystem by collaborating with other actors in developing digital service capabilities that will help create value by interacting remotely with their customers.

The study finding suggests that for business people to be successful in the co-creation of value with customers and foster the exchange process; they need to respond positively by adapting to the changing circumstance of digital transformation accelerated by Covid19 that necessitate offering service in an unusual way which now demands business people to have digital capabilities that will help them serve customers.

Research limitations and future research direction

There is scant literature linking SES_SA and the DD_SC. Future studies can test the same model by including a moderator variable. One can undertake a similar survey but use operational or economic data for businesses or customers using digital means. People can examine the role of digital technologies in customer satisfaction, consumer behavior in the service sector, digital service experience for those with vision disabilities, loyalty and change in customer expectations.

One can also examine the contribution of developed digital technologies in empowering customers and increasing the perceived value of digital services. Explore challenges of traditional business culture in adopting designed digital technologies to improve customer service and study the role of a business's economic status, size of the company, level of technological advancement and investment made to technical infrastructure in influencing the development and adoption of digital technologies.

Future studies can assess if demographic characteristics present contradictory findings regarding the outcome of digital service capability. One can also examine if the development of digital capabilities in developing countries will make them turn to online businesses and become creators of the eco-friendly economy.

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Further reading

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