Cloud Computing and Organizational Resilience: An Empirical Investigation in the Context of Saudi Enterprises

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ABSTRACT
Whereas cloud computing has become a popular approach to implementing and managing information systems, little remains known about its potential impact on organizational resilience. Using a capability perspective, this study investigated the relationship between cloud computing capabilities and organizational resilience conceptualized as anticipation of crisis, coping with crisis, and adaptation to post-crisis environments. The relationship was tested based on survey data of 396 companies in Saudi Arabia. The results of the study showed that flexibility, integration, and service capabilities of cloud computing are positively related to crisis coping and adaptation, but not to crisis anticipation. Where the relationships were confirmed, a positive moderating role of cloud computing spending was also established. The results were controlled for company size and industry. Theoretical and practical implications of the findings are presented and research directions are outlined.

Keywords
Cloud computing, organizational resilience, IT spending; capability

1. INTRODUCTION
Cloud computing (CC) can be considered as one of the major drivers of technological business innovations in the past decade. By enabling on-demand computing services and resources through remote access, it has offered a paradigmatic shift in the ways that organizations' information systems are implemented and managed. The size of the cloud market has nearly tripled since 2016 to reach a global value of over $371 billion in 2020 ("Cloud Computing Market," 2021). Many researchers and information technology experts agree that CC represents a general-purpose technology which has the potential to exert an aggregate economy growth effect through technological complementarities [1-3]. Therefore, wide CC adoption by organizations can be beneficial at the level of national economies.

From the organizational perspective, CC has been extensively investigated as a business development technology. Researchers explored the benefits of CC adoption through enhanced organizational agility [5,6], performance [7,8], and competitive advantage [9,10]. As a result, CC has received an increasing amount of interest among Saudi scholars and practitioners. Studies of CC with an organizational lens have covered such topics as CC adoption factors [11-13] and adoption outcomes [14,15]. A less explored area, however, is the link between cloud computing and organizational resilience. Whereas organizational resilience have become an important aspect of performance in view of the recent disruptions caused by the COVID-19 epidemic, studies of technology impact on resilience of Saudi businesses are virtually absent.

This study aims to fill an apparent gap in knowledge regarding CC impact on organizational resilience in Saudi Arabia. The author believes that the current pandemic is just one example, albeit a strong one, of the negative impacts that crises at different levels may have on organizations. Unless prepared well, business risk to become unable to survive in such rapidly changing environments [16]. This research takes a comprehensive view on organizational resilience as a combination of several factors. Further, the role of CC is considered through an IT capability lens to determine the specific ways in which resilience can be enhanced [17,18]. As such, the study's contribution is in proposing and empirically testing a framework for technology impact on organizational resilience in Saudi Arabia. CC is taken as a testable technology because it has been increasingly adopted by Saudi businesses.

2. LITERATURE REVIEW

2.1. Organizational Resilience
Organizational resilience is a concept that has many definitions, although most of the have a common core. The majority of scholars agree that in a business context, resilience directly or indirectly relates to unprecedented, unexpected challenges that organizations may become exposed to [19-21]. This feature distinguishes resilience from related organizational concepts such as flexibility and agility. Whereas the former defines organizational capacity to adjust and the latter relates to ability of finding opportunities in the environment [22,23], their foci are on everyday business operations. Resilience, on the other hand, focuses on unexpected events and the ability of an organization to withstand their negative effects on business [24,25].

Ruiz-Martin et al. (2018) identified more than 50 conceptualizations of organizational resilience and found that the majority of them define resilience as an organizational feature allowing it to deal successfully with destructive events [26,27], disruptive events [28,29], or sudden disturbances [30] and threats [31]. For the purpose of this study,

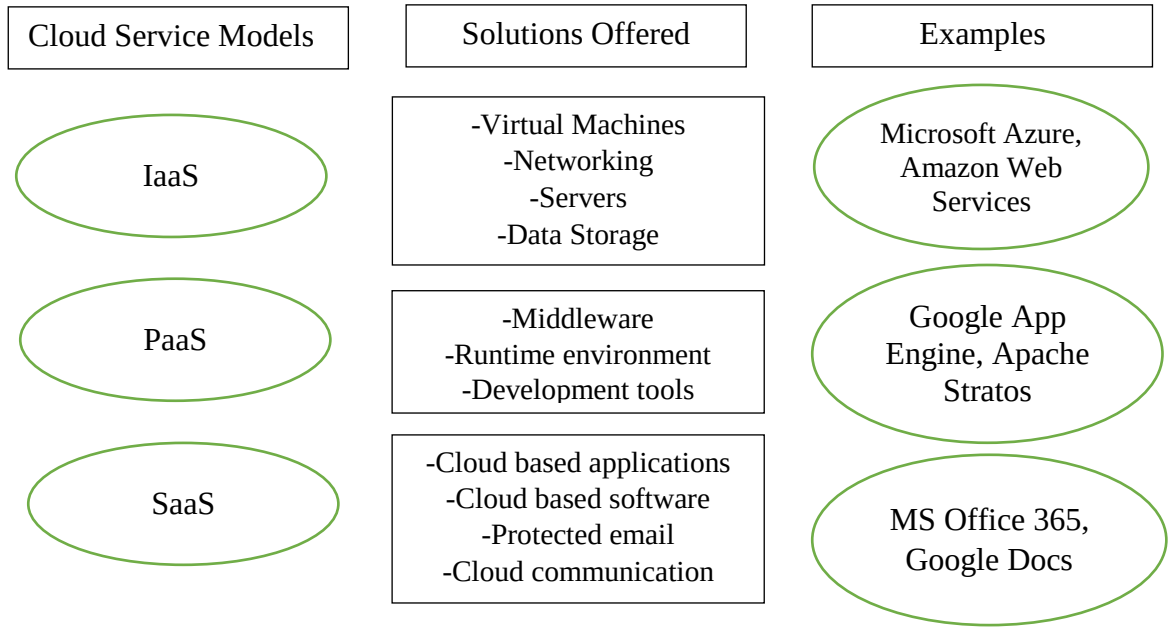


Fig1:CloudComputing Paradigm [37]

organizational resilience is defined as an organizational capacity to withstand the negative effect on business by sudden, adverse disruptions in their business environments. A definitive example of such event is the COVID-19 epidemic which has affected business both globally and locally through the severed business links, establishment of lockdowns, and increased levels of uncertainty regarding the economy. Despite all the negative consequences that the epidemic brought, it nevertheless offers a good opportunity to assess organizational resilience in the real world context.

Researchers of organizational resilience usually see it as a dynamic capability. Specifically, the capacity to withstand the negative effect from unexpected events is considered not only during such events, but also before and after them [32]. This is also in line with the crisis management literature that describes the process as a combination of anticipatory, immediate, and reactive actions [33]. As such, organizational resilience is considered in this study as a combination of anticipatory, coping, and adaptation capabilities which correspond, respectively, to pre-crisis, during-crisis, and post-crisis periods.

Cloud Computing

Cloud computing (CC) is generally defined as a "model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources […] that can be rapidly provisioned and released with minimal management effort or service provider interaction" [34]. The CC paradigm contains a number of service models and corresponding solutions which can fit the demands of various organizations (Figure 1). The most popular service models include [4]:

Infrastructure-as-a-service (IaaS): which offers virtual machines, networks, operating systems and cloud storage;

Platform-as-a-service (PaaS): which offers space for deployment and testing of software and applications;

Software-as-a-Service (SaaS): which offers access to cloud-based applications andsoftwares.

Further, additional service models have been introduced, such as big-data-as-a-service and analytics-as-a-service, which cater to particular servicing needs as their names suggest [35]. As such, with CC, organizations have a choice which type of service to use based on their specific information technology and business needs and purposes. Likewise, deployment models offer flexibility in terms of cloud management, security, and access. Private clouds, for example, are created for specific organizations only whereas community clouds serve the needs of several organizations, and public clouds offer services for multiple users [36].

Adoption of CC has been associated with a number of benefits for business organizations. Researchers usually link the main benefits of the technology to greater operational efficiencies and flexibility [38]. These arise from the ability of CC to move organizational information systems, partially or fully, outside of firm's resource bases while maintaining the ability to use them on demand. Such new level of organizational flexibility was found to positively influence organizational agility thereby allowing firms adopting CC to become more responsive to environment change and seize business opportunities fast [39].

Whether the same positive impact applies to resilience and reducing the sudden, unexpected adverse effects is less understood. On the one hand, adoption of various novel technologies in general was found to strengthen organizational resilience [40]. Further, some recent studies explored the overall effect of Industry 4.0, a definitive part of which CC is, on organizational resilience [41]. On the other hand, the specific impact of CC on resilience remains scantly investigated. This is especially true in the context of Saudi enterprises. The existing research CC adoption outcomes focuses almost exclusively on organizational performance in terms of efficiencies, quality of services, or financial performance [14]. At the same time, studies of organizational resilience factors fail to consider the role of technology in

Saudi enterprises [42]. Therefore, there is a major gap in knowledge related to CC role in enhancing organizational resistance. Closing this gap in knowledge may not only improve general understanding of CC role for crisis management but also prompt the technology's faster adoption rate.

2.2. Cloud Computing: A Capability Perspective

CC has long been considered a breakthrough approach to managing IT resources and extracting value through them [43]. Extracting value from IT resources, on the other hand, is linked to the resource-based view (RBV) of the firm which sees all types of assets, processes, and capabilities as types of resources utilized by organizations to achieve higher levels of effectiveness and efficiency as well as meet their strategic goals [44]. Capability, on the other hand, is a special resource type which is deployed to enhance other resources in achieving the desired goals [45]. Accordingly, IT capability in general is viewed as an ability to identify technologies that meet business needs, deploy them effectively to enhance business processes [46]. Empirical research supports this perspective as IT capabilities have been often linked to better performance and competitive advantage [47].

As a specific type of information technology, CC can be viewed from a capability perspective of an organization. This paper defines CC capability as an ability to effectively incorporate CC into organizational processes for more effective and efficient resource allocations, streamlining operations, achieving efficiencies, and cultivating business relationships. This definition integrates the previously identified benefits of CC. For example, CC was found to enable fast adjustment and reconfiguring of organizational processes for new business requirements, enhance market information acquisition and sharing, improve partner collaboration, and improve process efficiencies [48].

Overall, the value of CC capability is seen in integrating with business processes to enable stronger fit and flexibility necessary in the constantly changing business environments [49].

Researchers distinguished a number of characteristics of CC as an IT capability. Most of the studies associate it with the infrastructure flexibility. It was argued that such CC characteristics as modularity, scalability, and compatibility allow for greater levels of flexibility and speed in delivering the required IT solutions [50]. Flexibility offered by CC allow to react fast by seizing emerging opportunities and addressing arising threats. Second, researchers noted the integration aspect of CC capability. Integration comes in form of shared connectivity, data consistency, and cross-functional applications enabled by CC [51].

Finally, the service component of CC capability allows an organization to expand or reduce the required IT capacity depending on business needs at a given period of time (Luo et al., 2018). It also creates what Marston et al. (2011) called an adaptive infrastructure where IT services are acquired and used according to organizational needs at particular points of time.

3. CONCEPTUAL FRAMEWORK AND HYPOTHESES

Based on the literature review, this study proposes a conceptual framework exploring the relationship between CC capability and organizational resilience. CC is represented through flexibility, integration, and service capabilities whereas organizational resilience is considered at anticipatory, coping, and adaptation levels (Figure 2). Additionally, the study recognizes the possible confounding effect of company size and industry type both of which have been found as influential elsewhere [52]. These factors are considered as control variables in the framework. Finally, a moderator variable of IT spending is introduced as discussed below.

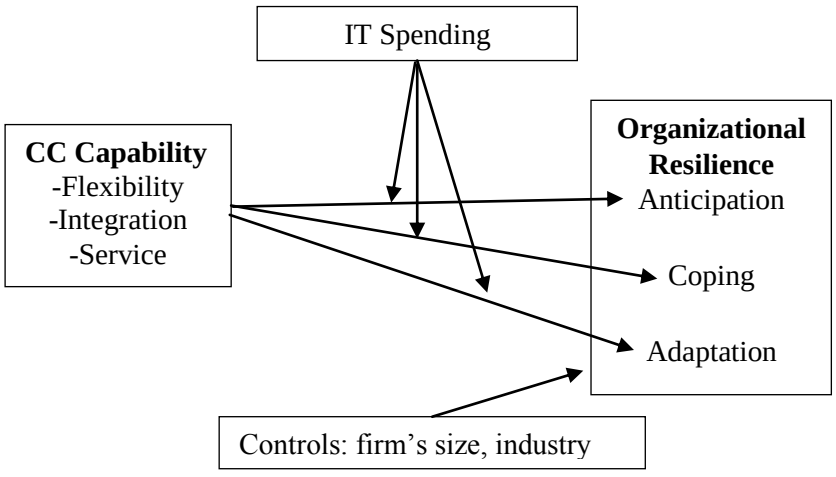


Fig 2: Conceptual Framework

3.1. CC Capability and Anticipation of Crisis

Crisis anticipation is related to preventive dimension of organizational resilience. It can be operationalized as the ability to identify the critical changes inside and outside the organization and act proactively to address them [53]. Observation, identification, and preparation are essential organizational qualities in this regard [54]. They exemplify organizational ability to scan the existing environment, detect the negative developments earlier, and remain prepared in order to react fast to diminish the negative consequences. Even if there is no complete safeguard from all potential crises, the anticipation capability provides organizations the necessary resources and tools to address [55]. CC technology can be considered one such resource. Marcucci et al. (2021) argued that CC tools provide organizational leaders with the tools allowing to predict disruptions and foresee circumstances that can harm their business. Similarly, Ralston and Blackhurst (2020) also pointed to CC's proactive role in addressing unanticipated adverse events, especially in the context of organization's supply chains. Taking the current COVID-19 crisis as a basis, the emerging literature suggests that organizations that deployed CC systems beforehand had easier times in addressing the associated operational issues such as transfer of workforce to work-from-home [56]. Therefore, the following hypothesis is proposed:

H1: CC capability is positively related to anticipatory dimension of organizational resilience.

3.2. CC Capability and Coping with Crisis

The coping aspect of organizational resilience refers to effectively dealing with the crisis as it [57]. This implies an organization-wide, coordinated response to mitigate the immediate the negative consequences to business and set up the path for sustainable operations afterwards. According to Duchek (2020), effective coping with crisis requires that an organization not only develops crisis-addressing solutions but actually implements them. CC capabilities, at least in theory, should prompt effective coping with crises. The on-demand nature of CC allows organizations to quickly configure their information systems resources based on the existing market demand [54]. In times of unexpected crises, sharp declines in demand are likely, and it may not be possible to reduce the scale of expenses with the traditional in-house information systems. CC, on the other hand, offers an important capacity to scale down IT resources and reduce costs fast [58]. Likewise, CC offers an opportunity to eliminate certain unneeded services and add new ones in order to counter a crisis' consequences [59]. Further, CC infrastructure allows for fast, simultaneous system change across all business units [60], which also allows to reduce associated expenses. Therefore, the following hypothesis is formulated:

H2: CC capability is positively related to coping dimension of organizational resilience.

3.3. CC Capability and Post-Crisis Adaptation

The adaptation aspect of organizational resilience encompasses organizational adjustment following a crisis and setting up for work in new realities [61]. Two important features in the process are organizational learning and organizational capacity to change [62]. As unexpected changes take place, resilient organizations are better equipped to generate actionable knowledge about the crisis and apply the existing resources to successfully adapt to the new conditions of doing business. Arguably, the on-demand nature of CC allows an organization to adapt its IT needs to such conditions easier than in case of pertinent, inflexible IT infrastructures [59]. Adaptation can also be stimulated by CC's ability to facilitate immediate linkages with business partners, redesign operation processes, and create new business relationships as needed [63]. Finally, in relation to customers, CC can modify the existing services and products to accommodate the changed demand patterns and consumer preferences through better coordination and communication [6]. Overall, flexibility, integration, and service aspects make CC an important element in restructuring IT and business operations to fit with the new post-crisis environments. Therefore, the following hypothesis is formulated:

H3: *CC capability is positively related to adaptation dimension of organizational resilience.*

3.4. The Moderating Role of IT Spending

The positive effects of CC on resilience may be moderated by IT spending. Investments in technology capabilities have been long considered a double edge sword for organizations, as both positive and negative impacts on firm's operations and business outcomes have been discussed in literature [64]. Whereas traditional approach to IT investment involved channeling financing into software and hardware products and their maintenance, the modern view is that IT spending must be coordinated with the overall business strategy and functional departments. This is also proposed by the Business-IT Alignment perspective [65]. As a type of information technology, CC and its effect are considered as susceptible to approaches in IT spending. In general, the inherent characteristics of CC – flexibility, integration, and service – should offer a more efficient approach to IT management regardless whether in time of crises or not. Whereas to the knowledge of the author there are no studies exploring the effect of CC spending on resilience, literature suggests that it has a positive effect on agility and performance [6]. It can be argued that agility and resilience require the same kind of flexibility and integration that CC provides because both deal with organizational change. Further, since CC spending positively influences organizational performance, it may be an additional indication that it could enhance organizational resilience. Therefore, the following hypothesis is formulated:

H4: CC spending has a positive moderating effect on the relationships between CC capability and organizational resilience.

4. METHODOLOGY

4.1. Instrument Development

The original questionnaire consisted of 39 items that corresponded to 9 variables from the conceptual framework and two additional items for the descriptive statistics (Appendix A). Each of the control variables (size, industry) was represented by one item. Size was determined based on the number of employees and industry classification was based on an open ended question. The IT spending measure was represented by one item based on the proportion of CC spending to firm revenues.

The independent variables' CC capability measures were based on the previously validated questionnaires. Flexibility was measured by 6 items from Bhatt et al. (2010), Liu et al.

(2018), and Saraf et al. (2007). Integration was measured by 6 items from Bhardwaj et al. (2007), Roberts and Grover (2012), and Liu et al. (2018). Service was measured by 6 items from Zhu and Kraemer (2005) and Luo et al. (2018). All items were measured on a 7-point Likert scale ranging from 1 for "strongly disagree" to 7 for "strongly agree."

The dependent variables representing organizational resilience dimensions were operationalized based on conceptual research by Duchek (2020). Anticipation was measured based on observation, identification, and preparation items (6 in total). Coping was measured based on acceptance and developing solutions items (5 in total). Adaptation was measured based on organizational learning and organizational change items (6 in total). All items were measured on a 7-point Likert scale ranging from 1 for "strongly disagree" to 7 for "strongly agree."

The original questionnaire was translated to Arabic using the back-translation technique [66]. The translated version was pilot tested on a small sample of 10 representatives of CC user organizations. The results of the pilot test suggested that in order to improve the instrument reliability, several items had to be discarded. The final questionnaire consisted of 30 items as is indicated in Appendix A.

4.2. Data Collection Procedures

An online survey study design was implemented. Saudi Arabia Business Directory was used as a starting place to draw a sample of organizations for the study. A random number generator software was used to select companies from the database. Emails with invitations to the study and an online link were provided in each email. Two batches containing 1,000 emails were generated and sent out during the month of July 2021. The data received through online questionnaires were coded and analyzed with SPSS Amos software. The study aimed to reach at least 384 respondents in order to achieve a 5% margin of error for the sample size [67].

5. RESULTS

5.1. Descriptive Statistics

In total, 415 questionnaires were completed online which represented a 20.75% response rate. After invalid responses (incomplete data) were discarded, the total number of valid questionnaires for the analysis was 396, which satisfied the minimum requirement for the study. Table 1 presents a summary of the sample characteristics based on industry, company size, respondent's position, and type of CC used. As it is seen, in terms of industry, the sample was dominated by information technology firms, followed by sales companies, telecom, and industrial. Smaller number of firms represented healthcare and financial industries while about 10.9% represented other industries or not indicated industry type. In terms of company size, small and medium enterprises represented the dominating majority of the sample, with fewer firms being of micro or large size. A small percent of respondents (1.3%) did not indicate the company size. The respondents represented a proportional mix of business and IT related positions. IT managers and business managers represented the largest part of the respondents (45.7% and 41.7% respectively). A smaller percentage was represented by C-level executives and business owners. About 4% of the respondents did not indicate their position. Finally, SaaS was the most popular mode of CC use, followed by PaaS and Iaas. Note that for CC use, the sum of responses is above 396 because some companies reported using more than one CC mode.

Table 1. Sample Characteristics

Industry	**Frequency**	**Percentage**
IT	112	28.3%
Sales	88	22.2%
Telecom	65	16.4%
Industrial	59	14.9%
Healthcare	15	3.8%
Financial	14	3.5%
Other	43	10.9%
	396	
Company Size		
Micro (< 10 employees)	23	5.8%
Small (10-50 employees)	155	39.1%
Medium (51-250 employees)	164	41.4%
Large (250+ employees)	49	12.4%
No Response	5	1.3%
	396	
Respondent's Position		
IT department manager	181	45.7%
Business manager	165	41.7%
CEO	14	3.5%
CIO	10	2.5%
Business owner	10	2.5%
No Response	16	4.0%
	396	
CC Platform		
SaaS	197	45.0%
PaaS	165	37.7%
Iaas	76	17.4%
	438	

5.2. Preliminary Analysis

The data were checked for normality using a Shapiro-Wilk test for all continuous variables [68]. In each case, the resulting p-value was non-significant ($p > 0.05$); therefore, the hypothesis of data normality could not be rejected. Therefore, the data were deemed suitable for covariance-based structural equation modeling (SEM) analysis.

A series of tests were performed to examine the data for reliability and convergent and discriminant types of validity. Reliability of the constructs was measured by Cronbach's alpha with the target values of 0.7 and above [69]. The convergent validity of data was measured with the Average Variance Extracted (AVE) method with the target values of 0.5 and above [70]. Table 2 demonstrates that the study variables met both requirements thereby indicating good data reliability and convergent validity.

Table 2. Reliability and Convergent Validity Scores

Construct	**AVE**	**Cronbach's α**
Flexibility	0.541	0.798
Integration	0.532	0.806
Service	0.615	0.785
Anticipation	0.592	0.813
Coping	0.601	0.809
Adaptation	0.542	0.818

Discriminant validity of the data was measured by checking square root AVE scores against constructs' correlations (Table 3). Following Hair et al. (2010), the requirement is that the scores are higher than the correlations. Table 3 presents a correlation table which indicates that discriminant validity was not an issue with the collected data.

Table 3. Discriminant Validity Check

	Flexibility	Integration	Service	Anticipation	Coping	Adaptation
Flexibility	**0.736**					
Integration	0.586	**0.729**				
Service	0.574	0.561	**0.784**			
Anticipation	0.432	0.487	0.461	**0.769**		
Coping	0.465	0.417	0.435	0.599	**0.775**	
Adaptation	0.501	0.469	0.512	0.593	0.577	**0.736**

An exploratory factor analysis (EFA) further demonstrated that the items had strong factor loadings on their corresponding constructs with all values exceeding 0.7 (Table 4). A unidimensionality check test showed that the R-matrix determinant was at 0.0000212, above the recommended 0.00001 level [71]. The data fit was confirmed by the Bartlett sphericity test ($p<0.01$) and the KMO value test (0.807).

Table 4. EFA Analysis for the Data

Coding	CCF	CCI	CCS	CA	CC	ACA
CCF1	0.768					
CCF3	0.797					
CCF5	0.802					
CCF6	0.751					
CCI1		0.825				
CCI2		0.814				
CCI3		0.779				
CCI4		0.747				
CCS1			0.801			
CCS2			0.832			
CCS3			0.780			
CCS6			0.755			
CA1				0.756		
CA3				0.777		
CA4				0.791		
CA6				0.817		
CC1					0.788	
CC3					0.786	
CC4					0.805	
CC5					0.769	
ACA1						0.842
ACA3						0.812
ACA5						0.761
ACA6						0.749

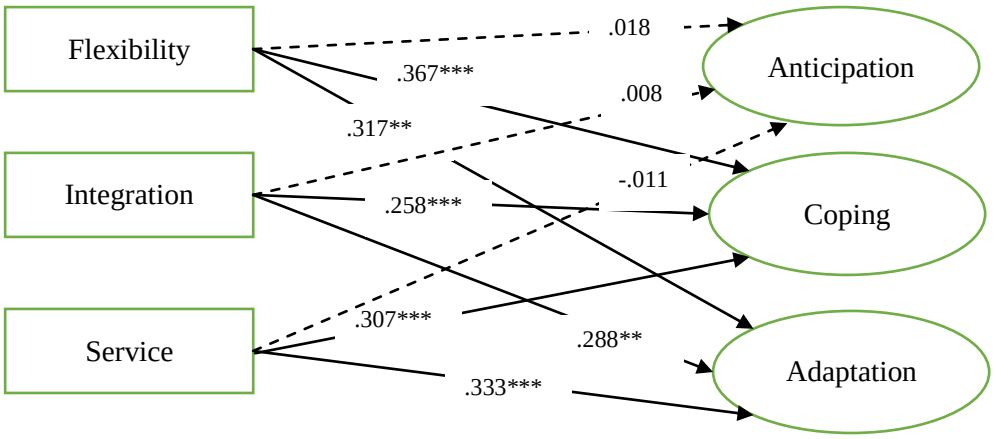
The data were also checked for possible multicollinearity issues by examining the squared correlations of the main constructs and measuring variance inflation factor (VIF). The squared correlations were below the recommended 0.8 value and the VIF scores were below the recommended 5.0 value. Therefore, multicollinearity was not an issue with the data. Finally, tests were performed to check for common method bias and non-response bias. The common method bias test was performed by the Harman's single factor analysis that demonstrated a value of 35.67%, below the recommended 50% cutoff rate [72]. The non-response bias test was conducted by comparing the answers of the early (completed questionnaires within the first three days after an email) and late respondents (completed questionnaires after a two-week reminder email). The t-tests did not demonstrate statistically significant responses thereby suggesting that non-response was not an issue with the data.

6. STUDY RESULTS

6.1. Testing Direct Relationships

Two SEM models were run to test the study hypotheses. Three indices were used to test for the model fit in each case: the root mean square error of approximation (RMSEA) with a cutoff rate of 0.1 and lower, the Tucker–Lewis Index (TLI) and the comparative fit index (CFI) both with a cutoff rate of 0.9 and higher [73]. The first model, without control variables, showed good fit (RMSEA = 0.067; TLI = 0.978; CFI = 0.954). The second model, with control variables of firm size and industry showed a poorer fit (RMSEA = 0.105; TLI = 0.867; CFI = 0.914). Further, the relationships for the control variables did not show statistically significant effects. Therefore, only the results of the model without control variables are reported since the effect of controls was negligible.

The direct path analyses for the independent and dependent variables. Are presented in Figure 1.



Note: *** p < .001; **p<.01

Fig 3: Direct Effects of CC Capabilities

The first hypothesis stated that CC capabilities would be related to organizational crisis resilience. The results of the analyses demonstrated that flexibility was not significantly related to crisis anticipation (β=0.018, p > 0.05). Likewise, no relationship with crisis anticipation was observed for CC integration (β=0.008, p > 0.05) and CC service (β=-0.011, p > 0.05). As such, hypothesis 1 was not supported by the study results: there was no relationship between CC capabilities and crisis anticipation.

The second hypothesis stated that CC capabilities would be related to organizational crisis coping. All three CC capability factors demonstrated statistically significant relationships with the Coping dimension of organizational resilience. The relationships were positive and moderate in strength for CC flexibility (β=0.367, p < .001), CC integration (β=0.258, p < .001), and SS service (β=0.307, p < .001). Therefore, hypothesis 2 was supported by the study results. Further, the total effect based on R2 value was 0.637, which means that the considered CC capability factors accounted for about 63.7% variability in the Coping variable.

The third hypothesis stated that CC capabilities would be related to organizational crisis adaptation. All three CC capability factors demonstrated statistically significant relationships with the Coping dimension of organizational adaptation. The relationships were positive and moderate in strength for CC flexibility (β=0.317, p=.008), CC integration (β=0.288, p =.004), and SS service (β=0.333, p < .001). Therefore, hypothesis 3 was supported by the study results. Further, the total effect based on R2 value was 0.489, which means that the considered CC capability factors accounted for about 48.9% variability in the Adaptation variable. Table 5 provides a summary of the direct relationships tests.

Table 5. Summary of Direct Relationship Results

Hypothesis	Relationship	β	Sig.	Hypothesis Supported?
H1a	CC Flexibility -> Anticipation	0.018	0.156	No
H1b	CC Integration -> Anticipation	0.008	0.216	No
H1c	CC Service -> Anticipation	-0.011	0.178	No
H2a	CC Flexibility -> Coping	0.367	<.001	Yes
H2b	CC Integration -> Coping	0.258	<.001	Yes
H2c	CC Service -> Coping	0.307	<.001	Yes
H3a	CC Flexibility -> Adaptation	0.317	0.008	Yes
H3b	CC Integration -> Adaptation	0.288	0.004	Yes
H3c	CC Service -> Adaptation	0.333	<.001	Yes

6.2. Moderating Effects of CC Spending

The second step in the analysis was to study the possible moderating effect of the CC spending variable. The independent and dependent variables were centered, and an interaction item between each independent variable and CC spending was introduced. The effects were tested with a hierarchical regression analysis performed for each independent variable on each dependent separately. Therefore, in total, nine models were tested. There was no effect of either CC spending or the interaction variable on the dependent variable anticipation for flexibility (β=.032; p > .05), integration (β=.107; p > .05), and service (β=-.054; p > .05). Therefore, no moderating effect was observed for the relationships between CC capability factors and crisis anticipation.

At the same time, moderating effects of CC spending were observed for the relationships between CC capabilities and the coping variable. Both flexibility and CC spending had a significant relationship to coping (R2=.458, p < .001). After introduction of the interaction variable, a statistically significant positive change to the coping variable was observed: ΔR2=.058, β=.215, p<.001. Likewise, both integration and CC spending had a significant relationship to coping (R2=.553, p < .001). After introduction of the interaction variable, a statistically significant positive change

to the coping variable was observed: ΔR2=.069, β=.305, p<.001. Finally, both service and CC spending had a significant relationship to coping (R2=.471, p < .001). After introduction of the interaction variable, a statistically significant positive change to the coping variable was observed: ΔR2=.029, β=.229, p<.001). Therefore, an enhancing effect of CC was observed: organizations that spent more on CC were able to cope with crisis better through the enhanced flexibility, integration, and service.

Finally, positive moderating effects were observed for the CC spending variable and the relationship between CC capabilities and crisis adaptation. Both flexibility and CC spending had a significant relationship to adaptation (R2=.531, p < .001). After introduction of the interaction variable, a statistically significant positive change to the adaptation variable was observed: ΔR2=.101, β=.431, p<.001. Likewise, both integration and CC spending had a significant relationship to adaptation (R2=.492, p < .001). After introduction of the interaction variable, a statistically significant positive change to the adaptation variable was observed: ΔR2=.080, β=.391, p<.001. Finally, both service and CC spending had a significant relationship to adaptation (R2=.482, p < .001). After introduction of the interaction variable, a statistically significant positive change to the coping variable was observed: ΔR2=.045, β=.296, p<.001). Therefore, an enhancing effect of CC was observed: organizations that spent more on CC were able to adapt to the crisis aftermath better through the enhanced flexibility, integration, and service.

The effect of the moderator variable is shown in Table 6.As it is seen, there was no observed moderation effect for the Anticipation dimension of organizational resilience. However, positive moderating effects were observed for both Coping and Adaptation dimensions of organizational resilience. Therefore, hypothesis 4 was partially supported by the study results.

Table 6. Moderating Effects of CC Spending

Relationship	β	Sig.	Supported?
CC Flexibility x CC Spending -> Anticipation	0.032	0.217	No
CC Integration x CC Spending -> Anticipation	0.107	0.335	No
CC Service x CC Spending -> Anticipation	-0.054	0.158	No
CC Flexibility x CC Spending -> Coping	0.215	<0.001	Yes
CC Integration x CC Spending -> Coping	0.305	<0.001	Yes
CC Service x CC Spending -> Coping	0.229	<0.001	Yes
CC Flexibility x CC Spending -> Adaptation	0.431	<0.001	Yes
CC Integration x CC Spending -> Adaptation	0.391	<0.001	Yes
CC Service x CC Spending -> Adaptation	0.296	<0.001	Yes

7. DISCUSSION

7.1. Study Findings

This study sought to produce a conceptual framework to test the effect of CC capabilities on organizational resilience. Drawing from both conceptual and empirical literature, CC was operationalized through three capabilities: flexibility, integration, and service whereas organizational resilience was operationalized through capacity to anticipate a crisis, cope with crises, and adapt to the after-crisis environments. The proposed framework suggested that the outlined CC capabilities will positively influence each of the aforementioned aspects of organizational resilience. These effects were also examined for possible moderation by CC spending and influence of confounding factors such as company size and industry.

Two of four major hypotheses formulated in the study, two were confirmed, one was disconfirmed, and one was confirmed partially. First, the results indicated a positive relationship between CC capabilities and coping with a crisis. This result suggests that CC-enabled flexibility, integration, and service help organizations effectively deal with crises as they unfold. The flexibility aspect of CC has been previously shown to arise from its ability to scale down expenses and IT resources following sharp demand declines [74], whereas integration allows to fast, simultaneous IS system changes across all organizational unites, and service aspect allows to eliminate certain unneeded services and add new ones in order to counter a crisis' consequences. As such, organizations that adopted CC are better equipped during a crisis to reduce costs and adjust their IT resources and operations.

Second, the results demonstrated that CC also positively relates to post-crisis adaptation thereby suggesting that firms that adopted CC are better equipped to adjust to the new realities following a crisis. This can be linked to CC capabilities as well. CC-enabled flexibility allows companies to adjust its IT resource needs as needed to meet the after-crisis demands. CC-enabled Integration, on the other hand, allows organizations to facilitate the necessary technology, information, and communication links across the organization, partners, and customers and rapidly redesign business processes in the new post-crises environments. Finally, the service component of CC allows to modify the service deliveries to accommodate the changing customer demands [6].

At the same time, this study did not observe a statistically significant impact of CC capabilities on crisis anticipation. One reason for this could be that, in general, organizations invest in CC for other purposes rather than protect themselves from serious market disturbances. Indeed, existing literature on CC benefits predominantly mentions its contribution to organizational bottom line and streamlining of services and IT resources. It is, therefore, seen as a source of competitive rather than a tool to predict and prepare for serious, unexpected changes. Moreover, crisis anticipation is, in fact, seen as a product of good management that is able to observe the environment, determine the early signs of a crisis, and prepare for it [54]. Therefore, it is a managerial rather than technology-related feature. Nevertheless, CC technology can aid in facing the crisis and its consequences, as it was demonstrated by the study results. This makes it an important contribution to crisis management and organizational resilience in general.

Third, the results of the study showed that the positive impact of CC capabilities on organizational resilience is likely positively moderated by CC spending. For modern organizations, continuous prudent investment in IT is probably more of a necessity rather than a choice. What matters, however, is how IT investments are conducted. Researchers wrote the so-called "rigidity trap" where alignment process between IT and business becomes to formal and resource consuming to effectively react to environmental changes. The results of the study demonstrate that CC spending enhances organizational responsiveness and, therefore, allows to avoid the rigidity trap problem. This can be related to reduction in redundant, legacy information systems and infrastructure.

7.2. Study Contributions

This study offers several important theoretical and practical contributions. From a theoretical standpoint, the study introduced a novel conceptual framework that uses a capability perspective and crisis management literature to outline the impact of CC capability on organizational resilience. This is the first framework of its kind, at least in the context of enterprises in the Middle East. Second, the study operationalized both these factors to offer a detailed view on the relationship between them. The framework, however, is flexible in nature: it can be enhanced or adjusted based on contextual factors or new influential variables. Overall, this is a new perspective on organizational resilience from a technology point of view, and it is also useful in the field of CC, where previous studies paid little attention to its role in organizational resilience.

Secondly, this study empirically confirmed the relationship between CC and organizational resilience. This may suggest that CC is important for those organization that seek to protect themselves from unexpected, rapid changes in the environment that could adversely impact business. This offers a new, previously less considered benefit of CC adoption. It may also provide a new perspective on the value of CC for organizations and offer additional reasons to consider CC adoption for those companies that hesitate to do so. This is especially important for the countries like Saudi Arabia, where wide CC adoption has been slowed down by managers' concerns about its viability and benefits [75]. This study offers an important avenue for analysis of additional benefits of CC adoption, especially in view of the ongoing COVID-19 epidemic and its continuous negative impact on businesses of various kinds.

From a practical standpoint, the study offers some important managerial insights. Managers can consider the study results to attain a more comprehensive understanding of CC and its contribution to organizational success. Whereas CC contribution to managing ongoing operations and risks are well known and explored, its role in times of unexpected, severe business shocks is yet to be well understood. This study suggests that CC adoption may play a positive role to managing such unexpected risks in addition to supporting everyday activities. This study also proposes that CC should be considered as a capability rather than a yet another piece of IT. Indeed, CC was shown to increase flexibility, integration, and service aspects of IT and organization as a whole. A granulated look at CC contributions may be also applied to other key and emerging technologies used by business firms. Because CC spending showed a positive moderating role in CC capabilities' relationship to organizational resilience, investments in CC should be at least considered when an organization is formulating its IT strategy.

8. STUDY LIMITATIONS AND FUTURE RESEARCH

The study results should be considered in light of several limitations. First, this study did not consider the potential concerns regarding CC adoption such as security, privacy, transfer of control, and others. These factors have been noted as important to the process of adoption in both international and Saudi Arabia contexts [76]. Therefore, future research could consider the effect of these barriers and its role in organizational resilience. Second, the study did not distinguish between different service and deployment models of the cloud. Whether some models offer a stronger contribution to organizational resilience remains an open question which can be explored by the researchers. Similarly, it could be useful to determine whether companies of different sizes or industries benefit from CC in terms of resilience formation. Third, the proposed framework can be tested in new populations and different contexts to offer a more solid view on its feasibility and application. Likewise, it could be enhanced by introducing additional variables and possible mediators or moderators to the process. Finally, in order to add robustness to the results, other study designs could be considered. For example, case studies of companies overcoming the COVID-19 pandemic crisis may offer more insight into how CC specifically contributed to organizational resilience, while qualitative research could offer rich understanding of how CC could be used by managers to deal with crises.

9. CONCLUSIONS

Since its introduction, CC has grown in popularity as an IT deployment and management model in many organizations. However, as with any other technology, good understanding of CC, its potential benefits and drawbacks, is necessary for successful adoption. In most cases, researchers have looked at CC in the context of day-to-day operations and, to some extent, managing ordinary organizational risks. This paper proposed that the role and contribution of CC could be wider by investigating its role in dealing with unexpected, severe crises coming from business environments. By considering CC as a range of capabilities – flexibility, integration, and service – this study offered a granulated view on CC and its contribution to organizational resilience. Even though CC did not show a positive impact on organizational ability to foresee a crisis, its contribution to coping with a crisis and adaptation to post-crisis environments has been clearly demonstrated. It is suggested then that organizations should consider CC adoption as a part of their long-term IT strategy if they wish to enhance their ability to withstand a crisis. At the same time, it is important that organizational factors are considered alongside pure technology factors in order to achieve the required level of alignment and integration of CC systems and business operations and strategy.

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