



**Impact of ICT Usage and Dynamic Capabilities on the Business  
Resilience of SMEs During the COVID-19 Pandemic:  
A Case of Galle District**

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***Abstract***

*The primary concern of this study is to examine how Information & Communication Technology (ICT) usage and dynamic capabilities impact the business resilience of Small and Medium Scale Enterprises (SMEs) to survive and continue during the COVID-19 pandemic. The data were collected from a sample of 129 ICT-used SMEs employing face-to-face and telephone interviews. Partial Least Square-Structural Equation Modelling (PLS-SEM) was used to analyse the data through SmartPLS software. The study findings reveal a significant positive relationship between ICT usage and business resilience during the pandemic. And ICT usage significantly affects the dynamic capabilities of the business. Results also claim that dynamic capabilities play a complementary mediating role in the relationship between ICT usage and business resilience. Consequently, the study concludes that the adoption of ICT and the ability to integrate, build and reconfigure the available resources of SMEs with ICT enablers enhanced their resilience and ensured survival during the pandemic. The research design, the methodology utilized, and the findings of this study will benefit researchers, policymakers, and entrepreneurs and contribute to future studies regarding the regrowth and resilience of SMEs during a crisis.*

***Keywords:*** Business Resilience, Dynamic Capabilities, ICT Usage, SMEs

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## 1. Introduction

The COVID-19 pandemic caused the global health system's breakdown and worsened the global economy. It is evident that in 2020 global GDP growth rate has been reported as -3.59% (Shang & Zhang 2021). During the lockdown period, the Sri Lankan economy also suddenly experienced a considerable deterioration in national output, trade, employment, and demand and growth, resulting in -3.57% GDP growth in 2020, while 1st quarter of 2020 reported -1.8% and 2nd quarter reported -16.4% and after easing the restrictions showing positive change as -1.3% in last two quarters (Faculty of Humanities and Social Sciences (FHSS), 2020). FHSS (2020) have identified that the income sources of 64% of households in Sri Lanka have been affected by the pandemic, while 7% of them lost income and 3% lost their entire livelihood in the crisis. The industrial sector, which includes the majority of SMEs, such as tourism, education, apparel, accommodation, food and beverages, and other retail sectors, has been affected severely by this crisis (International Finance Corporation (IFC), 2020). According to the Department of Census and Statistics (DCS) (2020), during the lockdown period, SMEs' total revenue and employment declined by 56.8% and 62.4%, respectively. Consequently, most SMEs failed to cope with the crisis and collapsed due to the lack of resilience of entrepreneurs.

Business resilience is the capacity of an organization to survive. It can help businesses to survive and sustain any hardship and setback they face by regaining pre-disaster levels of functioning to increase growth after the crisis. If a business has a high resilience ability, that firm can convert losses into profits using the existing situation as an opportunity and reduce costs. (Fiksel, 2006; Huggins & Thompson, 2015; Paton, Violanti & Smith, 2003). In Sri Lanka, even though most of the businesses couldn't be able to survive, 10% of SMEs have adjusted their business strategies by identifying the pandemic as an opportunity and survive as a resilient strategy firm adopted the online-based market concept and e-commerce technologies since the public preferred contactless transactions in the market (FHSS, 2020).

ICT usage consists of technological tools and resources such as computers, applications, and many other communication technologies with smartphones, enabling people to connect through social media regardless of

time or place (Wally & Koshy, 2014). As reported by Kemp (2020), from 2019 through 2020, it has scored that the number of internet users and social media users in Sri Lanka has increased by 399,000 (4.1%) and 491,000 (8.3%), respectively. Consequently, it decreased the limitations of travel restrictions. To address the global challenges, rapid technology or ICT adoption is the better path toward mitigating the barriers (Gamage et al., 2020). Expecting the resilience and sustainability of SMEs that resist the preconditions of digitization is insensitive in a crisis. (Guo, Yang, & Guo, 2020; Syed et al., 2020). Technology adoption and digital transformation have moved from growth enablers to business continuity determinant factors during the pandemic lockdown period (Dunne, Crowder, Pascoe, & Bakhru, 2020).

Dynamic capability is the firm's ability to integrate, build and reconfigure internal and external resources to address rapidly changing environments (Teece, Pisano, & Shuen, 1997). According to (Schepers, Vandekerckhof & Yannick, 2021), in a crisis, business resilience is highly dependent on the dynamic capabilities of a firm as a strong need to adapt and evolve in that situation. ICT adoption can increase small businesses' dynamic capabilities through ICT competencies. As a result, and solution for survival in the pandemic, small enterprises adopt ICT for resilience in the crisis by improving dynamic capabilities. Considering those relationships and concepts can examine the impact of ICT usage and dynamic capabilities on the business resilience of SMEs in Sri Lanka during the pandemic situation. Although few previous research studies have been conducted and are available about the impact of ICT adoption and dynamic capabilities on the business resilience of SMEs in the COVID-19 pandemic situation in other countries, Sri Lanka has not paid attention to business resilience from this perspective, especially in understanding the mediating role of dynamic capabilities on the relationship between ICT usage and business resilience. Therefore, the objective of this study was to understand the contribution of ICT to achieving the dynamic capability needed to enhance the resilience of SMEs during the COVID - 19 pandemic. Consequently, the study established the research problem of the impact of ICT usage on the dynamic capabilities and business resilience of SMEs in Sri Lanka during the Covid-19 pandemic. The findings of the study reveal new avenues for researchers, policymakers,

and entrepreneurs to overcome the damage of this crisis and develop the resilience of SMEs in Sri Lanka.

The paper layout is organized as follows. First, it reviews the literature on ICT, dynamic capabilities, and business resilience and their relationships. Research hypotheses are formulated based on the literature review. The description of the study materials and methods and the obtained results are presented and discussed in the next section. Finally, the paper concludes by reviewing the contributions and limitations of the study and providing directions for future research.

## 2. Literature Review

**SMEs in COVID-19 Pandemic:** Recent research states that SMEs in Sri Lanka provide 45% of employment and 75% of total enterprise in the economy (IFC, 2020). SMEs remain vulnerable to external shocks such as financial crises, disasters, and forced changes in the business environment during the COVID-19 pandemic (Shinozaki & Rao, 2021). The COVID-19 pandemic has become an unprecedented crisis for SMEs, which made to change their business operations and adapt to new circumstances (Paunescu & Matyus, 2020). According to IFC (2020), Most of the subsectors of SMEs, such as tourism, textiles, food, and footwear, were affected and lost continuously in Sri Lanka and reported that two-thirds of SMEs in Sri Lanka had faced a decrease in demand for their products and services due to the pandemic. Mainly firms in the agriculture, manufacturing, construction and service sectors were hit harder. Large corporations have well-established digital solutions in place to face the pandemic. However, SMEs are severely affected by the restrictions because of their concentration in the retail and hospitality sector, and consequently, most of the SMEs have closed down their firm, and others face hardship in paying the running cost of the organizations (FHSS, 2020; ITU, 2020; Warsame, 2020).

**ICT usage:** ICT is a set of different technological tools and resources such as computers and applications, telephones, mobile phones, communication services, and internet services which are used to communicate, create, distribute, store and manage information (Ashrafi & Murtaza, 2008; Matlay & Addis, 2003; Tinio, 2003). ICTs provide

opportunities for enhanced and innovative solutions for managing products and processes, hence allowing businesses to flourish in competitive markets (Mwantimwa, 2019; Sellens, Chao, & Gonzalez, 2015). ICT usage in enterprises in resource planning and e-commerce reduces the cost of operations and maximises the revenues of business firms (Jameel, Karem, & Mahamood, 2017). Access to new technology is a vital factor in the determination of the growth and expansion of SMEs (Amaradiwakara, 2017; Ranatunga, Priyanath & Meegama, 2020). Small businesses are using social media because of its effectiveness in identifying the changing consumer behaviour, new marketing strategies and increasing brand credibility by enhancing their brand image. It has emerged as an essential piece of business marketing strategy. According to Global Digital Statistics, 52% of social media marketers believe social media positively influence their company's revenue and sale (Benwell, 2014). With globalisation, most SMEs stepped towards ICT-based activities such as E-business and m-commerce, which indicated more positive consequences such as increasing productivity, reducing operational costs, and improving customer satisfaction (Gamage et al., 2020). During the COVID-19 pandemic, digital technologies have become a critical enabler of connectivity, facilitating the continuity of our regular lives and connecting people more than ever before (ITU, 2020). In Sri Lanka, during the pandemic situation, one-third of SMEs have tried at least one new digital business channel to continue their businesses. Even so, women-owned SMEs were significantly less likely to have digital business channels than other businesses (IFC, 2020). In a crisis like COVID-19, ICT usage is the best solution to keep the country's small business sector awakened as the economy also breaks down in Sri Lanka.

**Dynamic Capabilities:** Dynamic capabilities as the firm's ability to reconfigure operating capabilities and consequently allow the firm to adapt and evolve (Zahra, Sapienza, & Davidsson, 2006; Teece et al., 1997; Newey & Zahra, 2009). It is mainly involved in certain change routines and analysis, creative managerial and entrepreneurial acts such as product development, and establishing new markets (Teece, 2010). Dynamic capabilities have been conceptualised as a firm's capacity to sense, create, extend, modify, reconfigure, integrate, and renew, etc. its capabilities in fast-changing environments (Ambrosini & Bowman, 2009; Borch & Madsen, 2007; Helfat & Peteraf, 2009). Based on the dynamic capability theory of Teece (2007),

dynamic capabilities can be divided into the capacity (1) to sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through reconfiguring, enhancing, combining, protecting the business enterprise's tangible and intangible assets. Sensing, which means identifying and assessing opportunities, and threats outside the firm, seizing and mobilising resources to capture value from these opportunities, and reconfiguring or transforming by continuously renewing, can make capability dynamic. Sensing describes the ability of a firm to identify and assess market and technology changes and opportunities through learning about the internal and external business ecosystems. Sensing and shaping opportunities involve scanning, creating, learning, and interpreting the market. Sensing capability enables the organization to obtain relevant knowledge about changing market environment and ensure that organizations respond quickly to opportunities and threats (Eisenhardt & Martin, 2000). Seizing refers to identifying opportunities by investing in and addressing new products, processes, or services. Reconfiguring can be identified as continuously renewing a firm's resources or assets to maintain competitiveness (Teece, 2007). Seizing capability is also considered the ability to integrate resources to maximise opportunities in the market, and reconfiguring capacity produces efficient responses to significant environmental changes (Zahra et al., 2006; Okuwa & Onuoha, 2019).

Dynamic capabilities enable firms to quickly adapt, recognise the changes in the external environment, and take necessary actions to respond to those changes (Mishra, Singh, & Subramanian, 2021). For a firm to sustain its competitive advantage, it needs to renew its stock of valuable resources as its external environment changes, and dynamic capabilities enable firms to impact these changing environments, which build resilience to minimise enterprise risk (Ambrosini & Bowman, 2009; Lee & Rha, 2016). In a continuously and unpredictable changing market environment, firms are essential to developing dynamic capabilities to survive; mainly, SMEs should develop more dynamic capabilities to compete with large firms and compete in global markets (Borch & Madsen, 2007; Zhou & Li, 2009). During a crisis like COVID-19, dynamic capabilities can improve SMEs' operating performance and revenues with more substantial benefits for smaller SMEs (Clampit, Lorenz, Gamble, & Lee, 2021).

**Business Resilience:** Resilience is a psychological concept that emphasises organizations' and individuals' strengths in coping with unusual situations (Cooke et al., 2016). Also, it can be viewed as adaptability, responsiveness, sustainability, and competitiveness in evolving market (Gunasekaran, Rai, & Griffin, 2011). Business resilience can be defined as the capacity of a company to survive, adapt and grow in the face of turbulent change (Fiksel, 2006). Hendry, Stevenson, Macbryde, and Ball (2019) defined business resilience as preventing and absorbing changes and regaining the initial performance level after an unexpected disturbance. Resilience is adapting to and growing within a disaster (Rusell, 2016). Resilience enables businesses to recover from hardships and setbacks experienced by crises faced by managing the business process (Duchek, 2018; Huggins & Thompson, 2015). If an enterprise manages to deliver a positive transformation, to escape the threat while becoming more active and efficient in a crisis, it is enterprise resilient (Riaz-Martin, Lopez-Paredes, & Wainer, 2018).

The COVID-19 pandemic has complicated the global business environment, making the resilience of the small and medium enterprise sector a criterion for business sustainability (Aldianto et al., 2021). Due to the lack of investments required to increase resilience, SMEs are considered unprepared for challenging opportunities and are at risk in the face of adversity (Sullivan-Taylor & Branicki, 2011). Resilience is regarded as a suitable indicator of SMEs' performance during an economic crisis. The resilience of SMEs must be considered to enable them to compete in the global market (Gunasekaran et al., 2011). Business resilience enables SMEs to maintain or regain pre-disaster levels of functioning or adapt successfully and enhance their business growth after the crisis (Paton et al., 2003). To promote the resilience of organizations, especially SMEs, the owners or the managers must satisfy several factors, such as dynamic capabilities, access to finance, external support, and adequate planning (Ali, 2021). Some of the previous literature refers to business resilience as whether the business is open after a disruption or how long the business can remain open after a disturbance, while some studies consider resilience as recovery or adjustments of the firm in income, profit, and business process. (Wasileski, Rodriguez, & Diaz, 2010). Based on the different definitions of previous literature (Sanchis, Canetta, & Poler, 2020) have adopted preparedness

capacity, recovery capacity, and adaptive capacity as the capabilities of resilience in a different disruption based on the enterprise resilience conceptual reference framework. Campos (2016) concluded that business resilience is multidimensional and has identified five significant factors that characterize business resilience in the context of post-disaster recovery. Those are institutional control, planning and preparedness, philosophy and integrity, external support and linkages, and communication and media.

**Empirical Evidence:** According to ITU (2020), the economic impact of COVID-19 on digital infrastructure has identified that the countries with the most extensive broadband infrastructure have been able to offset the adverse effects of the pandemic. While researching the economic crisis of 2008 – 2009, Bertschek, Polder, and Schulte (2019) mentioned that ICT adoption by firms can adjust their business process by improving resilience during a crisis. Millan et al. (2019) stated in the investigation of ICT implication of self-employers and their business performance during the pandemic they have identified that with the level of ICT use, their earnings also have increased, showing ICT adoption is positively related to entrepreneurial performance. Raj, Sundararajan, and You (2021) imply that the digitalisation of small businesses is crucial in creating business resilience in the post-COVID-19 period. Empirical research conducted by Gunasekaran et al. (2011) on the resilience and competitiveness of SMEs has identified that the ICT usage of firms positively impacts the resilience of SMEs. Social media has revolutionized the way people connect, relate, communicate and interact with other people. Organizations can enhance and develop their business operations using social media for knowledge creation and innovation. Through mass collaboration using social media, SMEs can adopt new business ideas which strengthen resilience to meet the challenges of the COVID-19 pandemic or other unseen turbulence or a crisis. Business resilience, sustainability, and continuity rely on sustainable ICT infrastructures (Yu, Pauleen & Jafarzadeh, 2021).

Guo, Yang, and Guo (2020) have identified from their study that ICT usage enabled SMEs to respond effectively to the crisis using dynamic capabilities. Prida, Oghazi, and Cedergren (2016) reveal that the use of ICT in firms in such ways; as internal efficiency, collaborative service, and communications influence the capabilities of dynamic capabilities of small



firms. Mobile app usage in SMEs in Nigeria helps to increase firms' dynamic capabilities by enhancing SMEs' adaptive, absorptive, and innovative capabilities (Owoseni & Twinomurinzi, 2018). Conversely, Adeniran and Johnston (2016) stated that a positive relationship exists between dynamic capabilities and ICT utilisation, and dynamic capabilities can increase the SME's long-term benefits through ICT applications, functions, and tools. However, Kedemeteme and Twinomurinzi (2019) suggest that the African SMEs' dynamic capabilities do not influence their adoption and emergence of ICT.

Most researchers utilised quantitative methods in their research studies to find the impact of ICT on business resilience and dynamic capabilities (Akpan, Johnny, & Sylva, 2021; Deakins & Battisti, 2015; Owoseni & Twinomurinzi, 2018). They have chosen large samples and analysis techniques such as PLS-SEM, covariance-based structural equation modelling, maximum likelihood estimation (MLE) method etc. Some researchers have constructed conceptual frameworks for examining the impact of dynamic capabilities on business resilience and studied the digitalisation of SMEs and their crisis response to the COVID-19 pandemic. They have used the qualitative approach for their studies (Aldianto et al., 2021; Guo et al., 2020; Martinelli, Tagliazucchi, & Marchi, 2018). Literature analysis and conceptual frameworks, content analysis, and semi-structured in-depth- interviews were employed in these qualitative analyses. As a whole, in research regarding the concept of resilience, a smaller number of studies have followed systematic empirical studies.

Most studies have followed theoretical approaches, focusing on conceptual framework development and selecting suitable measurements (Aldianto et al., 2021; Fiksel, 2006; Huggins & Thompson, 2015). And also, the review of existing literature revealed the absence of a universally accepted definition for resilience and a uniform scale for measuring business resilience. Consequently, most studies have considered the relationship between dynamic capabilities and competitive advantages rather than resilience. Considering previous literature, most researchers have felt the effects of ICT adoption on supply chain resilience during the COVID-19 pandemic. Even though some studies have given their attention to the impact of dynamic capabilities on ICT adoption (Adeniran & Johnston, 2016;

Kedemeteme & Twinomurinzi, 2019), there is a lack of previous research investigating the impact of ICT usage on the dynamic capabilities of SMEs. As well as the mediating role of dynamic capabilities in business resilience studies not considered by previous scholars.

### 3. Conceptual Framework and Hypotheses

The main goal of SMEs is to achieve a satisfactory level of resilience to survive in the turbulent environment generated by the pandemic situation. Three theoretical aspects have been introduced and combined to examine the problem. ICT usage, dynamic capabilities, and business resilience. The independent variable is ICT usage, the dependent variable is business resilience, and the dynamic capability performs as mediating variable. ICT usage contains four forms; ICT applications, infrastructure, human resources, and mobile technology. According to the literature, dynamic capability comprises three dimensions: sensing, seizing, and reconfiguring. Business resilience considers situation awareness, keystone vulnerability, and adaptive capacity. The study constructed three hypotheses while it was connecting these three variables.

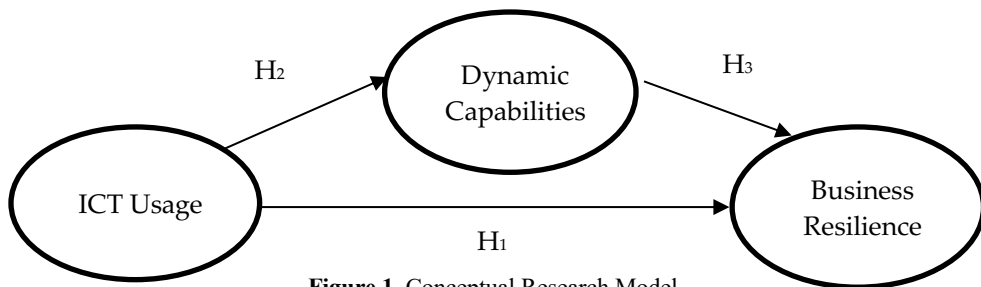


Figure 1. Conceptual Research Model

ICT usage and Business Resilience: ICT usage of a business in different modes and systems such as E-commerce, internet, website, and social media positively influenced the resilience of SMEs (Gunasekaran et al., 2011). Using social media and advanced data analytics technology in the business process can make SMEs generate better business ideas and solutions, enhancing the business resilience to face COVID-19 or other turbulent situations (Yu et al., 2021). The adoption of ICT has been a survivor for small businesses during the COVID-19 pandemic, which increased business

resilience without the need for high investment, resources, and lengthy process adjustments (Bianchini & Wong, 2020). ICT-intensive firms were hit less hard by the productivity and continuity of firms in the service sector during a crisis period (Bertschek et al., 2019). In enhancing business resilience, technology plays a significant role. In service sector firms, different types of technology such as information systems, artificial intelligence (AI), and industry 4.0 and intelligent systems positively contributed to building business resilience during the COVID-19 pandemic (Huang & Jahromi, 2021; Jameel et al., 2017; Min, 2019; Saravi et al., 2019). Thus, ICT usage can increase the business resilience of SMEs in a pandemic, and the study predicts that

H1: There is a significant positive relationship between ICT usage on the business resilience of SMEs during the pandemic situation.

**ICT Usage and Dynamic Capabilities:** ICT usage of SMEs has enabled them to respond effectively to the COVID-19 crisis by using the dynamic capabilities of organizations (Guo et al., 2020; Prida et al., 2016). ICT usage as a mobile app in SMEs can increase the dynamic capabilities of SMEs (Owoseni & Twinomurinzi, 2018). Using ICT capabilities in small businesses positively affects firms' dynamic capabilities and competitive advantage (Prida et al., 2016). ICT utilisation has a significant positive impact on enhancing the dynamic capabilities of SMEs (Adeniran & Johnston, 2016). Therefore, a firm's ICT usage can increase SMEs' dynamic capabilities. Considering these facts, the study assumes that;

H2: There is a significant positive relationship between ICT usage on the dynamic capabilities of SMEs during the pandemic situation.

**Dynamic Capabilities and Business Resilience:** Ali (2021) stated that there is a positive relationship between dynamic capabilities and the business resilience of SMEs. Adopting a dynamic capability in the organization corresponds with the organizational resilience process, which looks beyond including capabilities that can adapt to changing circumstances and identify new opportunities to survive and grow (Martinelli et al., 2018). A company's dynamic capabilities help to increase business resilience during the COVID-19 pandemic (Aldianto et al., 2021). SMEs which have developed dynamic

capabilities have the potential to raise the firm's recovery and growth capacity in a post-disaster environment (Deakins & Battisti, 2015; Raj et al., 2021). In a crisis period, the dynamic capabilities of an organization enable firms to survive and evolve in crisis by increasing their resilient ability. Thus, a firm's dynamic capabilities can increase SMEs' business resilience. Hence, the study predicts that;

H3: There is a significant positive relationship between dynamic capabilities on the business resilience of SMEs during the pandemic situation.

ICT usage dynamic capability and Business Resilience: ICT usage increases the business resilience of SMEs and creates a positive relationship with business resilience (Gunasekaran et al., 2011). Conversely, dynamic capability positively influences business resilience (Ali 2021). As mentioned above, ICT usage increases dynamic capability (Guo et al., 2020; Prida et al., 2016). Although the previous empirical studies combining ICT usage, dynamic capability, and business resilience do not appear, it is reasonable to consider that the positive effect on business resilience under ICT usage may be increased by the positively effecting factor of dynamic capability. Conversely, the impact of dynamic capability on business resilience can be increased by ICT Usage. Consequently, the study has considered that dynamic capability mediates the relationship between ICT usage and the business resilience of SMEs. Therefore, the study assumed that;

H4: There is a mediate effect of dynamic capabilities on the relationship between ICT usage and business resilience of SMEs during the pandemic situation.

#### **4. Methodology**

This research used three theoretical aspects to answer the research problem, and hence combining these aspects to produce a new concept belongs to the deductive approach. The quantitative research design was utilized for testing the established hypotheses. Seven points Likert scale questionnaire was applied to primary data collection for the study. The unit of analysis of the survey contained SME owners of Sri Lanka. The multistage sampling technique was utilized, and the primary sampling units

are districts. Randomly selected Galle district from 24 districts as in the first stage. The secondary sampling units are the divisional secretariat, and hence, Ambalangoda divisional secretariat was randomly selected in the second stage from 19 divisional secretariats of the Galle district. The sampling frame of the study was developed using the data sources of a list of ICT-used SMEs in the Ambalangoda DS division area provided by the Galle district secretariat. These data were used as a sampling frame to derive a particular sample for the current study. The study determined that 129 ICT-adopted SMEs which were utilized at least mobile technology, mobile applications, internet, and data link for their business activities as sample size and was distributed among 10 Grama Niladari divisions according to the established location.

A two-step procedure has been utilized to prepare the seven-point Likert scale questionnaire, which included strongly disagree to strongly agree on scales. After carefully reviewing the past literature, confirmatory factors for all the constructs have been included in the questionnaire. A pilot survey was conducted before organising the distributing questionnaire to examine whether the obtained data was appropriate for achieving research objectives as well as clear and understandable for the respondents to give their responses to gain validity and reliability of gathered data. The structured questionnaire was sent online through Google forms and used to collect data through face-to-face interviews and Telephony interviews with the managers or the owners of the selected SMEs.

According to the conceptual framework, multiple independent and dependent variables and evaluating more than one construct simultaneously should be done to test the hypotheses. Therefore, Partial Least Square - Structural Equation Modelling (PLS-SEM) was selected as the analysis tool since it provides all the capabilities to conduct such analysis. There are two main approaches to evaluating the relationships in a structural equation model: PLS-SEM and CB-SEM (Hair, Ringle, & Sarstedt, 2011). CB-SEM is used to confirm theories, while PLS provides causal explanations (Hair, Hult, Ringle, Sarsedt, & Danks, 2021). The measurement model is assessed by examining reliability (indicator reliability and internal consistency reliability) and validity (convergent validity and discriminate validity) tests.

The study developed latent variables to measure all the variables (ICT, dynamic capability, and business resilience), following a hierarchical model using PLS path modelling. The efficiency of the structural model was tested by multi-collinearity issues,  $R^2$ , and predictive relevance ( $Q^2$ ).

ICT usage was divided into four dimensions: ICT applications, infrastructure, human resources, and mobile technologies (Ranatunga et al., 2021). According to Ranatunga et al. (2021) and Ashrafi and Murtaza (2008), ICT applications were operationalised using six items, including the use of the web, email, social media, standard software, online selling, and online banking. The other four items include the use of computers for business, fixed-line telephone, nature of internet connection, and internet-enabled devices for operationalising ICT infrastructure. Three items measured in ICT human resources: employee IT knowledge, use of e-mails or Internet Messaging, and capability to access and use the internet. Five items were utilised to operationalised ICT mobile technology, which included the use of mobile phones, the use of mobile equipment with internet for business purposes, the use of mobile apps for communication, the use of social media through the mobile connection, employees' use of internet messaging or email through mobile phones for business purposes (Ashrafi & Murtaza, 2008; Ranatunga et al., 2021; OECD, 2015). The dynamic capability was divided into three subcategories: sensing capability, seizing capability, and reconfiguring capability. The sensing capability was measured using four items, seizing capability operationalised using another three items, and reconfiguring capability measured using another three items (Adam, Strahle, & Freise, 2018; Akpan et al., 2021; Teece, 2007). Business resilience contained three sub-items situation awareness, keystone vulnerabilities, and adaptive capacity. Five items were utilised for measuring situation awareness. Keystone vulnerabilities were measured using another five items, and finally, adaptive capacity was operationalised by four items (Asgary, Azimi, & Anjum, 2013; McManus, Seville, Brunsdon, & Vargo, 2007; Tibay et al., 2018).

## 5. Results

According to Hair et al. (2021), the analysis depended on multivariate techniques and, therefore, some degree of measurement error should be expected. Hence, the validity and reliability of such measures should be assessed. The validity of a measure refers to the degree to which the measure accurately represents what it is intended to be used for (Hair et al., 2011). Ten endogenous latent variables were evaluated as the outer model. Table 01 shows standardised factor loadings above the minimum threshold criterion of 0.7, confirming the indicator reliability of first-order reflective constructs and factor loading also statistically significant at 0.05 level. Furthermore, it shows that Cronbach's  $\alpha$  was higher than the required threshold value of 0.7 and the composite reliability was higher than the recommended 0.7 value. Therefore, it depicts and confirmed the convergent validity of the first-order constructs.

Considering the discriminant validity test, which is the other test used to measure the validity of a construct, the square root of the AVE of each construct should be higher than the highest squared correlation with any other construct (Fornell and Larcker, 1981). Table 2 included the square root of AVE values of each construct in bold. According to the above table, the values horizontally below the  $\sqrt{\text{AVE}}$  values (Correlation of other variables) are lower than the  $\sqrt{\text{AVE}}$  values. Therefore, the Discriminant validity of the constructs exists in the first-order analysis. As a result, we can conclude that all the constructs build in the first-order analysis have validity where the items adequately represent the constructs.

**Table 1. Validity and Reliability constricts of First Order Analysis**

Construct	Internal Reliability		Internal Consistency Reliability		Convergent Validity AVE
	Loading	T Statistics ( O/STDEV )	Composite Reliability	Cronbach's alpha	
<b>ICT USAGE</b>					
ICT Applications			0.817	0.668	0.599
have an email address for business	0.845	33.332			
use applications on the computer for business purposes	0.708	9.622			
Uses e-banking /e-Money applications for our business	0.763	15.123			
ICT Human Resources			0.832	0.705	0.623
have IT knowledge	0.840	16.645			
use e-Mail/Internet Messaging for business	0.795	19.005			
have access to the Internet	0.728	13.832			
ICT Infrastructure			0.895	0.766	0.810
the business has a fixed /mobile broadband connection or Wi-Fi	0.892	37.323			
use computers for business purposes	0.908	45.402			
ICT Mobile Technology			0.967	0.954	0.880
uses mobile phones for business purposes	0.922	54.063			
use mobile phones with internet facilities for business activities	0.963	94.975			
use social media networks through mobile phones for business	0.950	60.898			
Mobile apps are used for communication	0.916	24.746			



<b>DYNAMIC CAPABILITIES</b>					
Sensing Capabilities			0.827	0.592	0.706
Considers proposals regarding business from outside parties	0.895	33.233			
Communicates with competing businesses	0.782	13.498			
Seizing Capabilities			0.812	0.539	0.683
Customers respond promptly	0.791	5.596			
Always work to identify customer habits, factors that affect customer satisfaction, and existing barriers to innovative solutions	0.860	21.200			
Reconfiguring Capabilities			0.842	0.628	0.728
Creates and shares new knowledge from other external networks	0.829	16.331			
Business is based on customer feedback	0.877	43.483			
<b>BUSINESS RESILIENCE</b>					
Situation Awareness			0.802	0.596	0.709
have a good understanding of my roles and responsibilities of myself as well as others in the business	0.886	4.327			
Have a good understanding and awareness of all the stakeholders in the organization. E.g., suppliers, customers	0.796	3.031			
Keystone Vulnerabilities			0.974	0.947	0.949
have good relationships with other organizations in the day-to-day affairs of the organization and have a good understanding of that relationship	0.974	30.348			
have a good understanding of the organization's internal and external resources and their impact on a disaster	0.975	17.135			
Adaptive Capacity			0.802	0.530	0.672
In the event of a disaster, the organization works independently of all individuals to achieve its goals	0.901	34.993			

The day-to-day operations of the business are highly independent and decentralised	0.729	21.531
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Source: Survey Data, 2021

**Table 2. Discriminant Validity of the Measurement Model**

	Applications	Infrastructure	HR	Mobile techno	Sensing	Seizing	Reconfiguring	Situation	Adaptive	Keystone
Applications	<b>.774</b>									
Infrastructure	.636	<b>.900</b>								
HR	.611	.590	<b>.789</b>							
Mobile Techno	.259	.301	.393	<b>.938</b>						
Sensing	.244	.088	.083	-.037	<b>.840</b>					
Seizing	.145	.187	.150	.436	.179	<b>.827</b>				
Reconfiguring	.313	.309	.134	.222	.479	.395	<b>.830</b>			
Situation	.345	.377	.316	.201	.274	.143	.402	<b>.842</b>		
Adaptive	.007	.063	.149	.368	-.230	.288	-.170	-.180	<b>.820</b>	
Keystone	.338	.406	.274	.117	.278	-.018	.430	.585	-.238	<b>.974</b>

Note: Diagonal values in bold are the square roots of the AVE values. To establish discriminant validity, the diagonal elements must be greater than the off-diagonal elements below in the corresponding rows and columns.

The latent variable scores of the first-order constructs were used to develop the second-order constructs (independent and dependent variables) of the study. Same as the first-order analysis indicator reliability using order loadings, t-statistics, and internal consistency reliability using composite reliability and Cronbach's alpha was tested, and the validity of constructs was tested using Convergent validity (AVE) and Discriminant validity in between indicators and the variables. Table 3 shows that all the constructs obtained the values above the mentioned thresholds.

**Table 3. Validity and Reliability of Second-Order Constructs**

	<b>Internal Reliability</b>		<b>Internal Consistency Reliability</b>		<b>Convergent Validity</b>
	<b>Loading</b>	<b>T Statistics ( O/STDEV )</b>	<b>Composite Reliability</b>	<b>Cronbach's Alpha</b>	<b>Average Variance Extracted (AVE)</b>
ICT Usage			0.895	0.826	0.739
ICT Applications	0.884	30.669			
ICT Human Resources	0.814	21.428			
ICT Infrastructure	0.880	39.150			
Business Resilience			0.884	0.738	0.793
Situation awareness	0.888	45.850			
Keystone Vulnerabilities	0.893	37.437			
Dynamic Capabilities			0.844	0.648	0.731
Sensing Capabilities	0.784	10.313			
Reconfiguring Capabilities	0.921	38.503			

Source: Survey Data, 2021

According to Table 3, the AVE value results above 0.5 by proving the convergent validity in the final model. Therefore, the second-order analysis indicates both the reliability and the validity of the constructs in between indicators with the variables. Considering the Discriminant validity test, the second test for testing the validity, according to Fornell & Larcker (1981) square root of the AVE value of the variable can be considered the discriminant validity value. The bolded values in table 04 show the calculated square roots of AVE.

**Table 4. Discriminant Validity of Second-Order Constructs**

	<b>Business Resilience</b>	<b>Dynamic Capabilities</b>	<b>Ictus age</b>
Business Resilience	<b>0.890</b>		
Dynamic Capabilities	0.469	<b>0.855</b>	
ICT Usage	0.453	0.292	<b>0.860</b>

Note: Diagonal values in bold are the square roots of the AVE values. The diagonal elements must be greater than the off-diagonal elements below in the corresponding rows and columns to establish discriminant validity.

**Table 5. Assessment of Structural Model for Collinearity Issues**

<b>Variable</b>	<b>Collinearity Statistics</b>	
	<b>Tolerance</b>	<b>VIF</b>
<b>ICT Usage</b>		
ICT Applications	0.474	2.109
ICT Human Resources	0.495	2.022
ICT Infrastructure	0.485	2.061
ICT Mobile Technology	0.631	1.586
<b>Dynamic Capabilities</b>		
Reconfiguring Capabilities	0.575	1.740
Sensing Capabilities	0.599	1.671
<b>Business Resilience</b>		
Adaptive Capacity	0.670	1.492
Keystone Vulnerabilities	0.525	1.905
Situation Awareness	0.580	1.725

Source: Survey Data, 2021

The structural model has been assessed following the guidelines of Hair et al. (2014) to estimate the hypothesised causal relationship among the latent variables constructed using the measurement model. There are five steps to examine the inner model; Assessment of collinearity issues, significance and relevance of structural relationships,  $R^2$ , effect size  $f^2$ , and predictive relevance  $Q^2$ .

The initial step is assessing the collinearity issues. To identify the multicollinearity between independent and dependent variables, use the Tolerance value and the VIF (Variance Inflation Factor). It is essential to test the multicollinearity since it reduces the statistical significance of the independent variable. The acceptable level of collinearity is VIF values lower than 5 and values higher than 0.2 Tolerance values. Table 5 indicates that the obtained values are established at acceptable levels, and the outer model has no collinearity problem.

The next step is evaluating the path coefficients of the hypothetical relationship constructed based on the conceptual model. Table 06 presents the path coefficients and t-statistics of the latent variables of the structural model. According to the model results, there are significant relationships between ICT usage and Business Resilience, ICT usage and Dynamic Capabilities, and Dynamic Capabilities and Business resilience.

**Table 6. Path Coefficient and Significance**

Hypothesis	Relationship	T-statistics	Coefficient	Decision
H <sub>1</sub>	ICT -> BR	4.716	0.345	Accepted
H <sub>2</sub>	ICT -> DC	4.032	0.292	Accepted
H <sub>3</sub>	DC -> BR	5.573	0.368	Accepted

Source: Survey Data, 2021

The next step is to examine the correlation between independent and dependent variables. According to Hair et al. (2014), the model having  $R^2$  of 0.67, 0.33, and 0.19 are considered substantial, moderate, and weak, respectively. According to this model, Business resilience,  $R^2$  contains 0.329, which shows a moderate effect of the model. That means the independent variables of the model explain a 32.9% variation in business resilience.  $f^2$  effect size measures the contribution of any exogenous variable in a model if there is more than one exogenous variable for an endogenous variable. According to (Cohen, 1988), if  $f^2$  values 0.02, 0.15, and 0.35, respectively, it represents small, medium, and large effects.

Table 7 presents the effect size result obtained from the SmartPLS software. According to the result, ICT usage has 0.162, and Dynamic Capabilities contains 0.185, which indicates a medium effect on business resilience. According to the calculation of cross-validation redundancy, ICT usage and Dynamic Capabilities obtained  $Q^2$  values of 0.246 and 0.051, respectively. Since these values are greater than 0, both business resilience and dynamic capabilities have predictive capability. While business resilience has a medium capability, dynamic capabilities have a small predictive capability.

Table 7 represents the evaluation of the mediating effect of dynamic capabilities between ICT usage and business resilience. Since the indirect

effect is significant at a 0.05 significance level by scoring t-statistics higher than 1.96, there is a complementary mediating effect of dynamic capabilities in the current study.

**Table 7. Mediator effect of dynamic capabilities**

Path	Direct Effect		Indirect Effect	SD	T-Stat	Total Effect		Type of Mediation
	Beta	T-statistics	A*B	SE	(A*B)/SE	(A*B)+C	VAF	
C	0.345	4.576	0.107	0.039	2.744	3.089	0.035	Complementary
A	0.292	3.850						
B	0.368	5.178						

Source: Survey Data, 2021

## 6. Discussion

The main objective of this study was to examine whether the ICT usage of SMEs can impact and increase the dynamic capabilities and business resilience during the COVID-19 pandemic. Since the spread of the pandemic has taken place, most businesses have adopted technology for survival. Most businesses lend themselves to digital readiness and technological change, resulting in them surviving the slowdown (Ahamad, 2020; Millan et al., 2019). Establishing and enhancing the digital capabilities of SMEs in crises increase their business resilience which has been empirically examined by proving the positive relationship (Bertschek et al., 2019; Nation, 2021; Syed et al., 2020). According to this study, the adoption of ICT for SMEs during COVID-19 has helped to enhance the resilience of the SMEs and maintain continuity. The result indicates that an increase of 1 unit in ICT usage will increase business resilience by 0.345 ( $\beta = 0.345$  and  $t\text{-value} = 4.716$ ) during a pandemic.

Considering the relationship between dynamic capabilities and business resilience, this study identified that dynamic capabilities considerably amplify the resilience of SMEs during the pandemic situation. The results show that an increase of 1 unit in dynamic capabilities will increase business resilience by 0.368 ( $\beta = 0.368$  and  $t\text{-value} = 5.573$ ) during a pandemic. This growth has been achieved through the development of dynamic capabilities through ICT, which includes proper communication, immediate response to customers and easy identification of their needs and feedback, as well as the

ability to implement innovative approaches to improve their satisfaction. This finding is similar to findings by Aldianto et al. (2021) and Prida et al. (2016), who mentioned dynamic capabilities of a firm are critical to organisational resilience under environmental disaster situations and contain a significant positive relationship between them. It has been proved that the dynamic capabilities of Sri Lankan SMEs can modify and rearrange their internal resources to meet the uncertainties of their business environment generated by the COVID-19 pandemic. Researchers who examined the business resilience of this pandemic, like Akpan et al. (2021) and Ali (2021), have obtained similar results, and they explained that dynamic capabilities contain a significant positive relationship with business resilience and take various advantages to overcome uncertain environment, and this study proved their findings.

ICT plays a critical role in the business capability of a dynamic competitive environment (Jameel et al., 2017; Owoseni & Twinomurinzi, 2018). Prior studies have identified adopting or enhancing a firm's ICT-related competencies to develop and increase its dynamic capabilities (Owoseni & Twinomurinzi, 2018; Prida et al., 2016;). The current study results are in line with the previous studies like Adeniran and Johnston (2016) by proving the positive relationship between ICT usage and dynamic capabilities in this crisis and depicting an increase of 1 unit in ICT usage will increase the dynamic capabilities of SMEs by 0.292 ( $\beta = 0.292$  and  $t\text{-value} = 4.032$ ) during a COVID-19 pandemic situation.

The next specific objective was the study to examine whether dynamic capabilities impact as a mediating factor between ICT usage and business resilience of SMEs in such a disaster situation. Dynamic capabilities can be considered the central engine of business resilience under any dynamic, turbulent condition (Ali, 2021; Akpan et al., 2021; Rusell, 2016). Conversely, ICT usage enhances the firm dynamic capabilities (Owoseni & Twinomurinzi, 2018). According to the current study results, the dynamic capability effect is a complementary mediating effect on the relationship between ICT use and the business resilience of SMEs. This new finding implies that accelerating the improvement of business resilience through the

use of ICT can be further significantly accelerated by exploiting the dynamic capabilities that SMEs gain through the use of ICT.

## **7. Conclusions**

This study revealed a new approach that has not been noticed in Sri Lanka either empirically or in the literature that can save SMEs in a developing country when the world economy suffers a severe recession due to the COVID-19 pandemic. It conceptually combined three theoretical aspects to achieve the objective and established four hypothetical relationships which assumed positive relations among ICT usage, dynamic capabilities, and business resilience. According to the result, all these established hypotheses were accepted. It examined and provided a better understanding of how the usage of ICT and the dynamic capabilities of SMEs enable the firms in Sri Lanka to be resilient during a disaster. A pandemic such as COVID-19 can disrupt businesses, and generally, ICT can be used as an enabler in a business disruption to make it resilient. It was pointed out that computer applications, infrastructure, internet services, social media, as well as mobile technology tools are also essential to get rid of this instability. Furthermore, the study revealed that the dynamic capabilities of the business could be used as a great stimulus that can be utilized to enhance its performance with this pair. To overcome the problems of running a business in such a business environment, the sensing capabilities, the seizing capabilities, and the reconfiguration capabilities contained in the dynamic capabilities are critical, and information technology makes a significant contribution to their development. According to the study's findings, the increased resilience of businesses through information technology is further intensified by the dynamic capabilities that information technology develops.

According to this study, entrepreneurs require to innovate their business strategies and adapt to digital or enhanced business information systems with new technology. SMEs must identify and use the right information technology tools that are appropriate for them to reduce the risk of collapse. They should not blindly adopt technology tools that large businesses use in their business models. Policymakers should ease the heavy taxation imposed



on technological tools and provide space for SMEs to acquire them at a minimal cost. The government should do the necessary work to create good coordination between other institutions that need to advance SMEs technically. Examples include communication service providers, computer and mobile software manufacturers, freight service providers, banking service providers, etc.

This study has examined the 129 SMEs to understand how they have built up resilience through ICT usage and the dynamic capabilities of the enterprises. The study findings have addressed the gaps in previous literature and still have offered several limitations, which provide opportunities to continue future studies. Firstly, this research was conducted using SMEs in one Divisional Secretariat in the Galle district, which is not a broader representation of the whole district or the country. Therefore, a considerable amount of the population of SMEs should be involved in future research for highly generalisable results. Furthermore, this study only considered two factors affecting resilience during a disruption. Future researchers can consider more areas and factors and contribute to filling the gap in the literature. This research was conducted in the Asian region, and researchers are encouraged to conduct similar studies in different regions with different educational, social, and cultural environments since ICT usage and dynamic capabilities can vary widely due to such contextual differences.

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