DIGITALIZATION AS A CATALYST FOR RESILIENCE IN THE HOSPITALITY SECTOR

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Hospitality organizations are particularly vulnerable to changes in demand caused by disruptive events such as natural catastrophes, geopolitical events, and pandemic diseases. Nevertheless, the development of organizational resilience by hospitality organizations has remained under-explored. The ongoing digitalization trend provides a unique opportunity for hospitality organizations to combine the adoption of digitalization tools with the development of data analytic capability as a way to anticipate disruptive events and mitigate their impact on operations and performance. Through a cross-sectional survey design and using Partial Least Square Structural Equation Modeling, the present study demonstrates that hospitality organizations can improve their organizational resilience by developing data analytic capability. This can be achieved by (1) investing in the digital tools and IT infrastructure that allows them to sense their environment and (2) adapting their organizational infrastructure to quickly be able to use this information in decision-making. A limitation of the study lies in the use of cross-sectional data which limits temporal causality inferences.

1 Introduction

Service organizations, and hospitality organizations in particular (e.g. hotels, restaurants, campsites), are vulnerable to disruptions (He et al. 2023). Due to their fixed capacity, simultaneous production and consumption, perishable inventory, and high fixed cost/ low variable cost structure, hospitality organizations have difficulty in absorbing the large shifts in customer demand that can be caused by disruptions (Kokkinou et al. 2023c). COVID-19 was the most recent high-impact disruption affecting the hospitality industry (Gursoy and Chi 2020). However, while the COVID-19 pandemic was unprecedented, hospitality organizations have a long history of vulnerability to a variety of disruptions such as disease outbreaks, terrorism attacks, and natural disasters such as earthquakes or floods (Hall et al. 2023).

These disruptive events have accentuated the importance of resilience for hospitality organizations. Resilience is defined as an organization's ability to *either* absorb shocks and continue operating, *or* bounce back from these shocks in a short enough time that there is no lasting effect on its performance (Hall et al. 2023). Resilience has received extensive attention in the tourism literature (Lew 2014; Luthe and Wyss 2014; Jiang et al. 2019; Usher et al. 2019), where it is typically treated from a systems perspective (e.g. destination level and/or ecosystem). Hospitality organizations are typically considered as part of such a tourism ecosystem, as they act both as an enabler of tourism and a beneficiary thereof (Melián-Alzola et al. 2020). Nevertheless, in the context of hospitality research, resilience is typically examined from an organizational perspective, using the organization as the level of analysis.

On an organizational level, resilience is seen as a capability that organizations can develop through investments in assets and organization-specific processes (Jiang et al. 2019). The resilience capability is further enabled by other capabilities, such as organizational flexibility, organizational agility, and organizational learning. In other industries, a promising avenue for the development of resilience has been shown to be the development of Data Analytic Capability (DAC) (Kokkinou et al. 2023b). This ability to quickly deploy data, people, and technology allows organizations to generate the insights needed for complex decision-making. For hospitality organizations this might include a better understanding of market segments, how to allocate scarce capacity to them, and where to find additional sources of business

and revenue in crisis situations. Nevertheless, developing DAC requires significant investments in acquiring new knowledge, developing the necessary IT infrastructure and organizational infrastructures and moving the organizational culture towards a more data driven approach (Kokkinou et al. 2023a).

Ongoing digitalization is encouraging hospitality companies to embrace technological innovations as a way to remain competitive (Law et al. 2022), and thus also improve the resilience of their organizations. Nevertheless, and despite the rising importance of digitalization, the role that digital technologies and data analytics can play in developing resilience remains limited (He et al. 2023). The purpose of the present study is to examine how hospitality organizations can harness the opportunities provided by digitalization to develop their resilience. Our study thereby contributes to the growing body of literature examining how hospitality organizations can develop their resilience capabilities through a combination of assets and organization-specific processes.

The next section reviews existing literature on resilience capabilities, with special attention to resilience research in hospitality and tourism. We subsequently review literature on digitalization, examining the role that DAC plays in developing resilience, and which organizational assets and processes are needed for this, leading to the study hypotheses and conceptual model. The third and fourth sections describe the sampling, data collection, and data analysis procedures used to test the study hypotheses. The fourth section discusses the findings of the study and compares them to literature. We conclude with the implications for practice, a review of the limitations of the study and suggestions for future research.

2   Review of the Literature

2.1   Resilience as an Organizational Capability

Several conceptualizations of resilience exist. Hall et al. (2023) distinguishes between socio-ecological resilience, ecological resilience, and engineering resilience. Socio-ecological resilience is applicable when changes happen at the system level, while ecological resilience is primarily concerned with changes at the sectoral level. From this perspective, the ongoing digitalization trend can be seen as a change that affects the hospitality industry in its entirety. The present study adopts the engineering

perspective of resilience, viewing it as an organization's ability to return to its previous state after a disruption (Hall et al. 2023). This conceptualization of resilience is also consistent with how other industries view organizational and/or supply chain resilience (Dubey et al. 2021; Iftikhar et al. 2024).

Through the lens of Dynamic Capability Theory (DCT), resilience is perceived to be an organizational capability that (1) allows organizations to sense their environment and identify opportunities and/or threats, (2) seize opportunities or neutralize threats, and (3) transform themselves to remain aligned with their changing environment (Teece et al. 1997; Teece 2007; Helfat and Raubitschek 2018). This conceptualization has also been adopted in the context of tourism where Jiang et al. (2019) argued that tourism organizations build resilience by using dynamic capabilities and slack resources to transform their operational routines into new ones, more resilient to disruptions. Organizations can develop their resilience capability by investing in other capabilities, assets and company-specific routines.

While the scope of the present study is on organizational resilience, resilience can also be seen from the individual and group perspectives (Sutcliffe and Vogus 2003). At the individual level, employees contribute to the resilience of the organization by identifying potential threats early on, and/or providing creative and flexible solutions (He et al. 2023). At the group level, teams can perform better in adjusting to new conditions when they oriented towards acquiring new knowledge and skills (Sutcliffe and Vogus 2003). In the context of individuals at work, resilience is enhanced when they have access to resources and perceive to have the needed expertise and efficacy. At the organizational level, resilience can be achieved when the organization has sufficient information to manage vulnerabilities and/or adjust its direction in case of a disruption (He et al. 2023).

Across industries, antecedents of organizational resilience have included (1) other capabilities such as resourcefulness, dynamic competitiveness, organizational learning, organizational culture; (2) assets such as cash flow, skilled employees, and (3) organization-specific processes and routines such as networks, leadership, and operational flexibility (Pal et al. 2014; Cotta and Salvador 2020; Vakilzadeh and Haase 2021). In the context of hospitality organizations, Melián-Alzola et al. (2020) further identified strategy and culture as antecedents of resilience.

More recently, ongoing digitalization across industries has drawn attention to the potential of digital technologies to improve organizational and supply chain resilience by improving the information flows and reducing uncertainty across the organization (Jia et al. 2020).

2.3 Digitalization

Broadly speaking, digitalization refers to society's transition from analog to digital, and the corresponding changes in customer and organizational behavior (Vial 2019). Digitalization is contributing to a shift in customer behavior and expectations. Social media, Virtual Reality (VR) and Artificial Intelligence (AI)-enabled chatbots are diversifying the information sources that customers can use to form service expectations. Concurrently, novel digital technologies are providing hospitality companies with innovative ways to meet these expectations by customizing service experiences and empowering customers (Neuhofer et al. 2015). Digitalization is also a source of competitive advantage for organizations that can successfully transform their operating model. Organizations are harnessing the power of digital technologies to develop new IT capabilities, using them to design new digital strategies (Bharadwaj et al. 2013).

Digitalization has been linked to improved organizational and supply chain resilience (Dubey et al. 2021; He et al. 2023). In the context of hospitality organizations, He et al. (2023) demonstrated that a hospitality's digital maturity was positively associated with its organizational resilience. Nevertheless, given how broad the concept of digitalization is, further elaboration is needed to better understand how digitalization contributes to organizational resilience. In the section below we focus on an IT capability, DAC (Wamba et al. 2017), that has been linked to supply chain resilience (Yu et al. 2021; Kokkinou et al. 2023b), and the organizational assets and processes that are known to contribute to it.

2.3.1 Data Analytic Capability (DAC)

In the context of DCT, DAC can also be seen as an organizational capability. DAC enables organizations to identify new demand and consumer behavior patterns (e.g., changes in booking patterns, evolution in consnumer preferences and requirements), thereby improving their ability to *sense* their environments (Mikalef et al. 2019). DAC

furthermore facilitates organizations in *seizing* these opportunities by fueling the use of data-driven decision-making when assessing business opportunities and potential investment opportunities. Finally, DAC supports organizations in *transforming and reconfiguring* their activities as it pushes the organization culture towards becoming more data-driven (Kokkinou 2024). DAC has been shown to be a source of competitive advantage, particularly in uncertain environments (Wamba et al. 2017). DAC is also commonly viewed as enabling other capabilities (Helfat and Peteraf 2009), including organizational and supply chain resilience.

DAC has been linked to organizational and supply chain resilience in a variety of industries including manufacturing and supply chains (Dubey et al. 2021). In this context, DAC helps organizations to increase their capacity to process information and generate the insights that help them mitigate risks associated with disruptions (Iftikhar et al. 2024). This finding can extend to service organizations who similarly can develop their DAC to more quickly identify (potential) disruptions and which measures they can take to mitigate their effect on their operations. We therefore propose: in the context of hospitality organizations, DAC is positively related to organizational resilience (H1).

2.3.2 Enablers of Data Analytic Capability

For organizations to develop their DAC, they need to orchestrate people, processes, and technology assets and capabilities (Gupta and George 2016). The development of DAC is qualified as a complex socio-technical process, requiring a multi-disciplinary perspective (Legner et al. 2017; Mikalef and Krogstie 2020). This requires concurrent investments in digital transformation technologies and the corresponding organizational infrastructure (Kokkinou et al. 2025). We therefore propose that in the context of hospitality organizations, IT infrastructure is positively related to DAC (H2) and organizational infrastructure is positively related to DAC (H3).

We posit that DAC is the capability by which hospitality organizations can translate investments in digital tools and processes into increased organizational resilience (He et al. 2023). We therefore propose the corresponding mediation hypotheses: DAC mediates the relationship between IT Infrastructure and organizational

resilience (H2') and DAC mediates the relationship between organizational infrastructure and organizational resilience (H3').

In the context of the hospitality and tourism industries, SMEs are perceived to be more vulnerable to disruptions due to their lack of organizational capabilities and slack resources (Jiang et al. 2019). Similarly, brand-affiliated hotels are perceived as having better access to the resources needed in case of disruptions as compared to independent hotels. Hotel size and affiliation are therefore used as control variables. The conceptual model is shown in Figure 1.
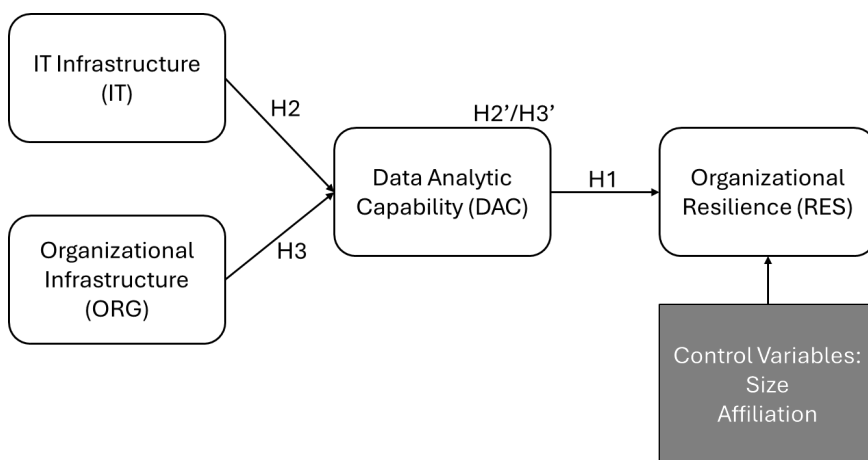

Figure 1: Conceptual Framework
Source: Own work

3　　Methodology

To examine the study hypotheses, a cross-sectional survey design was employed as described below. The unit of analysis for the study was the organization, with each organization being represented by a single key informant (Yu et al. 2021; Kokkinou et al. 2023b). Cross-sectional data was used as it is more efficient and inexpensive to collect and reduces the risk of attrition typical of longitudinal studies (Maier et al. 2023). However, for the purpose of the present study, the use of cross-sectional data limits the study of temporal order and the differentiation between cause and effect.

3.1 Survey Development

For this study, a survey was designed and administered using the software Qualtrics. The survey consisted of five sections. First, participants were provided with information about the study and informed consent. In this first section, participants also had to confirm their eligibility for the study. The second section was used to collect demographic information about the hotel company. The third section of the questionnaire measured hospitality resilience, while the fourth section measured the digitalization and DAC of the hotel. The fifth section comprised demographic questions and attention checks.

Previously validated scales obtained from the literature were used to measure the variables of interest of this study. To measure hospitality organization's resilience, the scale developed by He et al. (2023) was adapted. He at al.'s (2023) scale is based on the combination of individual-level and organizational-level resilience. The 15 items were measured on a scale from 1 (completely disagree) to 5 (completely agree). The scale for DAC consisted of four items (Srinivasan & Swink, 2018). The hypothesized antecedent of DAC, namely IT Infrastructure and Organizational Infrastructure, were measured using scales adapted by Proksch et al. (2024) using a scale from 1 to 5. Hotel size and whether the hotel is independent or affiliated were included as control variables.

Given the risk for Common Method Bias (CMB), several survey design best practices were employed. These included keeping the language unambiguous and simple (Lindell and Whitney 2001; Podsakoff et al. 2003), ensuring participants anonymity and providing reassurance that there were no incorrect answers (Li et al. 2020). Furthermore, the scales for the dependent variables (resilience) were shown in a separate page. Halfway through the survey, an open question was used to collect information about the participants' role in the organization. This was also used as an attention check.

3.2 Data Collection Procedures and Sampling

Participants in the study were recruited through the platform Prolific. Participants were eligible for the study if they were currently employed by a hotel, or had been employed in the past six months, in a full-time or part-time position. In addition to

the initial screening question, participants were asked to describe their position in an open question. They were paid £2 to complete the study. The median survey duration was 10:10. Participants who took less than 50% of the median time were removed from the study, as did participants who failed the attention checks. The final sample for this study included 167 participants, of which 44.2% identified as male and 55.2% as female. Regarding position, 6.1% of participants indicated working on a management level, 30.9% on a middle-management level, 27.9% as team leader/ shift supervisor, and 32.1% at operational level. Participants' mean tenure at the company was 5.02 years (sd = 3.895). Most participants worked for an affiliated hotel (65.5%). Affiliated hotels included franchised hotels (19.2%), small chains (9.6%) and large chain hotels (35%). 32.1% of participants indicated working for an independent hotel, and 2.4% owned and operated their hotel or a small chain of hotels. Small and large hotels were relatively equally represented in the sample. 60.5% of hotels in the sample had fewer than 100 rooms. The largest two groups were hotels with 11-50 rooms (26.6%) and 51-100 rooms (26.6%). 7.3% of hotels in the sample had fewer than 10 rooms, while 4.0% had over 500 rooms.

3.3 Data Analysis Procedures

Prior to analysis, data were reviewed to remove responses from participants that completed the study too fast and/or failed the attention checks. Subsequently, demographics were computed using the sofware SPSS. To analyze the data and test the study hypotheses, Partial Least Squares Structural Equation Modeling (PLS-SEM) was applied using the software SMART-PLS (Ringle et al. 2022). This was done in two steps. First, the reliability, convergent validity, and discriminant validity of the focal constructs were examined using the PLS-SEM algorithm. Second, the full model shown in figure 1 was calculated using the bootstrapping function to estimate the significance of the coefficients.

4 Findings

First, and prior to testing the study hypotheses, reliability, convergent validity, and discriminant validity were assessed (Melián-Alzola et al. 2020). Reliability for each construct was determined by examining Cronbach Alpha (CA) and Scale Composite Reliability (SCR). As table 1 shows, for all constructs, CA and SCR exceeded the

recommended threshold of 0.7 (Fornell and Larcker 1981). Convergent validity was assessed by examining the Average Variance Extracted (AVE).

As shown in table 1, AVE exceeded the recommended value of 0.5 for all study constructs. Discriminant validity was assessed by applying two well-known criteria (1) Fornell-Larcker criterion (Fornell and Larcker 1981) and (2) Heterotrait-Monotrait (HTMT) ratio criterion (Henseler et al. 2015). For (1) for each construct, the square root of AVE (see diagonal in table 2) needed to exceed the construct's correlation with each of the other constructs (see bottom left quadrant of table 2), which was the case. For (2), the value of HTMT needed to remain below 0.850 for each combination of constructs (see top right quadrant for table 2), which was also the case. Therefore, discriminant validity was established.

Table 1: Scale Statistics

Construct	Mean	SD	CA	SCR	AVE
IT Infrastructure	3.751	0.869	0.878	0.908	0.623
Organizational Infrastructure	3.662	0.888	0.911	0.929	0.621
Data analytic capability	3.619	0.928	0.879	0.917	0.734
Resilience	4.022	0.730	0.938	0.946	0.558

Note: SD: Standard Deviation / CA: Cronbach Alpha/ SCR: Score Composite Reliability / AVE: Average Variance Extracted
Source: Own work

Table 2: Discriminant Validity (Fornell-Larcker criterion and HTMT)

Construct	AVE	IT	ORG	DAC	RES
IT Infrastructure (IT)	0.623	*0.790*	0.824	0.783	0.733
Organizational Infrastructure (ORG)	0.621	0.737	*0.788*	0.816	0.721
Data analytic capability (DAC)	0.734	0.688	0.730	*0.857*	0.723
Resilience (RES)	0.558	0.666	0.666	0.657	*0.744*

Note: Bottom left quadrant: correlations / Diagonal: square root of AVE / Top right quadrant: HTMT
Source: Own work

Since the requirements for reliability, convergent validity and discriminant validity were met, the structural model (shown in figure 1) could be examined. This model explained 44.0% of the variance in organizational resilience, and 58.3% of the variance in DAC. The results show that the control variables, size and affiliation,

were not statistically significant (respectively β=-0.037, p=.796 and β=0.294, p=.095). Using bootstrapping (5000 samples), the significance of the coefficients corresponding to each hypothesis were estimated (shown in tables 3 and 4).

Table 3: Direct Effects

Path	Coeff	t-value	p-value	Hyp.	Conclusion
DAC ➔ RES	0.685	12.917	.000	H1	Supp.
IT ➔ DAC	0.328	4.066	.000	H2	Supp.
ORG ➔ DAC	0.488	5.698	.000	H3	Supp.
Size ➔ RES	-0.037	0.259	.796	Control	Not
Affiliation ➔ RES	0.291	1.668	.095	Control	Not

Source: own work

Table 4: Mediation Hypotheses

Path	Coeff	t-value	p-value	Hyp.	Conclusion
IT➔DAC➔ RES	0.225	3.665	.000	H2'	Supported
ORG➔DAC➔ RES	0.334	5.254	.000	H3'	Supported

Source: own work

The results show that DAC has a statistically significant positive effect on organizational resilience (β=0.685, p<0.000), supporting H1. Furthermore, IT infrastructure and organizational infrastructure both have a statistically significant positive effect on DAC (respectively β=0.328, p<0.000 and β=0.448, p<0.001), supporting H2 and H3. Furthermore, an examination of the indirect effects shows that IT infrastructure and organizational infrastructure both have a positive effect on organizational resilience through DAC (respectively β=0.225, p<0.000 and β=0.334, p<0.001), lending support to H2' and H3'.

5   Discussion

Due to their characteristics, hospitality organizations are vulnerable to disruptions that affect demand and supply of their services and therefore need to develop organizational resilience (He et al. 2023; Kokkinou et al. 2023c). The purpose of this study was to examine how hospitality organizations can develop their DAC in such a way as to improve their organizational resilience.

First, DAC was associated with organizational resilience of hospitality organizations. This mirrors research conducted in other contexts such as manufacturing and supply chains (Dubey et al. 2021). However, whereas manufacturing organizations can somewhat mitigate the impact of disruptions on their supply chains through proactive measures such as strategically positioning inventory in their supply chains (Ivanov and Dolgui 2020), hospitality organizations are characterized by their fixed capacity and the simultaneous production and consumption of their services which renders them even more vulnerable to unexpected variations in demand (Melián-Alzola et al. 2020). DAC can therefore help hospitality organizations better anticipate on their demand, through for example improved forecasting (Kokkinou 2013).

Second, and consistent with previous research, we found that to develop organizational resilience, hospitality organizations needed to develop their DAC through the concurrent orchestration of digital technology, processes and people assets and capabilities (Kokkinou et al. 2023a). Hospitality organizations need to invest in the digital technologies that will help them develop an IT infrastructure capable of sensing their environment and translate data into insights (He et al. 2023). They also need to adapt the processes and structure of their organization to incorporate these insights into decision-making to mitigate the effect of disruptions on their performance. Furthermore, organizations also need to invest in the development of employees. Merely investing in digital technologies without providing appropriate support for employees is not sufficient (Motamarri et al. 2017; Kokkinou et al. 2024). This supports the view that the development of DAC is a complex socio-technical process which requires a more comprehensive and multi-disciplinary approach (Legner et al. 2017; Mikalef and Krogstie 2020).

5.1   Implications for Practitioners

The development of resilience is a strategic and long-term endeavor that is frequently postponed in favor of dealing with more immediate problems, especially by SMEs (Jiang et al. 2019). For unaffiliated hotels and other organizations that are not part of a network, the development of a resilience capability might be particularly daunting (Usher et al. 2019). Nevertheless, given the vulnerability of hospitality organizations to changes in demand, hospitality organizations are strongly advised to invest in developing their resilience capability. The ongoing digitalization trend

provides a unique opportunity for hospitality organizations to combine the adoption of digitalization tools with the development of their DAC as way to anticipate on disruptive events and mitigate their impact on operations and performance (Melián-Alzola et al. 2020). By investing in digital tools and their IT infrastructure, hospitality organizations can improve their ability to sense disruptions and take swift action. However, it remains necessary to couple the implementation of new digital tools to the adaptation of the organization's structure and processes. Hospitality organizations can adopt a step-by-step to the development of digital maturity, focusing on developing and adopting a digital strategy, and implementing it through investments in leadership, employee, operational, cultural and governance capabilities (Rossmann 2018).

5.2   Limitations and Future Recommendations

Our study has several limitations that need to be addressed. First, a cross-sectional design, even with ample support from academic literature, limits the ability to draw conclusions regarding causality. Temporal causality between investments in resources, the development of DAC, and the development of resilience, and how variance in investments in resources relate to resilience can be better proven using multi-wave data (Maier et al. 2023). Longitudinal research is thus needed to better understand the causal effects associated with investments in digitalization. Second, the unit of analysis for this study is the organization, however an organization's resilience can also be affected by the ecosystem in which it operates (Hall et al. 2023). For example, previous research has shown that during severe disruptions such as COVID-19, hospitality operators are able to draw on the goodwill of their suppliers to improve their digitalization capabilities (Kokkinou et al. 2023c) and local government for resources (Usher et al. 2019). Future research should therefore incorporate contextual variables such as environmental complexity, competitive intensity, government support, and legal environment as potential moderators.

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