

DIGITAL TRANSFORMATION AND INNOVATION IN SMALL AND MEDIUM-SIZED ENTERPRISES: EVIDENCE FROM THE HOTEL SECTOR



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Digital Transformation and Innovation in Small and Medium-sized Enterprises: Evidence from the Hotel Sector

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To my family

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This was a long journey.

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Declaration

I hereby certify that this doctoral thesis has been composed from the author alone; it is an original work completed under the guidance of Professor Panos Kourouthanassis; the content of this doctoral thesis has been carried out since the official commencement date; the work has not been submitted for any other degree or professional qualification; the ethics guidelines and procedures have been followed.

The current research presented in this thesis has produced the following publications:

Journal publications

- Nikopoulou, M., Kourouthanassis, P., Chasapi, G., Pateli, A., Mylonas, N. (2023). Determinants of Digital Transformation in the Hospitality Industry: Technological, Organizational, and Environmental Drivers. *Sustainability*, 15(3), 2736. <https://doi.org/10.3390/su15032736>
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- Pateli, A., Kourouthanassis, P., Nikopoulou, M., & Chasapi, G. (2021). Digital transformation for resilient tourism: Evidence from the Greek hospitality industry. Reviving tourism, in the post-pandemic era, In the Proceedings of TOURMAN 2021, *4th International Scientific Conference “Restarting tourism, travel and hospitality: The day after”*, 69. DOI: [org/10.5281/zenodo.6428590](https://doi.org/10.5281/zenodo.6428590).

Abstract

The current study aims to investigate the factors that affect a hotels' decision to adopt digital technologies. Our theoretical grounding builds on the Technology–Organization–Environment (TOE) research framework. The research model was validated through a survey of 502 hoteliers and managers using the Partial Least Squares–Structural Equation Modeling (PLS-SEM) statistical method. The results indicated that micro, small and medium-sized enterprise (MSME) hotels affected by the COVID-19 outbreak are more likely to adopt digital technologies. The intention to adopt digital technology is positively and significantly influenced by the digital maturity of organizations, financial resources availability and government regulations. The current study investigates rather less explored factors, such as the organizational digital maturity, which consists of a multi-dimensional latent variable. The findings may be employed to guide the formulation of digital strategies by hospitality industry organizations. Additionally, the research aims to advance the understanding of the moderating effect of firm innovation index and organizational size on the relationship between ICTs adoption and the technological, organizational and environmental elements of the TOE theoretical framework in the hotel industry during the pandemic. The results indicated that firm innovation index has a moderating effect on this relationship. In addition, concerning the size of the hotel, small hotels with 11-50 employees are a moderator on the adoption of ICTs within the government regulatory of the COVID-19 outbreak.

The main objective of this research study is to examine digital technologies adoption in the hospitality sector as a basement for its digital transformation. Other sub-objectives of the research study include:

1. The in-depth investigation of the ICT adoption and implementation process in the hotels.
2. The presentation of the perspectives of the hypothesized conceptual model presented in this study.
3. The empirical application of the conceptual framework for the evaluation of ICT adoption in a sample of Greek hotels.
4. Elaboration of the findings and the establishment of the conceptual model.
5. Determining future research efforts in in the hospitality sector regarding the ICT adoption.

Abstract (In Greek)

Η παρούσα ερευνητική εργασία σκοπό έχει να διερευνήσει τους παράγοντες που επηρεάζουν την υιοθέτηση και εφαρμογή των τεχνολογιών πληροφορίας (ΤΠ) στην βιομηχανία της ξενοδοχειακής φιλοξενίας. Η έρευνα βασίζεται στην θεωρία Τεχνολογίας, Οργανισμού και Περιβάλλοντος (ΤΟΠ) (Tornatzky et al., 1990). Η παρούσα έρευνα βασίστηκε στις θεωρητικές εξελίξεις της ΤΟΠ για να δημιουργήσει ένα εννοιολογικό μοντέλο που παρουσιάζει τους παράγοντες που επηρεάζουν την απόφαση των ιδιοκτητών και διευθυντών των ξενοδοχείων στην υιοθέτηση πληροφορικών συστημάτων τεχνολογίας. Η πρόθεση υιοθέτησης της ψηφιακής τεχνολογίας επηρεάζεται θετικά και σημαντικά από την ψηφιακή ωριμότητα των οργανισμών, τη διαθεσιμότητα οικονομικών πόρων και τους κυβερνητικούς κανονισμούς. Η σημαντικότητα της παρούσας εργασίας επικεντρώνεται στο γεγονός ότι διερευνά παράγοντες που δεν έχουν εξεταστεί στο παρελθόν, όπως η οργανωτική ψηφιακή ωριμότητα, η οποία αποτελεί μια πολυδιάστατη μεταβλητή που στόχο έχει να εξετάσει ολιστικά τους τεχνολογικούς και οργανωτικούς παράγοντες που διαμορφώνουν καταληκτικά την υιοθέτηση των ΤΠ. Τα ευρήματα μπορούν να χρησιμοποιηθούν για να καθοδηγήσουν τη διαμόρφωση ψηφιακών στρατηγικών από οργανισμούς του κλάδου της φιλοξενίας.

Η έρευνα πραγματοποιήθηκε υπό την αιγίδα του Υπουργείου Τουρισμού της Ελλάδας. Για το σκοπό της έρευνας στάλθηκε ηλεκτρονικό ερωτηματολόγιο μέσω της εφαρμογής Google Forms σε όλα τα μέλη του ξενοδοχειακού επιμελητηρίου Ελλάδος. Το ηλεκτρονικό ερωτηματολόγιο συμπλήρωσαν 502 ιδιοκτήτες και διευθυντές από όλη την ελληνική επικράτεια κατά την χρονική περίοδο Σεπτεμβρίου έως και Νοεμβρίου 2020.

Τα δεδομένα της έρευνας αναλύθηκαν μέσω συγκεκριμένων στατιστικών τεχνικών που πληρούσαν τους σκοπούς της έρευνας. Οι στατιστικές τεχνικές περιλαμβάνουν τα δομικά μοντέλα εξισώσεων μερικών ελάχιστων τετραγώνων (PLS-SEM). Τα αποτελέσματα της έρευνας δείχνουν ότι η επίδραση των παραγόντων της θεωρίας της ΤΟΠ στην υιοθέτηση και εφαρμογή των τεχνολογιών πληροφορίας στην ξενοδοχειακή βιομηχανία είναι καταλυτική, ειδικότερα κατά την περίοδο της πανδημίας του COVID-19. Επιπλέον, μέσω των συμπερασμάτων της έρευνας αναδεικνύεται η σημαντικότητα του δείκτη εταιρικής καινοτομίας και του μεγέθους της ξενοδοχειακής μονάδας στη σχέση μεταξύ των τεχνολογικών, οργανωσιακών και

περιβαλλοντικών παραγόντων και την υιοθέτηση και εφαρμογή τεχνολογιών πληροφορίας. Καταληκτικά, περιγράφονται αναλυτικά οι επιπτώσεις των αποτελεσμάτων της έρευνας στη ξενοδοχειακή διοίκηση και σε μελλοντικές έρευνες.

Table of Contents

Acknowledgments.....	i
Declaration.....	ii
Abstract.....	iii
Abstract (In Greek).....	iv
Table of Contents.....	vi
List of Tables.....	x
List of Figures.....	xi
List of Abbreviations.....	xii
1 CHAPTER.....	1
Introduction.....	1
1.1 Introduction.....	1
1.2 Research Background and Context.....	1
1.2.1 Capturing the Digital Maturity in the Business.....	4
1.2.2 ICT and Moderators affecting its Adoption in the Hospitality Industry.....	5
1.3 Research Motivation and Objectives.....	8
1.4 Research Methodology.....	10
1.5 Significance of the Research.....	11
1.6 Thesis Outline.....	11
1.7 Summary.....	13
2 CHAPTER.....	14
Review of Research Literature.....	14
2.1 Introduction.....	14
2.2 Information and Communications Technology (ICT).....	14
2.3 Business Value of ICT Adoption.....	16
2.4 ICT Adoption and Implementation Timeline in the Hospitality Industry.....	18
2.5 The Phenomenon of Digital Transformation (DT).....	19
2.6 The enabler of Digital Transformation: Digital Maturity.....	21
2.7 How are ICT adoption, Digital Maturity and Digital Transformation linked?.....	23
2.8 Health- related Crises in the Hospitality Industry.....	24
2.9 The Health-related Crisis of COVID-19 in the Hospitality Industry.....	26

2.10	Summary.....	27
3	CHAPTER.....	29
	Technology - Organization - Environment (TOE) Framework.....	29
3.1	Introduction.....	29
3.2	Theories associated with ICT integration.....	29
3.3	Technology - Organization -Environment (TOE) framework.....	32
3.3.1	Elements of TOE framework.....	32
3.4	The TOE Framework in the Hospitality Industry.....	44
3.5	The TOE framework in the Hospitality Industry and Health Crises.....	47
3.6	The TOE Framework adopted during the COVID-19 Pandemic.....	47
3.7	Summary.....	49
4	CHAPTER.....	50
	Research Development Model.....	50
4.1	Introduction.....	50
4.2	Rationale of the Hypothesized Research Model.....	50
4.3	Hypotheses Development and Conceptual Model.....	53
4.3.1	Technological Dimension: Digital Maturity.....	55
4.3.2	Organizational Dimension.....	63
4.3.3	Environmental Dimension.....	65
4.3.4	The Moderating Role of Firm Innovation Index.....	69
4.3.5	The Moderating Role of Hotels' Size (Number of Employees).....	71
4.4	Summary.....	73
5	CHAPTER.....	75
	Research Design and Data.....	75
5.1	Introduction.....	75
5.2	Research Philosophy and Approach.....	75
5.3	Research Design.....	76
5.4	Data Collection.....	79
5.5	Research Instrument and Online Questionnaire Design.....	80
5.6	Sample Size.....	82
5.7	Data Methodologies.....	83
5.8	Constructs of the Research.....	86
5.8.1	Technological Context.....	86
5.8.2	Organizational Context.....	87
5.8.3	Environmental Context.....	87

5.8.4	Dependent Variable: Information Communications Technology (ICT).....	89
5.9	Defining Research Targeted Population.....	89
5.10	Data (Constructs) Operationalization.....	90
5.11	Ethical Issues.....	90
5.12	Summary.....	91
6	CHAPTER.....	92
	Analysis and Results.....	92
6.1	Introduction.....	92
6.2	Data Description.....	92
6.3	Respondent Profile.....	94
6.3.1	Position.....	94
6.3.2	Hotel Category.....	94
6.3.3	Hotel Geographical Region.....	95
6.3.4	Hotel Star Rating.....	96
6.3.5	Firm Profile.....	97
6.3.6	Size of the Firm.....	98
6.3.7	Hotel Operation Mode.....	100
6.4	Results.....	101
6.4.1	Measurement Model.....	101
6.4.2	Structural Model.....	105
6.5	Results of the Moderators.....	107
6.5.1	Measurement Model.....	108
6.5.2	Structural Model.....	108
6.6	Summary.....	115
7	CHAPTER.....	116
	Discussion and Implications.....	116
7.1	Introduction.....	116
7.2	Research Outcomes.....	117
7.2.1	Digital Maturity as a Predictor of Technology Adoption.....	117
7.2.2	Organization Element and Technology Adoption.....	120
7.2.3	Environment Element and Technology Adoption.....	121
7.2.4	Moderating effects of Firm Innovation Index and Size of the Hotel.....	122
7.3	Implications of Research Study.....	124
7.3.1	Research and Theory Implications.....	124
7.3.2	Practical Implications.....	128

7.4	Summary.....	133
8	CHAPTER.....	134
	Limitations, Future Research and Conclusions.....	134
8.1	Introduction.....	134
8.2	Research Limitations.....	134
8.2.1	Limitations on Content.....	134
8.2.2	Limitations on Design and Methodology.....	135
8.3	Future Research.....	136
8.4	Conclusions.....	139
8.5	Summary.....	140
	References.....	141
	APPENDIX A.....	173
	APPENDIX B.....	174
	APPENDIX C.....	181
	APPENDIX D.....	183
	APPENDIX E.....	183

List of Tables

Table 2-1. Definitions of ICT.....	15
Table 3-1. Literature survey of studies that used TOE framework from 2011 to 2022.....	35
Table 5-1. Data collection phase.....	80
Table 5-2. Advantages and disadvantages of online questionnaire.....	81
Table 5-3. Determination of minimum sample size for a given population size for continuous and categorical data.....	83
Table 5-4. Digital maturity.....	86
Table 5-5. Financial resources availability.....	87
Table 5-6. Government regulations.....	88
Table 5-7. Firm Innovation Index.....	88
Table 5-8. Number of employees.....	88
Table 5-9. ICT list.....	89
Table 5-10. Position of respondents.....	90
Table 6-1. Demographic characteristics of the sample.....	93
Table 6-2. SME definition.....	98
Table 6-3. Results of the reflective construct assessments.....	102
Table 6-4. Results of the formative construct assessments.....	103
Table 6-5. Discriminant validity (Fornell-Larcker criterion).....	104
Table 6-6. Multicollinearity diagnostics and path weights of first-order constructs on second-order construct.....	104
Table 6-7. Structural model path coefficients and significance level.....	107
Table 6-8. Fornell-Larcker criterion.....	108
Table 6-9. HTMT ratio.....	108
Table 6-10. Structural model.....	109
Table 6-11. PLS multi-group test results according to firm innovation index group.....	110
Table 6-12. PLS multi-group test results according to number of employees.....	111
Table 6-13. Differences between the groups according to number of employees.....	111
Table 6-14. Hypotheses development.....	114
Table 6-15. Effect sizes of moderators.....	115

List of Figures

Figure 1-1. Research process.....	10
Figure 2-1. Public health-related threats timeline.....	25
Figure 3-1. Technology-Organization-Environment framework (Tornatzky and Fleischer 1990, p. 154).	39
Figure 4-1. Hypothesized conceptual framework.....	68
Figure 4-2. Hypothesized conceptual framework with moderator firm innovation index.....	70
Figure 4-3. Hypothesized conceptual framework with moderator size of the hotel.....	73
Figure 5-1. Quantitative data type.....	77
Figure 5-2. Research design and methods.....	78
Figure 6-1. Distribution of position.....	94
Figure 6-2. Distribution of hotel category.....	95
Figure 6-3. Distribution of geographical region.....	96
Figure 6-4. Distribution of stars.....	97
Figure 6-5. Distribution of number of employees.....	99
Figure 6-6. Distribution of rooms quantity.....	99
Figure 6-7. Distribution of annual income.....	100
Figure 6-8. Distribution of operation mode.....	101
Figure 6-9. Results for the structural model analysis.....	107
Figure 6-10. Moderating effect of firm innovation index in the relationship of digital maturity on digital technologies.....	111
Figure 6-11. Moderating effect of hotel size in the relationship of digital maturity on digital technologies.	112
Figure 6-12. Hypothesized conceptual model with moderating effect of firm innovation index.....	113
Figure 6-13. Hypothesized conceptual model with moderating effect of hotel size.....	114

List of Abbreviations

AI:	Artificial Intelligence
BA:	Business Analytics
BDA:	Big Data Analytics
BDS:	Big Data Solutions
BIS:	Business Intelligence Systems
CB-SEM:	Covariance-Based Structural Equation Modeling
CMR:	Customer – Managed Relationship
DOI:	Diffusion of Innovation Theory
DT:	Digital Transformation
e-business:	electronic business
e-commerce:	electronic commerce
EDI:	Electronic Data Interchange
ERP:	Enterprise Resource Planning
e-survey:	electronic survey
EU:	European Union
GDP:	Gross Domestic Product
ICT:	Information and Communication Technologies
IDT:	Innovation Diffusion Theory
IoT:	Internet of Things
IS:	Information Systems
IT:	Information Technology
MSCI:	Morgan Stanley Capital Index
MSME:	Micro-Small and Medium Sized Enterprise
OI:	Organizational Innovativeness
PLS-SEM:	Partial Least Squares –Structural Equation Modeling
PU:	Perceived Usefulness
PUE:	Perceived Ease of Use
QR:	Quick Response
RFID:	Radio Frequency Identification
SaaS:	Software as a Service

s-CRM:	Social Customer Relationship Management
SME:	Small and Medium Sized Enterprise
SMEs:	Small and Medium Sized Enterprises
TAM:	Technology Acceptance Model
TAM2:	Technology Acceptance Model Version 2
TOE:	Technology-Organization-Environment
ToRA:	Theory of Reasoned Action
TPB:	Theory of Planned Behaviour
TRA:	Theory of Reasoned Action
TV:	Television
ΤΠ:	Τεχνολογίες Πληροφορίας
USA:	United States of America
UTAUT:	Unified Theory of Acceptance and Use of Technology
VR:	Virtual Intelligence
WHO:	World Health Organization
ΤΟΠ:	Τεχνολογία-Οργανισμός-Περιβάλλον
5G:	5 th Generation Mobile Network

1 CHAPTER

Introduction

1.1 Introduction

This Chapter is a brief introduction to the contents of the entire doctoral thesis. It outlines a comprehensive overview at a quick glance. Section 2 describes the theoretical and contextual research background of the research study. The motivation and the objectives of the current research are presented in section 3, followed by a description of the research methodology. Section 5 describes the significance of the present research study. Chapter 1 concludes with the presentation of the thesis outline.

1.2 Research Background and Context

The research described in this study is aiming to explore and investigate the elements that affect the adoption of Information and Communication Technology (ICT) in the hotel industry in a turbulent environment which in this case is the COVID-19 pandemic that affected the world in all life aspects on a global scale (Akay, 2022; Dube et al., 2021; Haleem et al., 2020; Wang et al., 2022). Additionally, the research demonstrated that ICT adoption presented the hospitality industry with challenges and opportunities associated with survival of hotels during the pandemic. Furthermore, this study underlines the predominant theories through which this issue has been investigated.

In our contemporary fast-changing world, the business environment is characterized by rapid and highly unexpected changes that organizations must be able to overcome in a short period of time, in order to maintain their survival (Sambamurthy et al., 2003; Sultana et al., 2022). Thus, firms should be able to reinvent themselves to shifting environments (Eisenhardt & Martin, 2000). Especially in times of environmental uncertainty, ensuring resilience and long-term sustainability

are innovative steps deriving from the adoption of ICTs, their implementation and integration as well as adopting strategic flexibility (Hilty & Aebischer, 2015; Pateli, Kourouthanassis, et al., 2020; Sambamurthy et al., 2003). Additionally, prior literature examination revealed that investing in digital technologies is a way of achieving a competitive advantage in unpredictable and dynamic markets, which in the long run ensures the survival of the company (Mihalic & Buhalis, 2013; Sambamurthy & Zmud, 2000). However, Auramo et al. (2005) highlighted that the opportunities and benefits of technology depend on strategy planning and resource availability (Auramo et al., 2005).

The hotel sector had historically been reluctant to adopt and implement ICTs (Mihalic & Buhalis, 2013); micro, small and medium enterprise (MSME) hotels have been reported as late adopters of digital technology solutions (Strebinger & Treiblmaier, 2022). Nevertheless, scholarly attention towards understanding facilitators and inhibitors of ICT adoption has increased, especially as a means to tackle the challenges imposed by the pandemic (Hsu & Tseng, 2022). In addition, the latest information system (IS) literature on accessing an organization's state of digitalization is investigating its digital maturity (Thordsen et al., 2020). Digital maturity is defined 'as the status of a business digital transformation' (Chanias et al., 2019). Digital Transformation (DT) is possible by the adoption of digital technologies (Huijbens & Jóhannesson, 2019). Interestingly, there is only a limited number of studies investigating the technology adoption of MSME hotels (Kruja et al., 2019; Mohanty, 2019).

The DT journey of MSMEs in the hospitality sector started from the reorganization of websites, which were recognized as the primary channel for their clients during the pandemic, by sharing information about their COVID-19 policy and hygiene standards (Salem et al., 2022). Prior studies have revealed that websites create the first all-important impression of the hotel and could increase the direct bookings and build a hotel's brand (Lwin & Phau, 2013). Furthermore, mobile and remote-control applications have witnessed a wider use (Khanra et al., 2021). For example, some studies have reported that a vast majority of clients in China pay their hospitality bills via their mobile phones (Liu & Mattila, 2019). The pandemic increased the adoption and use of mobile technologies by hotels' guests. For example, the Hilton company employed a contactless check-in that uses face recognition software. Social media platforms represent another category of digital technology that is widely used in the hospitality sector to achieve direct communication

with customers (Kwok et al., 2022). They can be used as a strategic tool for achieving a reduction in operational costs as well as improving a client's relationship and loyalty (Pateli, Mylonas, et al., 2020). In terms of interorganizational systems, customer relationship management (CRM) systems have enabled hotels to gather and bring forth customer knowledge across different and multiple points of contact in order to obtain comprehensive knowledge about consumer behaviour and needs (Sigala, 2005). During the pandemic, CRM was shifted to become a vitally important tool for hotels to build long-term relationships with guests, which further impacts their innovation capability (Chi, 2021). The hospitality sector also closely monitors technology developments, including artificial intelligence (AI) and robotic technology (Tuomi et al., 2021). For example, the Henn-na Hotel in Japan introduced the first fully robotic-service-automated hotel world-wide (Buhalis & Leung, 2018) with studies reporting an increase in the acceptance of service robots, shifting service interactions towards purely technological communications (de Kervenoael et al., 2020). Recently, hotels have started to investigate the adoption of chatbots as a means of automating customer interactions and responding to their requests (Ivanov, 2020). A great number of studies have highlighted the significance and implications of ICTs in the hotel sector. Additionally, many scholars argue that the pandemic is a technological opportunity not only to overcome the severe health crisis but also to prepare for future challenges (Breier et al., 2021).

The research presents significant revelations in the technology and management literature. There has been general interest among scholars in ICT adoption such as robotics and AI conducted from the guest's perspective (Ivanov, Seyitoğlu, et al., 2020; Pizam et al., 2022). On the other hand, these technologies from the managers' standpoint remain under-researched (Ivanov, Seyitoğlu, et al., 2020). Thus, added knowledge is provided to hotel owners and managers. Furthermore, this study investigated a less explored but rather important technology adoption antecedent, namely organizational digital maturity under the context of hotels' culture, organizational structure, attitude towards technology, and organizational insights.

1.2.1 Capturing the Digital Maturity in the Business

Digital maturity is defined as the ability of an organization to systematically and efficiently adopt the ongoing digital changes through management practices, and it also refers to the DT journey (Bititci et al., 2015; Thordsen et al., 2020). Digital maturity encompasses two interweaved dimensions. From a technological stance, digital maturity reflects the extent to which organizational tasks are supported by information technologies. From a managerial stance, digital maturity reflects the organizational transformation efforts (i.e., upskilling or reskilling of employees, attitude of high management towards information technologies, redesigning business processes, and so on). Prior examination of hotel technology research revealed that scholars have given great attention to investigating the digital maturity of guests (Sun et al., 2020) and/or hotel employees (Sunny et al., 2019). Digital maturity is an emerging concept; hence, scholars have just started to propose pertinent measurement models. Thordsen et al. (2020) reviews extant digital maturity models. Their findings indicate that digital maturity organizations should be perceived as a multi-dimensional concept that involves cultural, organizational, technical, and managerial aspects of the firm (Thordsen et al., 2020). For example, technological elements may encompass hardware and software investments, whilst organizational elements may address human resources information technology skills and know-how (Oliveira & Martins, 2010). Likewise, organizational factors may include the culture of the firm, as well as the firm's strategy towards the human capital (Morakanyane et al., 2017). A similar perspective is reported by Kane et al. (2015) who relate the digital maturity of forms with aspects related to organizational digital capabilities, strategies, culture and talent and skills (Kane et al., 2015b). Under this prism, digital maturity is more of an organizational challenge rather than a technical one, since technology developments usually outpace the ways in which organizations evolve over time (Salviotti et al., 2019). Scholars may aggregate and estimate the current digital maturity level of the organization under investigation by capturing the individual performance of the firm in each dimension (VanBoskirk et al., 2017). Interestingly, not all organizations follow the same trajectory of digital maturity throughout their DT journey. Instead, digital maturity is context-specific and may follow idiosyncratic avenues (Remane et al., 2017). Among the plethora of tools to measure digital maturity, the current study considers that the recognition of digital maturity variables beyond the individual characteristics

could capture a deeper understanding of the digital technology adoption process as multi-dimensional factors that comprise the technological construct are investigated.

1.2.2 ICT and Moderators affecting its Adoption in the Hospitality Industry

At the time of the COVID-19 pandemic, ICTs were involved to manage the situation in the hospitality industry. Indeed, many hotels have adopted ICTs in their operations to ensure their existence (Goh & Baum, 2021a). ICTs can be defined as a set of tools used to send, receive and process information, including the required software, hardware, middleware, storage and technological devices (Zuppo, 2012). The ICT provide most tools, procedures and services that are required to support and accelerated the DT (Vial, 2021). ICT is also referred as digital technologies and both terms are used interchangeably (Evangelista et al., 2014) and thus those terms would be used in the present research study. However, although the terms are related, ICT refers to a broad range of technologies used for creating and processing digital data (Shortis, 2001).

ICTs have played a major role in the hospitality industry because, for instance, they enable more efficient transmittance of information, facilitate communication, empower transaction and enhance customer relationship management (Garbin Praničević & Mandić, 2020). Furthermore, ICTs offer access to hospitality products and services information from anytime and everywhere, for example, via mobile applications and web technologies (Buhalis, 2003). Especially at the time of the pandemic, the integration of ICTs in the hospitality sector offered a potential strong performance (Effendi et al., 2020a). Although, studies have highlighted the pre COVID-19 popularity of mobile applications and emerging technologies such as robots in the hotel sector (Ivanov et al., 2018; Liu & Mattila, 2019). Nevertheless, studies have confirmed that the pandemic has forced guests to opt for contactless applications as well as managers in order to response to guests' and market new demands (Kim et al., 2020; Nikopoulou et al., 2023). Therefore, scholars have agreed that the pandemic presented the opportunity to adopt and implement ICTs to help towards overcoming the ongoing health crisis and prepare for future challenges and potential future crises (Pizam et al., 2022). Thus, the increasing pressure to overcome the COVID-19 crisis and provide more sophisticated and tailored services to customers has led the hospitality sector to

become more reliant on ICTs (Garbin Praničević & Mandić, 2020). However, it is also important for the hospitality sector to constantly consider technological innovations to remain competitive and successful (Siguaw et al., 2006). Mihalič et al. (2013) underlined the important financial impact of ICT innovation on small-sized hotels, suggesting that, over time, an improvement of overall performance can be achieved (Mihalič & Buhalis, 2013).

In Greece, the vast majority of businesses are small- and medium-sized enterprises (SMEs), especially micro-enterprises (97.3%), which have been defined as the backbone of the Greek economy (Kravariti et al., 2021). According to the European Commission's definitions, micro-enterprises employ less than 10 employees. Small enterprises employ 11–50 employees, and medium-sized enterprises employ 51–250 employees. Tourism and the hospitality sector are considered one of the key pillars behind Greek economic growth. In 2019, travel, tourism and, hospitality accounted for 21.2% of the gross domestic product (GDP) and 10% of the total employment in the country (Zhongming et al., 2020).

Generally, tourism in Greece is a dynamic sector that needs to adapt to the fast-moving COVID-19 outbreak (Nicola et al., 2020; Pavlatos et al., 2021). During the pandemic, technology solutions and advances became an available and effective way to maintain a connection with clients, since strict measures to avoid human physical contact were applied (Rivera, 2020). Thus, the DT of the hospitality sector is accelerated because of the pandemic. The DT is rather a complex and dynamic process and is related to how to develop a DT strategy (Vial, 2021). Since the vast majority of companies are not ready for their digital future (Kane et al., 2015a; Vial, 2021), it is crucial for managers to understand the DT process to adopt it (Chanas et al., 2019). Recent studies have contributed to increasing the understanding elements and aspects of the DT phenomenon. Hence, since the DT highlights the impact of ICTs on the firms' structure, it is critical to fully understand the factors that could affect their adoption. In this sense, the investigation on an organizational level of the factors and moderators that affect the ICT adoption in the business could enable major business improvements in technological terms and ensure the DT.

In this context, besides the factors influencing the adoption of ICTs in the hotels, the investigation of the moderating effect of firm innovation index as a core element of businesses would add a building block of the DT process (Ruvio et al., 2014). Innovation has been transforming businesses, including the hospitality industry, in fundamental ways (Khan et al.,

2020). In terms of definition, firm innovation refers to the creation and implementation of novel products, ideas or processes within the firm and has demanding requirements in terms of infrastructure and organisational characteristics (Gopalakrishnan & Damanpour, 1997; Kessler et al., 2015). There are different conceptualisations of firm innovation regarding its importance to a firm's innovation success (Werlang & Rossetto, 2019). Sommer et al. (2017) defined firm innovation as the tendency of a business to adopt and implement innovation (Sommer et al., 2017). In addition, innovation can be defined as the intention to innovate new products or services (Damanpour, 1991). The increased popularity of firm innovation has been noted in the business literature (Ruvio et al., 2014). Singuaw et al. (2006) suggested that firm innovation has a direct and indirect influence on hotels' performance, ensuring long-term growth and success (Singuaw et al., 2006). Currently, investing in firm innovation brings about higher productivity, even though it could occasionally create difficulties arising from employees or even customers, training outlays and, undeniably, a significant financial cost (Mihalič & Buhalis, 2013). Overall, previous studies have revealed that digital maturity and firm innovation potential form the basis for exhibiting DT (Moldabekova et al., 2021). In addition, Phuong et al. (2015) suggested that, as an advanced technology innovation, cloud computing is positively affected by digital maturity and firm innovation as organisational factors of the TOE framework within SMEs (Phuong et al., 2015).

Further into the analysis of the moderators affecting the relationship between ICT adoption and the technological, organizational and environmental elements the size of the hotel is considered. The literature has defined organisation size as consistently referring to the number of employees, and this definition is used in the current study (Lippert & Govindarajulu, 2006; Racherla & Hu, 2008). According to Zhu et al. (2004), structural characteristics, including organisational size, play a critical role in the ICT adoption and implementation process of organisations (Zhu et al., 2004). Additionally, organisation size is a predictor of ICT adoption (Damanpour, 1992), though previous studies have provided conflicting outcomes regarding the impact of size on ICT adoption (Racherla & Hu, 2008) and pursuit of innovation (Baldrige & Burnham, 1975). A smaller firm is more flexible and requires less communication and coordination in order to achieve tasks (Zhu et al., 2004). On the other hand, smaller firms have constraints in terms of financial and technical resources, and are not willing to risk novel and unknown technologies (Lippert & Govindarajulu, 2006). Overall, the examination of the literature has revealed that the environmental context depends on contextual conditions such as the structure

of the industry, the competitive pressure, government regulations and the macroeconomic context (Depietro et al., 1990). In the current study, the focus is on government regulations that trigger at first a turbulent environment together with the COVID-19 outbreak. Previous studies have revealed that an environment lacking certainty could negatively affect the adoption of ICT (J. Chong & K. Olesen, 2017; Li et al., 2011). In addition, Effendi et al. (2020) suggested that firms with high uncertainty, such as COVID-19, are reluctant to adopt innovative ICTs (Effendi et al., 2020a).

The COVID-19 pandemic triggered technological challenges and changes that were supposed to arise years in the future. Therefore, this crisis, regardless of its severe drawbacks, can be seen as a driver to change (Mikac & Kravaršćan, 2021). In this vein, the hospitality sector has witnessed changes ranging from basic digital technologies to infrastructure that can lead to digital contactless accommodation (Mayor-Vitoria, 2023). Thus, the pandemic has set the bar to follow technological trends and redesign future digital strategies in the post-COVID-19 era. In this context, the current research has provided valuable evidence that has practical relevance in the hotel sector.

Consequently, the current research sheds light on ICT adoption by highlighting the moderating effects of firm innovation index and organisational size in micro- and small-sized hotels in Greece. The increased popularity of SMEs and ICT adoption in the hospitality industry has motivated researchers to explore the diverse factors within the TOE framework to understand the various internal and external elements influencing the adoption and implementation process (Racherla & Hu, 2008). However, there are limited empirical studies on what moderates the effect of the intention to adopt ICT and its usage. The current research is one of the first studies in the hospitality industry to provide empirical evidence of the moderating effect of firm innovation index and size on the relationship between ICT adoption and the TOE framework during the pandemic.

1.3 Research Motivation and Objectives

The ultimate motivation of the present research materialized from my theoretical and practical experience in the hotel industry for almost thirty years, as well as my educational background in

the travel, tourism and hospitality management. During my time and experience in the hotel sector I have witnessed the introduction and diffusion of digital technologies in the industry and their impact in daily operation. Motivation in the research field starts with curiosity (Loewenstein, 1994). This curiosity creates an enthusiastic desire to fully understand and make progress towards a particular goal (Markey & Loewenstein, 2014). However, staying motivated could become challenging for researches (Gross et al., 2020). Regarding the present study the willingness to continue making progress in a business field that I literally grew in, was my ultimate motivation and challenge.

The motivation for this research study was further triggered from the increasing interest of ICT adoption in the hospitality industry after the digital revolution of Industry 4.0 (Buhalis, 2000; Buhalis et al., 2019). Traditionally, the hospitality industry has been characterized as a labour-intensive sector (Iranmanesh et al., 2022). Nevertheless, the COVID-19 outbreak has accelerated the DT of the hospitality sector (Nikopoulou et al., 2023). The complexity and barriers of ICT adoption in the hotel industry in Greece requires adopting a novel theoretical model that could assist the DT journey. This research aims to shed exploratory light on the factors and moderators that influence ICT adoption in hotels, and what could be learned by adopting the present theoretical view.

The present research examines ICT adoption in the Greek hotel industry. The study objectives are as follows:

- To identify the importance of ICT adoption within the hotel.
- To provide an in depth-understanding of the TOE factors that influence the adoption of ICTs a hotels' business model.
- To test a theoretical framework that will explain and predict factors that affecting the ICT adoption in the hotel sector.
- Explore and investigate the moderating effects on the relationship between ICT adoption and the technological, organizational and environmental variables.
- To propose a conceptual theoretical business model for a hospitality firm or other industry and relevant emerging economies.

1.4 Research Methodology

The research process begins with the willingness to carry out research and the formulation of the research topic (Saunders et al., 2009). The literature was critically reviewed to carefully formulate the hypotheses of the present study. Thus, since this research started with theory, and ended up with a research strategy to test the theory, the deductive approach was adopted. The logic behind the deduction is based on the idea that when the premises are true, then the conclusions should also be confirmed as true (Saunders et al., 2003). Further in the deductive inference, the generalisability starts from the general to the specific and the data collection is used to access hypotheses related to existing theory. In addition, the main principal of the deduction posits the verification of the theory (Blaikie, 2018). Thus, the final characteristic of the deductive approach is generalisation. The formulation of the research process is illustrated in Figure 1-1.

To investigate the research hypotheses the mono-method approach was adopted by applying quantitative analysis using the structural equation modeling. The present research used a quantitative approach to explore the antecedents of ICT adoption in the hotel sector, from which they can improve a hotels' overall business performance.

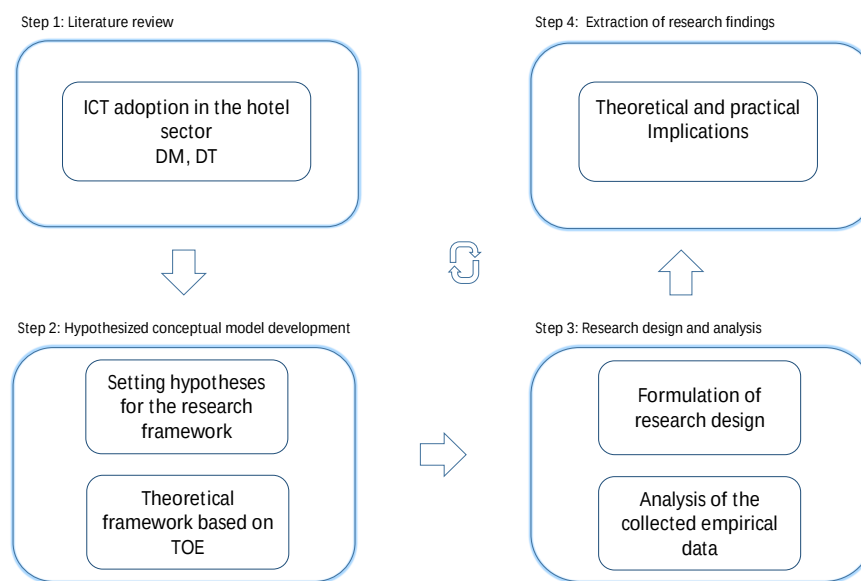


Figure 1-1. Research process.

Source: Own collaboration

1.5 Significance of the Research

The current study contributes to the body of knowledge on ICT adoption in the Greek hospitality by shedding light on organizational level aspects such as technological, organizational, and environmental factors that have only been moderately explored to date. Moreover, the research updates and extends the existing literature by incorporating existing theory into an empirical research design. Therefore, this study develops a business model contemplating a digital technology transformation in the COVID-19 pandemic. Hence, to the authors' knowledge this research adds evidence in the hospitality and management literature in the following ways:

- 1) The study is one of the first attempts to investigate the adoption of ICT in the Greek hospitality sector during the pandemic.
- 2) The current study is among the first research to explore the ICT adoption in the hotel sector from the managers' standpoint.
- 3) The present study investigates a less explored but rather important technology adoption antecedent which is digital maturity under the context of a hotels' culture, organizational structure, attitude towards technology, and organizational insights.
- 4) This study is one of the first studies in the hospitality industry field to provide empirical evidence of the moderating effect of firm innovation index and size on the relationship between ICT adoption and the technological, organizational and environmental variables during the pandemic.

1.6 Thesis Outline

This doctoral thesis has been structured into 8 chapters. Chapter 1 is the introduction and helps the reader to have a comprehensive overview of the research at a glance. It outlines the key elements and ultimately ties together the thesis. Thus, the research background and context are presented, followed by the objectives and motivation. The research methodology is also presented in Chapter 1. Lastly, this chapter includes significance and importance of the research study.

Chapter 2 provides a research literature review on the concept of ICTs adoption and implementation in the businesses over the cotemporary literature. Moreover, the second chapter is

dedicated to the perspectives and context of the investigated area. In this context, a large number of disciplines are presented. The DT is captured and followed by the description of assumptions regarding the adoption of digital technologies and the role of moderators in the hotel business. In the same context of analysis, the digital maturity term is explored. The chapter concludes with the presentation of the major public health-related crises that have affected business operation by emphasizing in COVID-19 health crises in the hospitality industry.

Chapter 3 introduces the theories associated with ICT adoption in businesses. Additionally, it includes theoretical definitions of the Technological-Organizational-Environmental framework, and these factors of the framework are investigated in-depth. Chapter 3 also presents information regarding scholars that have previously adopted TOE framework within the hospitality sector during health crises and the COVID-19 pandemic.

Chapter 4 extends the developments of chapters 2 and 3, and is directed towards describing how the technological, organizational and environmental elements can affect ICT integration in the hospitality industry. Consequently, the rationale of the hypothesized research model and proposed conceptual model are presented. This chapter concludes with the proposition on the moderating role of firm innovation index and the hotel size during COVID-19 turbulent environment, regarding the ICT adoption in the hotel.

Chapter 5 describes the research design and data applied to test the hypothesized research model. Furthermore, the research philosophy and approach are discussed. In this chapter the constructs and measurement variables are introduced, and the research targeted population is defined. The chapter concludes with the presentation of ethical issues and considerations.

Chapter 6 presents the analysis and results of the empirical application. Data is described and the respondent's profile. Following from this, are the results of the measurement and structural model. The results regarding the moderator affect are also presented in chapter 6.

Chapter 7 presents the main findings of the research. Subsequently, the presentation of the outcomes, research and practical implications are discussed in-depth.

Chapter 8 is the concluding chapter, it highlights the limitations of the research on the content, design and methodology basis. The doctoral thesis ends with the presentation of future research suggestions. Finally, this chapter deduces the conclusions of the empirical study.

1.7 Summary

Chapter 1 presented an introduction to the key concepts of the present research study. This introductory discussion aimed at framing the research. Then, the research motivation and objectives are described followed by the research questions and their approach. Having described the incentives and goals, the research methodology adopted in this study is briefly described. The chapter concluded with the significance of the research. Furthermore, in the analysis, tourism and hospitality industry contribute significantly towards the development of the economy in Greece and remain one of the main growth factors of the Greek economy. However, it needs some strategic adjustments to retain and increase its value and indeed, ICT adoption is the enabler towards this direction. In addition, the adoption of technology advances entails complicated decision-making that requires insight and input from strong research initiatives (Wang & Qualls, 2007)p. 570). The present study is aiming to provide knowledge regarding the ICT adoption as a profound way to achieve the DT of the Greek hotel sector.

2 CHAPTER

Review of Research Literature

2.1 Introduction

This chapter aims to conduct a comprehensive review of the literature regarding the components of this research. Section 2.2 begins with a description of the definitions and components of ICTs by emphasizing in the hotel sector. The next Section 2.3 describes the business value of ICT adoption, followed by the presentation of the concept of Digital Transformation (DT). Following this, Section 2.6 presents the digital maturity term as the basement of DT. Subsequently, Section 2.7 introduces information regarding the connection between ICTs, digital maturity and DT. Lastly, since the present research study was conducted during the COVID-19 outbreak, a concise description of the literature background of health-related crises is presented with emphasis given on the COVID-19 pandemic.

2.2 Information and Communications Technology (ICT)

The notion of ICT is more popular in Europe compared to the USA. In the USA, practitioners often use the term Information Technology (IT) which is considered as the extension of digital technologies (Jaremen, 2016). In the business and IT literature, several definitions for ICT were identified (Table 2-1). For example, ICT is defined as the various media used to communicate information such as computers and the internet (Chandler & Munday, 2011). Generally, the term ICT is accepted to mean all technologies that allow people to interact with the digital world (Shortis, 2001). Furthermore, ICT refers to all devices, networking components, applications and systems that facilitate this interaction with the digital world. More analytically, it refers to cloud computing, internet access, software, hardware, digital transactions, communication technology and data (Buhalis, 2022). These tools and processes are used in different fields such as education, healthcare and business (Haldorai et al., 2021; Lee et al., 2019). ICT includes a wide range of

tools and has dramatically changed the way people work, communicate and live; is continues to revolutionize all parts of the human experience (Vu, 2013). For example, email, chatbots and social media platforms have made it easier for people to stay connected around the world. Additionally, in the business world, ICT has become the key driver for innovation, DT and growth. For example, the use of customer relationship management (CRM) has made it easier to effectively to manage their relationships with customer and enhance customer satisfaction and loyalty (Guerola-Navarro et al., 2021).

Table 2-1. Definitions of ICT.

Definition ICT	Author(s)
The combination of manufacturing and service sectors that captures, transmits and displays data in an electronic way	(Colecchia & Schreyer, 2002)
Is the digital processing and use of information via computers. This process comprises 4 utilizations of information: 1) storage, 2) retrieval ,3) conversion and 4) transmission	(Sharma et al., 2007)
Includes various media in communicating information such as computers and the internet	(Chandler & Munday, 2011)
Technology assets that are widely available in the market	(Wang et al., 2012)

Source: Own collaboration

Thus, progress in ICT has dramatically changed business practice and structures (Buhalis & Law, 2008). ICT adoption involves the organizations' ability to use digital technology applications or processes in their business operation and activities (Parida et al., 2016). The adoption and implementation of ICT offers benefits to the hotels, including cost-related (Basker, 2012; Salim et al., 2013), productivity (Arvanitis, 2004; Hernando & Núñez, 2004; Wilson, 2009), operational, product or service improvements (Arvanitis, 2004), customers interaction (Sirirak, Islam, & Ba Khang, 2011), suppliers' interaction (Eustace, 2000), and marketing (Clayton et al., 2004).

The COVID-19 pandemic has impacted on all human activities and has significantly forced the widespread adoption and implementation of ICTs. For example, remote work and videoconferencing was a way to work while offices were closed, and social distancing was applied globally. An example of ICT tools was Zoom, Microsoft teams and Google meet (Williams, 2021).

Also, schools and universities have shifted to online learning platforms such as Google Classroom and Moodle, to ensure their education continuity (Aminatun et al., 2021). In addition, with physical stores closed online shopping has become an alternative option for many consumers (Koch et al., 2020) and many social events took place through virtual platforms (Silva, 2021). Overall, the pandemic has accelerated the adoption of digital technologies by enabling the global continuance (Zea Jiménez, 2023).

2.3 Business Value of ICT Adoption

Prior literature examination revealed that the business world is characterized by rapid and highly unpredictable changes that could destroy the value and existence of any firm (Sambamurthy et al., 2003). Thus, organizations need to reinvent themselves to match the constantly shifting markets (Buhalis & Cheng, 2020a). Moreover, in the context of the contemporary business world, environmental characteristics, globalization and digitalization are transforming the world and have a significant impact on the need to shift from traditional business theories to updated ones (Biggiero, 2006; Gill & VanBoskirk, 2016; Hart, 2010). In addition, it has long been argued that digital transformation should be at the heart of the business strategy (Gill & VanBoskirk, 2016). It turned out, that the most important means of achieving a competitive advantage in these fast changing environments is by making digital a core competency (Sambamurthy & Zmud, 2000; VanBoskirk et al., 2017).

Nevertheless, over the years, scholars have shown a contradiction on the relationship between ICT investment and business performance. In the past, researchers highlighted that there are no statistically significant outcomes between ICT adoption and implementation and business performance (Strassmann, 1990) (Roach, 1987). On the other hand, current research identified the positive impact of ICT integration and the business value that ICT generates (Beynon et al., 2021; Bogarin, 2022; Mihalic & Buhalis, 2013). But still, even if the positive side of technology is assumed, there is also a dark side, that should be taken into consideration (Buhalis, 2019). The dark side of technology integration within the firm might include privacy issues; digital exclusion; inefficient and failing networks and systems and elimination of human touch (Townsend, 2017).

Overall, investing in ICTs enables big transformation on business performance and triggers business benefits (Kim & Ramkaran, 2004; Leung et al., 2013; Pateli, Mylonas, et al., 2020).

In terms of the travel and hospitality industry, they have been characterized as reluctant to adopt technology (Buhalis, 2019). Thus, this could not be considered as a novel phenomenon since the early ages of the digital revolution; especially as international chain hotels have greatly favoured technology innovations to operate their business effectively (Buhalis & Main, 1998; Ostovare & Shahraki, 2019). Specifically, hotels, compared to other sectors, have been slowly adopting ICT due to the fact that the benefits exceed the expenses (Ostovare & Shahraki, 2019; Pateli, Mylonas, et al., 2020).

Prior examination of literature also revealed that digital technology adoption, implementation and integration have controversial outcomes in the tourism and hospitality research field. Hence, several research authors presented the positive impacts of digital technologies adoption and productivity (Brynjolfsson, 1993; Brynjolfsson & Hitt, 2000; Ham et al., 2005; Lucas Jr, 1993) and others have reported little relationship between digital technologies adoption and productivity (Banker & Kauffman, 1988; Dos Santos et al., 1993; Loveman, 1994). David et al. (1996) research highlighted the ‘productivity paradox’ of the hotel sector towards the adoption of digital technologies. The hotel managers who participated in the study have reported an absence of productivity expectations from technology adoption and installation (David et al., 1996). An important outcome that was highlighted from the study, is that the motivating factor to adopt digital technologies was to improve guests’ experience and loyalty rather than the hotel’s business productivity (David et al., 1996). The research of Omany (2014) suggested that a critical motivational factor towards digital technology adoption is the overall operational performance of the hotel (Omany, 2014). Further, Olsen et al. (2000) concluded that the adoption of ICTs will effectively improve productivity and service quality (Olsen & Connolly, 2000).

2.4 ICT Adoption and Implementation Timeline in the Hospitality Industry

In the past century, digital technology and technological novelties have developed exponentially over the last decades and ICTs have transformed into the engines of development and growth for any business firm (Bojanova, 2014). Regarding the hospitality industry, since the 1980s, ICTs have transformed the tourism industry dramatically (Buhalis & Main, 1998). Traditionally, hotels are reluctant in adopting and implementing digital technology at the same time, mainly higher-end luxury hotels are the early technology innovation adopters (Sahadev & Islam, 2005). The history of hotel technology is the proof: In 1894 the Netherland Hotel in New York City has introduced the first in-room telephone connection and in 1910 electricity becomes widely prevalent in hotels. Then in 1927, the Boston Park Plaza Hotel has displayed the first in-room radios. In 1946, as the bank system becomes more sophisticated, the Westin hotel chain debuts the first guest credit. One year later, in 1947, the Roosevelt Hotel in New York City has installed televisions in hotel rooms. The same year, the Westin Hotel has established the first hotel reservations system, and a decade later the Sheraton Hotel has introduced the first automated electronic reservation system and first toll-free reservation phone number (Berger, 2011; Bethapudi, 2013).

Then in the 1960s, toll-free reservation phone numbers were introduced in hotels and in the 1970s, the global distribution systems (GDSs)(Sheldon, 1997). In the 1990s Internet was launched and dramatically affected businesses' practices and strategies (Buhalis & Law, 2008). The internet era has introduced Web 1.0 technologies (1990-2005), and the hotels developed their presence through websites and e-commerce (Buhalis, 2003). For instance, more travellers used search engines seeking online information to design their traveling and hospitality experience (Ip et al., 2011). Then, online forums, blogs, online communities, and social media platforms have established the Web 2.0 presence (2005-2015) and contributed to an interactive internet (Miralbell et al., 2008). The growing number of travellers adopting Web 2.0 technology developed an influence on the decision-making process of future visitors (Pateli, Mylonas, et al., 2020). The Semantic Web (2015- 2020) introduced a range of advanced technologies such as artificial intelligence, robots, and chatbots in hospitality (Buhalis & Cheng, 2020b). The industry has already introduced the 4.0 Industrial revolution (2020-future) that includes the Internet of Things (IoT), fifth-generation mobile network technology (5G), big data analytics, Virtual Reality (VR),

cryptocurrency, and blockchain (Ting et al., 2020). This could not leave the hospitality industry unaffected in an ongoing way. Digital transformation in the hospitality industry has become more significant than ever before. On the other hand, the COVID-19 pandemic resulted in a broad technology-mediated customer experience across different segments of the hospitality industry (Ivanov, 2020). Many hotels have implemented updated service standards and precautionary initiatives (Chan et al., 2021b). For instance, robotic assistant concierges ‘services by delivering luggage in the guest’s room, or disinfection robots were used to kill viruses and bacteria through UV light (Mackenzie, 2020; Parvez et al., 2021). Consequently, for the hospitality industry to meet the rapidly changing demands of the COVID-19 outbreak, an approach that supports digital technology is required (Liu & Yang, 2021). Thus, ICTs have shifted from a behind-the-scenes tool, to a key strategy in the hospitality industry (Nyheim, Xu, Zhang, & Mattila, 2015).

2.5 The Phenomenon of Digital Transformation (DT)

In the digital age, organizations are changing much faster compared to past. In this context, the pressure for firms’ to follow technological trends is significant (Teichert, 2019). These technological trends include social media, cloud computing, the Internet of Things (IoT), Virtual and Artificial Intelligence (VR, AI). Consequently, they are transforming the environment and the structure context of businesses (Fichman et al., 2014). Thus, the phenomenon of DT has gained noticeable attention and interest for both practitioners and academia (Teichert, 2019). In this context, the role of organizational culture as a catalyst for DT has also been noticed (Denison & Mishra, 1995). In this regard, the ICT adoption motivated by DT engages the transformation of the organizational culture of the firm towards a technology driven changes (Hartl & Hess, 2017). The adoption of ICT is the enabler of DT (Vial, 2021). However, despite the rising interest in DT, there is a lack of a common definition and understanding identified (Pieretto & Hinterhuber, 2021). Generally, DT drivers include ICT usage, digital capabilities and, organizational triggers of DT (Vial, 2021). DT is possible by the adoption of ICTs. ICTs alone do not ensure the DT, however they do play a fundamental role and are definitely the foundation of digital transformation (Pieretto & Hinterhuber, 2021). Some scholars have defined DT as the use of technology to improve the organizational performance of the firm (Karimi & Walter, 2015). Others see it as the

blueprint that supports businesses in achieving the transformations by adopting and implementing ICTs, or as the usage of ICTs to improve a company's overall performance (Matt et al., 2015). The organization-centric conceptual definition of DT suggests that "DT is a process that aims to improve an entity triggering significant changes to its properties through combinations of information, computing, communication and connectivity technologies" (Vial, 2021)p. 13).

In order to successfully achieve DT, structural changes are required. Firstly, at the organizational structure, the ICT driven idea is necessary to ensure the DT as well as cross-functional collaboration (Maedche, 2016). Secondly, the organizational culture should be innovative and multimedia structured (Hartl & Hess, 2017). Furthermore, in the context of DT structural changes, the top management should work towards developing a digital mindset (Hartl & Hess, 2017). In addition, it is important to involve employees in digital-oriented roles (Yeow et al., 2018). However, barriers to DT are in existence. One significant barrier is considered to be the resistance of the employees when the ICTs are introduced within the company. Literature revealed that this barrier could be limited, when the potential benefits of ICT adoption and implementation are clearly communicated, as well as introduced correctly to avoid "innovation fatigue" (Fitzgerald et al., 2014). DT is linked to organizational level impacts such as operational efficiency. For example, previous studies revealed DT improves operational processes (Gust et al., 2017), cost savings, and decision-making (Ezeokoli et al., 2016). In addition, DT is associated with the improvement, financial performance, organizations' growth and competitive advantage (Pagani, 2013).

Despite recognizing the beneficial impact of DT, literature revealed that SMEs especially have significant constraints to successfully achieve this, since they are struggling with resource constraints, lack of digitally driven management and less aware of new technological trends and their benefits (Colapinto et al., 2021). Indeed, DT involves the usage of ICTs to make profound changes towards the creation of value that is further delivered to the firm and its customers (Verhoef et al., 2021). Thus, the managers should be cautious towards their DT and ensure that the use of ICTs is well adjusted to the business model (Fabian et al., 2021).

The digital revolution is changing dynamics in businesses, and the hospitality industry is not an exception, mainly because of the diffusion of technology advances creating the DT phenomenon. In order to meet technological trends, remain competitive and satisfy digital savvy -

customers, the hospitality sector needs to move toward its DT journey. The greatest challenge to achieve the DT is the change and transformation of the key enablers (Mairinger, 2019). Thus, the role of the owners and managers is fundamental in this process, since the organizational and cultural strategic change depends mainly on them (Bharti et al., 2022). The literature revealed that managers in the hospitality sector are acknowledging the benefits of DT (Alrawadieh et al., 2021). The DT in the hotel sector features high digitalization, such as tailored and customized services and smart device interaction (Pumaleque et al., 2021). For example, hotel rooms are transformed to smart with remote control or applications for the lights, the air-conditioner, the televisions and thus they could be easily switched on and off (Haktanır et al., 2022). Several studies have highlighted the benefits of using Chatbots in the hospitality sector. For example, they interrupted 24/7 human service, and became the initial responses regarding booking processes and guest enquiries, transforming the traditional way of doing business (Dash & Bakshi, 2019). Further into the digital era, the hospitality industry is well involved in the digital transitions, especially after the COVID-19 outbreak (Yik & Alizadeh, 2022).

2.6 The enabler of Digital Transformation: Digital Maturity

The academic research regarding digital maturity has increased since the Industry 4.0 (Teichert, 2019). However, there is no consistent definition available to describe digital maturity yet. The literature revealed a plethora of digital maturity models that show differences regarding content and methodology (Thordsen et al., 2020). The definitions are wide ranging. Scholars define digital maturity as the transformation of organizational and human capital into digital processes (Aslanova & Kulichkina, 2020). Others describe it as how firms are preparing to adapt to ongoing technological changes (Kane et al., 2015b). Chanias and Hess (2016, p.4) defined digital maturity as ‘the status of a company’s digital transformation’ (Chanias & Hess, 2016; Chanias et al., 2019). Digital maturity is related to DT and is actually the gradual process of ICT adoption and implementation of organization, human and other resources into digital processes (Teichert, 2019).

To assess a firms' digital maturity, several digital maturity models have emerged in the literature over the last years. For example, Westerman et al. (2011) introduced the four types of the digital maturity model. The 'Digirati' companies regardless of the industry, are digitally mature enough to gain and understand the benefits of ICT adoption and implementation (Westerman et al., 2011). Berghaus and Back (2016) presented the digital maturity and transformation report that proposed nine linear digital maturity levels (Berghaus & Back, 2016). Similarly, Ifenthaler and Egloffstein (2020) suggested the maturity model of technology adoption to identify the current state of adoption of ICTs within the targeted organization. The maturity scores range from the minimalist, conservative, pragmatist, and advanced to trailblazing (Ifenthaler & Egloffstein, 2020).

A digital maturity model consists of dimensions that are aiming to measure the levels of digital competency within an organisation (Braga Tadeu et al., 2019). These models have value for managers and practitioners since they enable the understanding of the current digital positioning of the company. Each of the models available have advantages and disadvantages and therefore it is challenging to choose the best suitable model for one specific company (Mullaly, 2014). The digital maturity process has several characteristics. Firstly, the process includes progressive stages and is not a spontaneous procedure. Thus, an organization progresses with different stages regarding its digital maturity (Kane et al., 2015a). The digital maturity models have different maturity dimensions depending on the scope and domain-specific industry. However, several models distinguish digital maturity in two main areas, stated as digital assets and digital transformation enablers. The digital assets include digital tools and infrastructure and the enablers comprise of the organizational culture and innovative value (Shahiduzzaman, Kowalkiewicz, Barrett, et al., 2017).

Digital maturity includes the technological and managerial interpretation of the company. In this regard, digital maturity describes what an organization has accomplished in terms of doing business in a digital way, including digital transformation in products, services and culture (Chanas & Hess, 2016). Therefore, the digital maturity models contribution relies on mapping of how firms approach their DT (Teichert, 2019). Furthermore, digital maturity models can support firms to evaluate their ability to encounter the DT (Teichert, 2019).

However, despite the existence and contribution of digital maturity models to assess the levels of digital foundation within the company as well as how to leverage this foundation for a strategic advantage (Shahiduzzaman, Kowalkiewicz, Barrett, et al., 2017), the application has limitations. The main point of criticism is based on deficient empirical evidence of the digital maturity models (Thordsen et al., 2020).

2.7 How are ICT adoption, Digital Maturity and Digital Transformation linked?

Digital maturity is the basement or the underlying element within Digital Transformation (DT) (Teichert, 2019). Digital maturity is the process of the adoption and implementation of ICTs into an organization and human resources to digital processes (Aslanova & Kulichkina, 2020). The literature revealed that digital maturity and digital transformation are used without considering any differences (von Leipzig et al., 2017). However, between digital maturity and DT significant differences exist. Digital maturity includes a systematic and holistic approach of a company's digital transition (Teichert, 2019). On the other hand, DT is a multifaceted phenomenon with multiple different impacts, depending on the industry (Tekic & Koroteev, 2019). DT encompasses two dimensions such as the usage of digital technologies and the digital maturity for digital operation (Tekic & Koroteev, 2019). To illustrate this, Tekic and Koroteev (2019) relate this concept to sweets and baking terminology, and have named ICTs as the key ingredient to make the digital transformation cake (Tekic & Koroteev, 2019). Based on this research, ICTs are the means for achieving DT (Tekic & Koroteev, 2019).

Further into this concept, the adoption and implementation of ICTs is part of the digital transformation in the organization. Digital maturity is closely related to DT. Scholars agree that digital maturity is the final stage of DT (Aslanova & Kulichkina, 2020). In order to complete the process of digital maturity as well as the DT of a company, digitally motivated employees and managerial attitude towards technologies are key components (Checchinato, 2021). Digital transformation is a multi-layered concept that triggers different impacts depending on the company. For example, for one organization it could be about adopting and implementing technologies advances (Caro & Sadr, 2019) and, for another it could be about completely

transforming the strategy of the company (Crittenden et al., 2019). These multiple facets of DT are also noticed on observations levels. For instance, some companies are seeing DT as a means to improve products or services and meanwhile other companies to foresee this as a way to enhance customers' experience (Tekic & Koroteev, 2019). Overall, outside of the hotel industry, DT encloses use of ICTs and structural changes (Fitzgerald et al., 2014).

Scholars highlighted that the ever-increasing complexity of the environment since the COVID-19 pandemic requires improving products and processes and building novel business models that incorporate digital technologies (Hinterhuber & Stroh, 2021). Furthermore, in order to successfully interpret DT, companies should adopt technology tools and update their strategy accordingly (Vescovi & Folonari, 2021). Emerging technology tools such as IoT, AI, Big Data, AR, VR and cloud computing could potentially produce the DT. However, the technological factor is also related to organizational culture and attitude towards adopting and implementing these technologies and the ability of the company being able to use them as innovate resources (Braga Tadeu et al., 2019). Overall, ICTs are the main driver for the DT journey and the level of digital maturity is directly connected with the level of digital competence of a company (Aslanova & Kulichkina, 2020).

The COVID-19 health crisis has triggered DT in organizations. Thus, transforming through the adoption and implementation of ICT became critical for many industries including the hospitality sector (Haktanır et al., 2022).

2.8 Health- related Crises in the Hospitality Industry

Over the last 50 years, the hospitality industry has witnessed unexpected diverse crises including natural (e.g., earthquakes, volcanoes, heatwaves) and human-made crises (e.g., financial, and political) (Harrington, 2021; Kapiki, 2012; Sydnor-Bousso et al., 2011; Wut et al., 2021). The list is long, the hotel sector has faced natural disasters such as a tsunami (Henderson, 2005; Rittichainuwat, 2013), health-related crises like severe acute respiratory syndrome (SARS) (Henderson & Ng, 2004; S. S. Kim et al., 2005; Lo et al., 2006), terrorists attacks including the 9/11 tragedy (Enz & Canina, 2002; Kosová & Enz, 2012; Kubickova et al., 2019), financial crises

such as the global financial crisis of 2008 (Cavero-Rubio & Amorós-Martínez, 2020; del Mar Alonso-Almeida & Bremser, 2013), real estate risks (Lee & Jang, 2012; Liu & Quan, 2012), non-existent before the competition of companies like Airbnb (Baek & Lee, 2018; Moreno-Izquierdo et al., 2019), refugee crisis (Nikunen, 2016) political crises (Harb, 2016; Leta & Chan, 2021) and scientific or industrial accidents (Robinson Jr, 2010; Susskind et al., 2016; Whitehead et al., 2018). According to academics, one of the most severe health crises that created a massive shock in the hospitality industry was the COVID-19 pandemic (Baum et al., 2020; Davahli et al., 2020). The COVID-19 virus was originally identified in China in November 2019 and the World Health Organization (WHO) announced a public international concern on the 11th of March 2020. The pandemic has triggered disruption in all aspects of human life (Sigala, 2021).

However, over the last decades, major virus outbreaks have affected the tourism and hotel sector in different countries and different ways. For example, in 1976, the well-known Bellevue Stratford Hotel in the USA experienced the deadly Legionnaires' Disease outbreak which nearly bankrupted the company (Shapoval et al., 2021). In November 2002, the widespread disease of SARS (Severe Acute Respiratory Syndrome) affected 26 countries (Wilder-Smith et al., 2020). China has been the mostly negatively affected from this outbreak and the losses in the travel and hospitality sector reached 2,8 billion dollars (Breda, 2004). Figure 2-1 illustrates the public health-related threats that affected the tourism and hospitality industry in both direct and indirect ways.

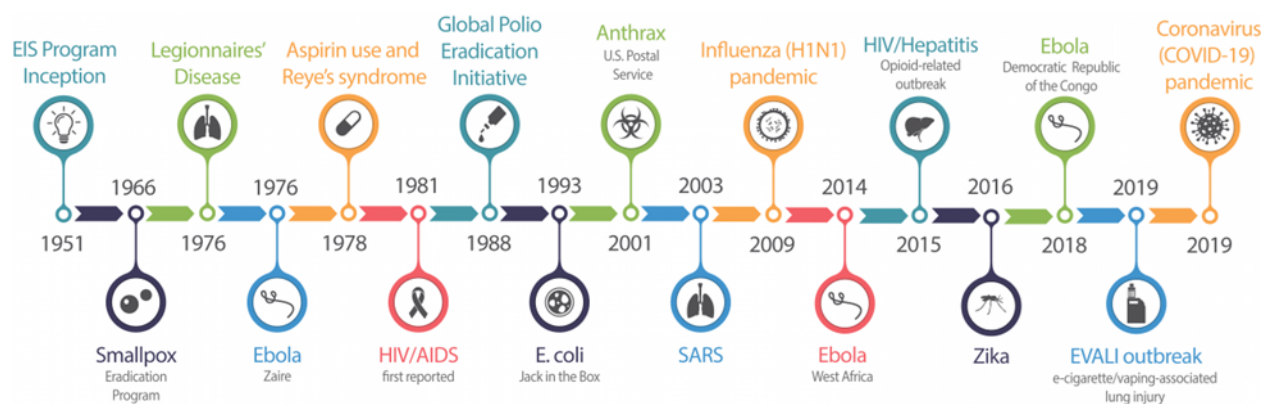


Figure 2-1. Public health-related threats timeline.

Source: Centres for disease control and prevention, <https://www.cdc.gov/eis/about/history.html>

Through these health-related crises the hotel sector has significantly used ICT to overcome them, by using different types of ICT in different ways (Barbe & Pennington-Gray, 2018a). For example, during the outbreak of the Zika virus in 2016, the hotels in Orland (USA), coped with this health emergency by adopting and implementing social media (Chaffey, 2016). Social media is considered an important tool for crisis communication, since almost 1.6 billion people use social media globally and it allows real-time communication between the involved parties (Sigala, 2011). Thus, it is critical for hotels to inform their guests how to keep themselves safe (Coombs, 2007). In the case of the Zika virus, hotels informed their guests of where to purchase mosquito repellent, as Zika is a mosquito born virus (Županc & Petrovec, 2016). Furthermore, the response of the hotels in China to SARS and H1N1 flu was done by the adoption of mobile technology that enabled hygiene and cleanliness in order to ensure their hygiene surveillance (Hung et al., 2018).

2.9 The Health-related Crisis of COVID-19 in the Hospitality Industry

The unprecedented conditions of restrictive measures that were suddenly imposed globally when the World Health Organization (WHO) announced the emergence of the COVID-19 outbreak, dramatically affected the tourism and hospitality sector (Sigala, 2020). By halting the travel and tourism activities, Greece couldn't remain unaffected (Ntounis et al., 2022; Pavlatos et al., 2021). In financial terms, the United Nations World Tourism Organization (UWTO) announced that in 2020, one billion fewer tourist arrivals had been reported, which was calculated as a loss of 1,3 trillion US dollars in total revenues (Tremblay-Huet & Lapointe, 2021). Government attempts to control the spread of the deadly COVID-19 virus have introduced strict measures, including social-distancing, lockdowns, shut-down of businesses, and closing of borders to restrict physical human contact (Shine, 2020). Due to the nature of the hospitality and tourism industry, which involves high human interaction, both have become one of the most affected industries worldwide (Dube et al., 2021; Gursay & Chi, 2020; Nicola et al., 2020; Ntounis et al., 2022). Hotels implemented digital technology to a greater extent at the time of the

COVID-19 outbreak, as digital technology is an alternative option to maintain connection with clients (Chadee et al., 2021; Liu & Yang, 2021; Majumdar, 2021).

Thus, in terms of technology, the pandemic produced new challenges in the hospitality industry (Liu et al., 2021). Many hotels have implemented novel service standards since the COVID-19 outbreak (Chan et al., 2021b). For example, to avoid direct contact with their guests, hotels have adopted touchless mobile keys that bypass the reception desk and mobile applications have been adopted to inform guests about service information, as well as the hotel's COVID-19 policy (Chan et al., 2021b). In addition, COVID-19 triggered the acceptance of service robots, accomplishing a shift from human to technology communication to eliminate the human physical touch (de Kervenoael et al., 2020; Tussyadiah, 2020). This reflects the contribution and critical role of technology in the future growth of the hospitality industry (W. G. Kim et al., 2005). The nature of hospitality has been characterized by “high-touch” and “low-tech” experiences; the pandemic has transformed the hospitality service via digital technological tools and processes into “low-touch and high-tech” (Sharma et al., 2021). Over the course of COVID-19, there has been an enormous shift in the use of digital technology in the hotel sector (Sigala, 2020). Although hospitality trends are rapidly changing, the main goal of hotels, as for any other for-profit business, is to maintain growth and profitability (Anagnostopoulou et al., 2019; Dimitrić et al., 2019; W. G. Kim et al., 2005). ICT adoption in hotels significantly affects the overall performance, including operational productivity, customer satisfaction, enhancement of the efficiency of employees in the workplace, reduction of operating costs, and higher service quality (Bethapudi, 2013; De Pelsmacker et al., 2018; Sirirak, Islam, & Khang, 2011; Wiesböck & Hess, 2020). At the time of the COVID-19 pandemic, ICTs were introduced to manage the situation in the hospitality industry. Indeed many hotels have adopted ICTs in their operation to ensure their existence (Goh & Baum, 2021b).

2.10 Summary

The ICT adoption by hospitality firms has demonstrated unique characteristics that require particular approaches in exploring the digital technology adoption process (Wang & Qualls, 2007).

Further into this analysis, MSME hospitality stakeholders are characterized by insufficient education and training regarding digital technologies, and the ignorance of ICT business value and closed ICT architecture (Cline & Warner, 2001; Heart & Pliskin, 2002b; Kruja et al., 2019). Thus, the understanding of the importance of ICT adoption within the hotels is fundamental. In this chapter, the business value of ICT adoption and implementation is discussed. ICTs adoption that will lead to DT, requires an attitude and cultural shift towards a technology driven mindset (Checchinato, 2021). Hence, capturing the digital maturity and DT of businesses and especially of the hospitality sector is presented. This research was conducted during the COVID-19 outbreak and therefore information regarding the COVID-19 virus and its impact in the hotel sector are discussed in this Chapter 2.

3 CHAPTER

Technology - Organization - Environment (TOE) Framework

3.1 Introduction

This chapter is aiming to present the theoretical background as the basis of the hypothesized research model presented in the current research. In addition, the purpose of the chapter is to present the most influential theories, models and frameworks on ICT adoption which are presented in section 3.2. Moreover, Chapter 3 provides a thorough review of the TOE framework. The three contexts of the TOE framework are presented in the following sections. Starting with Section 3.3.1.1 which outlines the technological context, Section 3.3.1.2 presents the organizational context followed by environmental context in section 3.3.1.3. Then, in Section 3.4 the TOE framework is presented through its application in the hospitality industry. Section 3.5 provides information about the adoption of the TOE framework in the hospitality industry during health crises and 3.5.1 specializes in the health crisis of COVID-19. At the end of Chapter 3, the summary is discussed.

3.2 Theories associated with ICT integration

Over time, for the adoption and implementation of ICTs in the businesses' several models, theories and frameworks have emerged. These are summarized in the current section. The adoption and implementation of ICTs entails organizational as well as individual changes (Awa et al., 2010; Lundblad, 2003), therefore the process of ICT adoption and establishment has proven challenging for the firms (Grudin, 1989; Orlikowski, 1992; Pateli, Kourouthanassis, et al., 2020; Zhu et al., 2004). This exact complex phenomenon associated with the adoption and implementation of ICTs, has led researchers and practitioners seeking to explore, understand and manage the field. Thus, extensive literature on ICT adoption and implementation is exists and is still growing in terms of numbers (Jeyaraj et al., 2006; Korpelainen, 2011; Millán et al., 2021; Mushtaq et al., 2022). More

analytically, according to Sila (2013) several theories have been developed to identify the elements that influence the adoption of ICTs at organizational level (Sila, 2013). Among competing theories of ICT integration, including institutional theory, innovation diffusion theory and the technology-organization- environment framework have received great attention from researches (Sila, 2013).

The institutional theory suggests that the firms' adapt to pressures by conforming to practices and strategies that are legitimate within the institutional environment. The isomorphic pressures have three types which are mimetic, coercive and normative (DiMaggio & Powell, 1983; Gibbs & Kraemer, 2004; Huang et al., 2010; Lin & Lin, 2008; Teo et al., 2003). Previous researches used the institutional theory and the TOE framework together as the institutional variables supplement of the environmental context of the TOE framework (Gibbs & Kraemer, 2004; Soares-Aguiar & Palma-dos-Reis, 2008).

Concerning the Diffusion of Innovation (DOI) by Rogers (Rogers et al., 2014) it is a socio-psychological theory, that aims to predict how people and firms make decisions regarding the adoption of innovative ICTs, by investigating their adoption behaviours and patterns (Min et al., 2021). The DOI is one of the oldest social and psychological science theories that was developed from Rogers in 1962; explaining how, why and what influences new ideas and technology diffusion (Rogers et al., 2014). The DOI theory proposes four components that influence the spread of a novel idea: innovation, communication channels, time and social system (Rogers et al., 2014). Oliveira et al. (2010) suggested that in DOI theory, various organization characteristics should be identified to successfully predict intention to adopt and implement technology within the firm (Erind, 2015; Oliveira & Martins, 2010). According to DOI theory at the organizational level a constitution of three groups of drivers for innovation adoption is presented: 1) innovation characteristics 2) organizational structure characteristics and 3) the environmental characteristics (Rogers et al., 2014). In regards to innovation characteristics, they may include relative advantages, compatibility, complexity, trialability and observability (Rogers et al., 2014). The literature supports that DOI has consistent empirical support (Dibra, 2015; Elmghaamez et al., 2022; Lundblad, 2003; Pateli, Mylonas, et al., 2020). Although DOI has been widely used to explore ICT integration, it fails to identify variables that are related to organizational culture and structure, external factors and inter-organizational relationships might affect the technology adoption and implementation (Awa et al., 2016; Cheung & Lee, 2012).

The TOE framework is consistent to DOI, however TOE introduces a broader scope of the environmental and organizational context (Wang et al., 2016). Further to the influential theories concerning ICT adoption and implementation on individual level. A popular theory for ICT integration in the business is the Technology Acceptance model (TAM) (Korpelainen, 2011) together with a more recent version of TAM (Davis et al., 1989), known as TAM2 (Venkatesh & Davis, 2000). Davis et al. (1989) has presented the theoretical model aiming to predict the elements of ICT usage behaviour. This model uses the Theory of Reasoned Action (TRA) as a basis (Ajzen, 1991). Moreover, in TAM, two theoretical constructs which are perceived usefulness and perceived ease of use are critical determinants that predict the intention to use ICTs and the actual usage of them (Davis et al., 1989). Furthermore, one of the most cited theories is TRA (Korpelainen, 2011). This psychological theory is developed from Ajzen et al. (2010) and is a special issue of the Theory of Planned Behaviour (TRB). Overall, the TRA suggests that an individuals' behaviour is determined by the intention to perform the behaviour and that this specific intention is actually a subjective norm towards the behaviour (Ajzen, 1991; Fishbein, 1979). Moreover, the TRA is focused on the prediction and understanding of individuals' behaviour concerning technology adoption. Further examination on the technology literature, revealed that the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2000) is a unified model which suggests that the usage of technology is determined by an individuals' behavioural intention (Venkatesh & Davis, 2000). This model suggests that the direct key elements that affect the likelihood of adopting technology are: performance expectancy, social influence, effort expectancy, social influence and facilitating conditions moderated by age, gender, experience and voluntariness of use (Venkatesh et al., 2003). In addition to ICT adoption theories, the six stage IS implementation model by Cooper and Zmud (1990) proposed an ICT implementation model to investigate diffusion (Cooper & Zmud, 1990). The six stages include initiation, adoption, adaptation, acceptance, routinization and infusion. Hence, this model covers ICT implementation from the organizational needs to the effective use of ICT (Abubakre et al., 2011). Next, the information systems success model introduced a comprehensive understanding of IS success, by exploring the most critical dimensions of success concerning the IS information systems (DeLone & McLean, 2003).

Overall, the theories that are developed to predict intention and behaviour concerning digital technology adoption and implementation at individual level are the psychological TPB that relates

beliefs to behaviour (Ajzen, 1985); TRA or ToRA aims to investigate the relationship between attitudes and behavioural intention within human action (Fishbein & Ajzen, 1980); TAM explores how individuals come to accept and use technology (Davis et al., 1989); whereas UTAUT and UTAUT2 aim to investigate user intention to use technology and its behaviour towards the technology (Venkatesh et al., 2012; Venkatesh & Zhang, 2010). However, examination on literature revealed that although this classification of organizational and individual level theory is accepted, it brings up bias (Awa, Ojiabo, et al., 2017; Awa et al., 2016). More specifically, as information even on an organizational level could only be gathered from individuals in the organization, where the key-informant bias is obtained. Li (2020) tried to explain to what degree is “objective” within the organization and, thus he has demonstrated an equivalence of TOE when individual perception was examined (Li, 2020).

In addition to ICT adoption and implementation, Poon and Swatman (1999) proposed the stage model of e-commerce adoption which is focusing on the level of integration of ICTs (Poon & Swatman, 1999). This model highlighted that integration would increase as firms realize the potential benefits of e-commerce. Further into the adoption models that have been proposed by researches to track down ICTs integration, is the Technology-Organization-Environment (TOE) framework (Depietro et al., 1990; Tornatzky et al., 1990) that in comparison with the above mentioned models, is the most dominant in studying organizational level adoption (Awa et al., 2016; Gangwar et al., 2014).

3.3 Technology - Organization -Environment (TOE) framework

3.3.1 Elements of TOE framework

In accordance with the TOE framework, contexts are separated into three types that can impact the technological adoption and implementation process. These are demonstrated as follows. The Technology–Environment–Organization (TEO) framework is described in Tornatzky and Fleischer’s book *The Processes of Technological Innovation* (1990) (Tornatzky et

al., 1990). The framework is often cited as Tornatzky and Fleischer (1990), as they have been the editors of the book. However, the authors of the study were De Pietro, Wiarda and Fleischer (1990) (Depietro et al., 1990). This theoretical framework focuses on higher characteristics of the firm and not solely on individuals' behaviours.

The TOE framework describes three different elements of a firm's context influence adoption decisions. These three elements are the technological context, the organizational context, and the environmental context. All three are posited to influence technology adoption (Depietro et al., 1990). The inclusion of these contexts precisely sets TOE as the most suitable theory for scrutinizing technological adaptability, technology usage, and generation of value from technological novelties (Hossain & Quaddus, 2011; Oliveira & Martins, 2010; Ramdani et al., 2009; Zhu & Kraemer, 2005). The technological context outlines the internal and external technologies relevant to a firm (Depietro et al., 1990). Conclusively, through the lens of this context, technology can be regarded in material terms as equipment, and nonmaterial terms as data and usage methods (Bose & Luo, 2011). In regards to the organizational context, it refers to depictive measures connected to firms, referring to the firm's scope, size, financial resources, and administrative beliefs (Hossain & Quaddus, 2011; Jang, 2010; Lee et al., 2010; Lin, 2009; Musawa & Wahab, 2012; Ramdani et al., 2009; Wang et al., 2010) (Carnaghan & Klassen, 2007; Raymond & Uwizeyemungu, 2007). They are characterized as pivotal to a firm's adoption of technology novelty. In addition to organizational readiness, senior leadership support is another catalyst for the organizational acceptance of digital technology (Racherla & Hu, 2008; Wang et al., 2010). Thong (1999) showed that senior management could encourage alterations by communicating and augmenting value and providing a joint vision for the firm (Thong, 1999). Lastly, the environmental aspect examines the environment in which a company is active (Martins et al., 2019). It focuses on the environment where a firm carries out its business transactions, prioritizing external aspects that could be swaying the industry, such as government incentives and regulations (Salwani et al., 2009) and the general application by other external powers (Depietro et al., 1990).

A review of the literature revealed that TOE theoretical framework has developed into a long-established method which studies the way a firm embraces and implements technology solutions (Abed, 2020; Awa et al., 2016; J. L. Chong & K. Olesen, 2017; Wang et al., 2010; Zhu et al., 2004). The TOE framework represents one segment of the adoption process – how the firm

context influences the adoption and implementation of technology solutions. The TOE framework is a theory based on organization level and describes three different factors that affect a firm's adoption and implementation of digital technology decisions (Bose & Luo, 2011). Thus, these three elements affect the way a business sees the need for and adopts novel technology. The solid theoretical structure, steady observational infrastructure and reliability in order to apply numerous technological novelties, has enabled TOE to stand out amongst many other theories (Awa et al., 2016; Oliveira & Martins, 2010). The name of the TOE theoretical framework occurred from the three components of this theory, which affect the procedure of organizational implementation and utilization of technological innovations (Bose & Luo, 2011). The theoretical framework describes the entire process of innovation, stretching from the development of innovations to the ratification and utilization of those innovations inside the firm's context. The revolutionary approach of Tornatzky and Klein (1982) and Pietro et al. (1990) portrays the idea that technological innovation shall be investigated spotlighting on organizations entity rather than partially (Depietro et al., 1990; Tornatzky & Klein, 1982). Exactly this inclusion of these contexts manages to set TOE as the most suitable theory for scrutinizing technological adoptability, technology usage and generation of value from technological novelties (Hossain & Quaddus, 2011; Oliveira & Martins, 2010; Ramdani et al., 2009; Zhu & Kraemer, 2005). An additional supremacy could be recognized as for the independence from industry and firm-size boundaries (Wen & Chen, 2010). Thence, it presents a comprehensive view for the adoption of technology, its application, apprehending challenges, its effect on value chain occupations, the post-adoption diffusion between companies, aspects leveraging hotels innovation-adoption choices in order to advance their organizational efficiency via ICTs (Lin & Lin, 2008; Salwani et al., 2009; Wang et al., 2010; Zhu et al., 2004).

Existent literature about the TOE framework confirms its wide application and vivid supremacy on numerous technological, industrial and cultural contexts (Baker, 2012), with its extensive used in organizational technology adoption researches, including for instance; broadband mobile application adoption (Chiu et al., 2017), radio frequency identification (RFID) systems (Ozturk & Hancer, 2014), social media (Alhassan & Adam, 2021), adoption of Artificial Intelligence (AI) and robots by industrial and building companies (Chatterjee et al., 2021; Pan & Pan, 2020; Simões et al., 2020) and e-business (Lin & Lin, 2008; Xu et al., 2004; Zhu & Kraemer, 2005). A selection of studies is presented below in Table 3-1.

Table 3-1. Literature survey of studies that used TOE framework from 2011 to 2022.

Author(s), Date	IT Adoption	Source	Analysed Variables	Context and data
Borgman, H. P., Bahli, B., Heier, H., & Schewski, 2013	Cloud computing	(Borgman et al., 2013)	Technology- relative advantage, technology complexity, technology compatibility Organization – firm size, top management support, IT expertise of business users Environment- competition intensity, regulatory environment	24 global enterprises across various firms, IT executives, interview
Bagale, G. S. (2014)	E-commerce (EC)	(Bagale, 2014)	Technology-relative advantage, compatibility, complexity Organization-financial commitment, top management support, profile of SMEs, profile of owner/IT head Environment- trading partner pressure, competitive pressure, information intensity, government support	Sample-not specified Micro- SME, India
Awa, H. O., & Ojiabo, O. U. (2016)	Enterprise resource planning (ERP)	(Awa & Ojiabo, 2016)	Technology- ICT infrastructures, technical know-how, perceived compatibility, perceived values, security Organization- size of the firm, demographic composition, scope of business operations, subjective norms Environment, external support, competitive pressure, trading partners' readiness	244 firms from various sectors such as maintenance, legal services, healthcare services, laundry and dry cleaning, make-ups and management consultancy, questionnaire to managers/ owners and senior executives, Nigeria, Africa
Salleh, K. A., & Janczewski, L. (2016).	Big data solutions (BDS)	(Salleh & Janczewski, 2016)	Technology-perceived complexity, perceived compatibility Organization- top management support, information security culture, organizational	25 firms from various sectors such as consumer goods, education, energy and natural resources, financial services,

			learning culture Environment- security/privacy regulatory concerns	government, healthcare, IT and technology, telecommunications, Chief information officer/IT director, IS/IT management, information security management, Australia
Chiu, C. Y., Chen, S., & Chen, C. L. (2017)	Broadband mobile applications	(Chiu et al., 2017)	Technology- relative Advantage, compatibility, complexity, trialability, observability Organization - information intensity, management support, employees' knowledge, absorptive capability Environment – competitive pressure, business partner, external supports, government supports	411 respondents from services manufacturing from mid-level and high- level position via email, Taiwan
Bhattacharya, M., & Wamba, S. F. (2018).	Radio frequency identification (RFID)	(Bhattacharya & Wamba, 2018)	Technology-Relative and advantage, cost, complexity, compatibility Organization- top management support, size, IT expertise Environment – Competitive pressure, external support, catalyst agent	74 experts such as consultants, academics, retail practitioners and third-party service providers, electronic questionnaire to top management, IT management and executives
Tripopsakul., S. (2018)	Social Media Adoption	(Tripopsakul, 2018)	Technology-relative advantage, complexity, compatibility, trialability, observability Organization- Academic support, entrepreneur, innovativeness, IT experience Environment- Competitive pressure, customer pressure, social pressure	357 respondents, online questionnaire-based survey residing in Thailand

Cruz-Jesus, F., Pinheiro, A., & Oliveira, T. (2019)	Customer relation management (CRM)	(Cruz-Jesus et al., 2019)	Technology- Technology competence, data quality and integration Organization- top management support Environment- Competitive pressure	227 CFOs, various sectors such as manufacturing, financial and banking, construction, distribution and commerce, e- questionnaire
Ijab, M. T., Wahab, S. M. A., Salleh, M. A. M., & Bakar, A. A. (2019)	Big data analytics (BDA)	(Ijab et al., 2019)	Technology- technology and skills infrastructure Organization- senior leadership, policy and legal framework, institutional structures, management policies and procedures, demand for big data, funding for BDA program Environment- BDA Engagement with external parties	10 respondents Implementer, academician, professional and top management, interview, National University of Malaysia,
Sugandini, D., Effendi, M. I., & Istanto, Y. (2019)	Social media adoption	(Sugandini et al., 2019)	Technology- perceived usefulness (PU), perceived ease of use (PUE) Organization-managers innovativeness, barriers to adoption, attitude Environment – pressure from competitors	200 respondents, hotel managers, Yogyakarta, Indonesia
Abed, S. S. (2020)	Social commerce	(Abed, 2020)	Technology – Perceived usefulness, security concern Organization-top management support, organizational readiness Environment- consumer pressure, trading partner pressure	181 social commerce SMEs, Questionnaire to owners, managers and employees, Saudi Arabia
Gui, A., Fernando, Y., Shaharudin, M. S., Mokhtar, M., & Karmawan, I. G. M. (2020).	Cloud computing	(Gui et al., 2020)	Technology-relative advantage, complexity, compatibility, privacy concerns, vendor lock-in Organization-top management support, organizational readiness Environment- competitive pressure, government support,	135 managers, medium enterprises (MSMEs), online questionnaire Indonesia

			business partner pressure, regulatory policies	
Kumar, A., & Krishnamoorthy, B. (2020).	Business analytics (BA)	(Kumar & Krishnamoorthy, 2020)	Technology- technology assets, compatibility Organization- top management support, data environment, data driven organizational culture, perceived cost Environment- competitive pressure, industry type, customer orientation pressure	21 respondents, media and entertainment, banking and finance, insurance, e commerce, telecommunication, chief technology officers, senior managers, semi- structured interview, India
Kim, Y., & Kim, B. (2021).	Continuity of information security	(Kim & Kim, 2021)	Technology- compatibility, system quality, preparedness Organization-Leader's support, organizational, financial support Environment-laws and regulations, institutional support, market competition	107 industrial security workers in the IT/information communication industry, online survey, Seoul
Malik, S., Chadhar, M., Vatanasakdakul, S., & Chetty, M. (2021).	Blockchain	(Malik et al., 2021)	Technology- perceived benefits, perceived compatibility, perceived complexity, perceived information transparency, perceived disintermediation Organization- organization innovativeness, learning capability, top management support Environment- competition intensity, government support, trading partners readiness, standards uncertainty	917 Automotive, construction, consultancy, education, electronics, finance, government, IT, manufacturing, pharmaceutical, retail, supply chain, telecommunication, transport, online survey Australia
Stjepić, A. M., Pejić Bach, M., & Bosilj Vukšić, V. (2021).	Business intelligence systems (BIS)	(Stjepić et al., 2021)	Technology- comparative advantage, complexity, compatibility, key personnel ability Organization- top management,	100 SMEs in information and communication activities, respondents' top managers, IT professionals and

			organizational readiness, data management Environment- competitive pressure, vendors' quality	employees online- questionnaire, Croatia
Wallace, S., Green, K., Johnson, C., Cooper, J., & Gilstrap, C. (2021).	Cybersecurity	(Wallace et al., 2021)	Technology-tech provider, IT resources, IT research, monitoring, protocol, consultant, IT policy, policy dissemination Organization- culture, committee, structure, user Environment- customers, competitors, suppliers, market, government regulations, cyber-attacks,	Manufacturing, non- profit and service, semi-structure interview c-level executives and IT consultants, US Midwest

Source: Own collaboration

The TOE framework has proven to be a long-established method which studies the way a firm embraces and implements various ICTs (Zhu et al., 2004). An illustration of the TOE is shown in Figure 3-1.

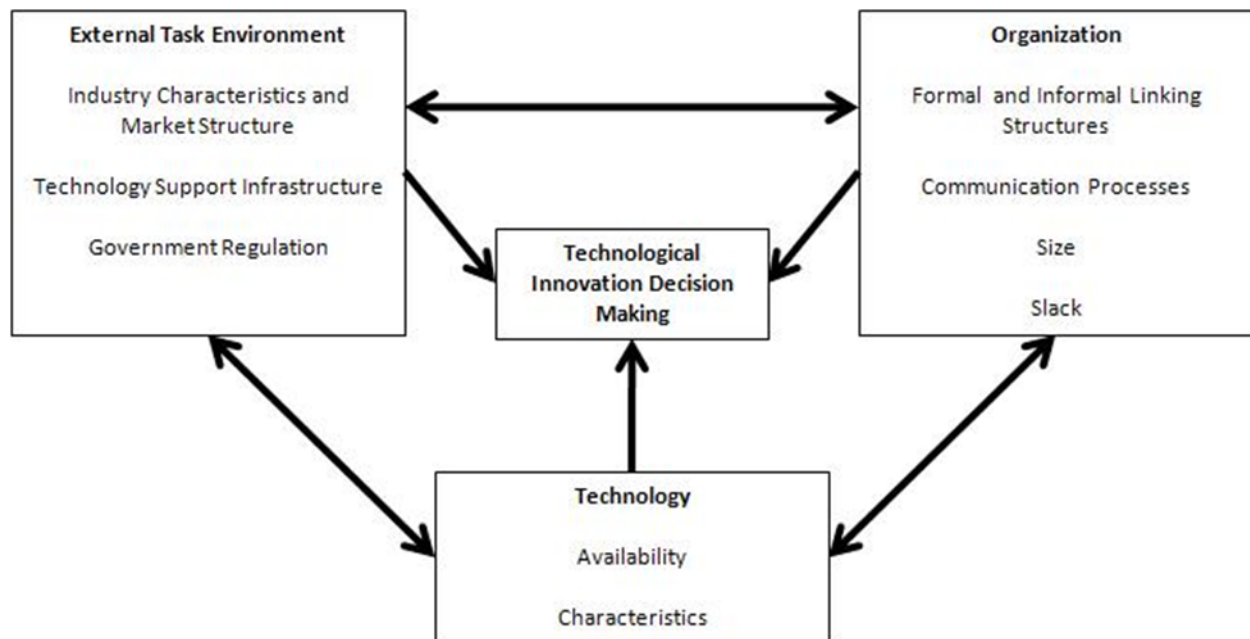


Figure 3-1. Technology-Organization-Environment framework (Tornatzky and Fleischer 1990, p. 154).

3.3.1.1 The Technological Context

The technological context includes the inner and outer technologies that are relevant to the business (Depietro et al., 1990; Tornatzky et al., 1990). Technologies could include equipment and process. More analytically, the technological context includes the technology that has already been used within the firm, as well as the digital technologies solutions that are available in the market, but have not yet been used by the firm (Cruz-Jesus et al., 2019). In a concise way, the technology development context describes the availability and characteristics of technology in the firm, as well as the perceived usefulness of this technology (Awa et al., 2016). The internal technologies refer to the already implemented practices and technologies and external technologies refers to those available on the market. This indicates that the main attention of the technological context is about how technology characteristics themselves can influence the adoption process. Technological context is comprised of the variables that influence firms' acceptance of innovations (Hung & Law, 2011). Furthermore, Tornatzky and Klein (1982) singled out five attributes in their meta-analysis of plentiful studies, referring to compatibility, complexity, observability, trialability, relative advantage and direct and indirect benefits that effect the probability of adoption (Dedrick & West, 2003; Rogers et al., 2014; Tornatzky & Klein, 1982). In addition, examination of literature identified more elements that have been used to investigate the intention to adopt and implement technology in the organizations. Those elements except the above mentioned, are communicability, divisibility, cost, profitability, and social approval (Tornatzky et al., 1990). Indeed, trialability and complexity, perceived direct and indirect benefits and standardization are also important variables (Musawa and Wahab, 2012; Alamgir Hossain and Quaddus, 2011; Thiesse et al., 2011; Jang, 2011; Wang et al., 2010; Ramdani et al., 2009; Huang et al., 2008; Lin and Lin, 2008; Carnaghan and Klassen, 2007; Raymond and Uwizeyemungu, 2007). Perceived direct benefits refers to the acknowledgment of enhancements on the inner operational system of a business, such as boosting operation efficiency, upgrading data accurateness and diminishing accounting mistakes. Perceived indirect benefits describe the recognition of advances in relationships with customers and antagonists, which consist of enhancing customer services, relationships with collaborators and gamesmanship. Compatibility, relative advantage and perceived cost diverge internally of the context. Nevertheless, the relative advantage is one of the two crucial components that have been steadily linked with innovation

adoption (Cragg & King, 1993). Conclusively, through the lens of this context, technology can be regarded in material terms (equipment) and/or nonmaterial terms (data and usage methods) (Bose & Luo, 2011). Trialability “is the degree to which an innovation is experimented with on a limited basis” (Lundblad, 2003; Rogers et al., 2014)(Rogers, 2003, p.258). In addition, complexity “is described as the degree to which an innovation is perceived as relatively difficult to understand and use” (Rogers, 2003, p.257). Observability “is defined as the degree to which the results of an innovation are visible to others” (Rogers, 2003, p.258).

Further to the technological context, as Kwon and Zmud (1987) suggested, the internal ICT infrastructure and technological skills are dominant for the meaningful adoption and implementation of technology solutions (Kwon & Zmud, 1987). Their theoretical assumptions were supported from several empirical research. Zhu and al. (2003) has explored the technological context and has identified that IT infrastructure and technology skills are operationalized technology competence in order to achieve the technology integration (Zhu et al., 2003). In addition, Kuan and Chau (2001) supported that improving internal functioning such as speeding up application processes, benefits the adoption of ICTs (Kuan & Chau, 2001). To a greater extent, the technology literature revealed that an organizations’ level of technology adoption is critical regarding its intention to move towards technology integration (Xu et al., 2004). Lin and Lin (2008) suggested that the organizations with technology systems should continue investing, to upgrade these systems to meet the competition demands (Lin & Lin, 2008). An organization’s existing technologies are critical in the integration process as they establish the scope and pace of the technological change that the firm is open to undertake (Collins & Brown, 1988).

3.3.1.2 Organizational context

The organizational context refers to the influence of the organizational characteristics, structures and processes on the decision to adopt and implement ICTs (Tornatzky et al., 1990). Those include both the formal and informal structure, the communication processes, the internal slack resources, the firms’ scope, the firms’ structure, the organizational size, top management beliefs, and the human and financial resources (Depietro et al., 1990; Tornatzky et al., 1990).

Among the above mentioned factors, the most frequently investigated by scholars are the quality of human resources, firms' size and top management behaviour (J. Chong & K. Olesen, 2017; Gui et al., 2020). The quality of human resources refers to the extent that the employees' capacity and "know-how" concerning technology matters is available within the organization (J. Chong & K. Olesen, 2017; Kumar & Krishnamoorthy, 2020; Setiyani & Rostiani, 2021). Concerning the firms' size, it has been shown to be a strong predictor of ICTs integration within organizations (Damanpour, 1991, 1992). Smaller firms have less resources, minor economies of scale and are not able to take risks associated with technology novelties (Bryan & Zuva, 2021; J. Chong & K. Olesen, 2017; Kuan & Chau, 2001). Nevertheless, small organizations are more flexible compared to larger firms (Awa & Ojiabo, 2016; Gui et al., 2020; Lippert & Govindarajulu, 2006). Moreover, regarding the organizational factors of the TOE framework, top management leadership could become either the inhibitor or facilitator for the technology adoption and implementation strategy within the organization (Awa & Ojiabo, 2016). Thus, top management leadership support plays a critical role for driving initiatives towards the ICT adoption process (Cooper & Molla, 2014; Marei et al., 2021). In addition, the top management enables the fostering of the technology integration by creating an environment that welcomes and challenges, and is supportive of changes that integrate technology innovations (Baker, 2012). Overall, scholars agree that the extent of top management engagement and commitment to support the new technology is fundamental for the ICT involvements in the organization (Cruz-Jesus et al., 2019; Ekong et al., 2012; Gangwar et al., 2015; Kandil et al., 2018; Marei et al., 2021). Thus, senior leadership support is another catalyst of the organizational acceptance of ICTs (Racherla & Hu, 2008; Wang et al., 2012). Thong (1999) showed that senior management can encourage alterations by communicating and augmenting value and joint vision for the firm (Thong, 1999; Venkatesh et al., 2012). Lee et al. (2010) claimed as well that the vision, assistance and dedication by senior managers can effectively create a supportive climate for technological novelty (Lee et al., 2010).

More broadly, the organizational context includes the financial resources which enclose several variables including financial capital, funding for technology innovations and financial availability (Hiran & Henten, 2020; Setiyani & Rostiani, 2021; Ullah & Qureshi, 2019). Ramdani et al. (2013) highlighted that regardless of the advantages of the technology adoption and implementation within the organizations, it is seemingly worthless for the firm when there are inadequate resources to back up the technology integration (Ramdani et al., 2013). Moreover,

Iacovou et al. (1995) highlighted that the financial readiness of the firm refers to the funding that is available for the purchase and installation of digital technologies, is pivotal to an organizations' adoption process (C. L. Iacovou et al., 1995). Drawing on the outcomes of previous studies, it is assumed that the financial readiness of the firm concerning its technology adoption, originates from the owners and managers point of view (C. L. Iacovou et al., 1995).

3.3.1.3 Environmental context

The environmental context of the TOE framework refers to the industry characteristics and market structure, the technology support infrastructure and the governmental regulatory environment (Depietro et al., 1990; Tornatzky et al., 1990). Market structure has been explored in several ways by scholars (Agrawal et al., 2022; Zhu et al., 2004). For instance, a competitive market environment stimulates the ICT integration (Kumar & Krishnamoorthy, 2020; Narmetta & Krishnan, 2020). In addition, dominant organization within the market chain might be able to influence partners to become in favour of the ICT adoption process (Bhattacharya & Wamba, 2018). Competitive pressure has long been recognized as an adoption trigger in the technology literature (C. L. Iacovou et al., 1995; Porter & Millar, 1985). Lippert et al. (2006) supported that the greater the competitive pressure for the organization, the more likely the organization will adopt and use web technologies to ensure long term prosperity (Lippert & Govindarajulu, 2006). Betwixt all the above-mentioned variables, the technology support infrastructure has also been identified as an important determinant that impacts the ICT integration within the firm (Hiran & Henten, 2020; Mohammad et al., 2022). Moreover, except the technology infrastructure within the company, the staging of technology adoption depends on the technology infrastructure available, both within the industry and the country (Picoto et al., 2014; Porter, 2012).

The regulatory influence could have either a beneficial or a detrimental effect on ICT adoption and implementation. More analytically, when governments impose inhibitors on the industry, the ICT adoption process is immediately declined (Adnan et al., 2019; Ali et al., 2015; Li et al., 2022). For instance, Lippert et al. (2006) suggested that organizations that experience higher levels of governmental constraints are more likely to adopt and implement technology

services (Lippert & Govindarajulu, 2006). From a similar perspective, Ghobakhloo et al. (2012) highlighted that regulatory support prompts the development of technological infrastructure, which further encourages the technology diffusion within the company (Ghobakhloo et al., 2011). Nevertheless, the lack of governmental support significantly influences the ICT adoption and implementation process (Agrawal et al., 2022). For instance, countries like Singapore, who were facilitating legislation concerning technology innovations became an early adopter of ICTs (Zhu & Thatcher, 2010). Overall, the environmental context of the TOE framework, focuses on the environment in which an organization carries out its operational transaction, by prioritizing the external factors swaying in the sector such as government incentives and regulations (Salwani et al., 2009). In addition, DePietro et al. (2009) supported that it comprises aspects associated with characteristics of the business such as competition, antagonists, outworkers and relations with governmental bodies, along with the cycles of a firms' life (Depietro et al., 1990). The pressure the industry perceives, indicating the level of technological competence of the firm's industry besides its competitors, has been found to be the major technological factor of technology adoption (Fuchs et al., 2010; Ramdani et al., 2013). Previous literature has displayed that customer mandate, competitive, external and internal pressure, as well as pressure from business associates (Grandon & Pearson, 2004; Hong & Zhu, 2006), marketers support, trade dependence, environmental uncertainty, information and network intensity are all crucial variables of the environmental context, while government regulations do not seem to behave accordingly (Hossain & Quaddus, 2011; Lin & Lin, 2008; Musawa & Wahab, 2012; Raymond & Uwizemungu, 2007; Salwani et al., 2009; Thiesse et al., 2011).

3.4 The TOE Framework in the Hospitality Industry

Previous examination on business and technology literature contributed to the emergence of the TOE framework, which exists as one of the more favourable amongst other models (Gangwar et al., 2014). Prior conducted researches on the implementation of technology innovation in the hospitality industry demonstrated a heightened interest and applies of TOE as a theoretical basis to assess hotels' willingness to embrace technology innovations (Pateli, Mylonas, et al., 2020; Racherla & Hu, 2008). It has been used in technology adoption studies in the

hospitality industry, such as service robots in the hotels (Zhong et al., 2022), social media adoption in Greece (Pateli, Mylonas, et al., 2020), automation technologies in the hospitality industry (Ivanov, 2020), digital marketing in hotels in Sri Lanka (Mohanty, 2019), adoption of software as a service in Tirana (Saas) (Kruja et al., 2019), clouding adoption by the Irish hospitality industry (Mohanty, 2019), ICT adoption in the hospitality industry in the western cape (Davids & Jokonya, 2019), eCRM adoption in the lens of direct and indirect benefits (Racherla & Hu, 2008), adoption of mobile reservations systems (Wang et al., 2016); ICTs primary adoption of hotels in Hong Kong (Leung et al., 2015), e-commerce in hotels in South Korea (Song et al., 2015) and radio frequency identification (RFID) systems (Bilgihan et al., 2011; Ozturk & Hancer, 2014; Pool et al., 2018).

In more detail, Leung et al. (2015) in an attempt to explore the factors impacting on ICTs using the TOE framework, showed that the level of anticipated benefits raised from ICTs, along with the inter-unity and probable risk are the main drivers for influencing a hotels' decision about their inclination towards ICTs implementation, in conjunction with financial and technological readiness (Leung et al., 2015). In another study examining the mobile reservation systems, Wang et al. (2016) revealed that compatibility, the size of the firm, technology capability, and amount of critical thought are ominously related to a positive attitude towards the adoption of mobile hotel reservation systems (Wang et al., 2016). Ndekwa and Katunzi (2016) applied TOE to investigate the factors leading hotels to the adoption of online social media in Tanzania, revealing that organizational and environmental context are major factors, while technology context was found to be rather unimportant (Ndekwa & Katunzi, 2016). Leung et al. (2011) revealed the eminent role of management endorsement and its approach in deciding a hotel's preference towards the beginning of adoption to Web 2.0 technologies (Leung et al., 2011). Similarly, posterior studies in the industry 4.0 era suggested that hotel managers play a vital role in the ICT integration within the hotel (Kruja et al., 2019). The willingness concerning technology adoption and implementation was found to be prevalent among younger managers that have been newly hired and are more highly educated (Kruja et al., 2019).

As performance in the hotel business is related to efficient service delivery and increase of profits through customer satisfaction and loyalty (Law et al., 2014), scholars have focused on investigating the key factors to serve this purpose (Jermisittiparsert, 2020; Li & Srinivasan, 2019; Sofi et al., 2020; Tonny & David, 2022). Mullins (2007) revealed that technology innovation is

the key-pillar to achieve long term prosperity in the hospitality business (Mullins, 2007). Sebel (2004) highlighted that those digital novelties are the most frequently examined strategic elements together with the human resources in hospitality literature (Sebel, 2004). However, Lam and Law (2019) described that the hospitality industry is “data-aware” but rather “data-savvy” concerning their digital technology behaviour (Lam & Law, 2019). Prior studies exploring the TOE assumptions in the hospitality industry concerning ICT adoption and usage at organizational level in the hotel, bring out mixed outcomes (Kruja et al., 2019). Van de Weerd et al. (2016) indicated that ICT adoption and implementation levels in the service industry are low in emerging markets (van de Weerd et al., 2016). The Morgan Stanley Capital Index (MSCI) has included Greece in the list of emerging markets and recognized the country as one of the best performing emerging markets. The tourism industry is considered as the main contributor to this performance (Adamolekun & Kladakis, 2022; Singh & Shaik, 2021).

In the current context, research on technology integration in the hospitality industry is scant. There is relatively limited research about technology and digital innovations, with even less adopting the TOE framework to explore the determinants of ICT adoption and implementation within the hotels. Thus, observational indications in the literature for the hospitality industry on this proposition is slightly narrow. Pateli et al. (2020) revealed that top management and innovativeness are quite significant influential features concerning social media adoption in hotels in Greece. Moreover, from the environmental context, the external pressure and the environmental uncertainty have a greater effect on the decision of ICT adoption. The technological features are considered the most important in terms of predicting power in the hotels (Pateli, Mylonas, et al., 2020). The technological features included relative advantage, presence and interconnections. On the other hand, Alshamaila et al. (2013) highlighted that perceived relative advantage was positively associated with the adoption decision on cloud computing and its factors such as: top management, innovativeness, prior similar technology experience, competitive pressure, external support and financial crisis which all have an insignificant influence on adoption decision concerning cloud computing (Yazan Alshamaila et al., 2013). The study also suggested that cloud computing is a critical type of ICT innovation that could provide strategic and operational advantages in the businesses (Yazan Alshamaila et al., 2013). The study took place in Greece after a political and financial crisis in the country (Kouretas & Vlamis, 2010; Pagoulatos & Triantopoulos, 2009; Sakellariopoulos, 2010; Zahariadis, 2010).

3.5 The TOE framework in the Hospitality Industry and Health Crises

Crisis events have a major impact in the tourism and hospitality industry (Henderson & Ng, 2004; S. S. Kim et al., 2005; Stafford et al., 2006). Hotels are considered the largest subsector within the tourism sector and is historically renowned to be highly vulnerable to crises (Ritchie et al., 2014). Therefore, it is critical for the hotels to engage strategies that will effectively respond to the crises (Campiranon & Scott, 2014; Lo et al., 2006). For instance, Barbe and Pennington-Gray (2018) suggested that a way to restore safety to the hotel clients in the growing concerns of the Zika virus was via successful implementation of crisis communication. In this case, social media is considered an important tool for crisis communication (Barbe & Pennington-Gray, 2018b). Schroeder et al. (2013) supported that social media has significantly transformed crises communication practices (Schroeder et al., 2013). Further to Barbe and Pennington-Gray (2018) study, the TOE framework indicated that more chain hotels as opposed to independent hotels used social media during crisis, and highlighted that the classification of the hotel was insignificant in whether or not the hotel communicated the crises (Schroeder et al., 2013).

3.6 The TOE Framework adopted during the COVID-19 Pandemic

The pandemic has negatively impacted all kinds of industries (Arumugam & Kanagavalli, 2020; Feng et al., 2021; Nayak et al., 2022; Sahoo & Ashwani, 2020; Xiao et al., 2022; Çolak & Öztekin, 2021). Amongst them, the most significantly affected is the tourism and hospitality industry (Barkas et al., 2020; Škare et al., 2021). Effendi et al. (2020) investigated the behavioural intention to adapt social media in SMEs' during the COVID-19 pandemic. The results indicated that government support has a strong impact in social media awareness and the intention to integrate it in the business in Indonesia. In addition, the environmental uncertainty has resulted in the reluctance to adopt social media technology (Effendi et al., 2020a). Similar to this outcome, concerning the environmental uncertainty, Apriliani et al. (2021) investigated the factors that could affect the integration of social media in a MSME during the pandemic of COVID-19 stating that environmental uncertainty was not related to the adoption of social media (Apriliani et al.,

2021) However, the technological factors were the most influential in the adoption and implementation of social media (Apriliani et al., 2021).

Yet, the COVID-19 outbreak has created a significant crisis on a global scale that has affected all aspects of daily life (Hall et al., 2022; Leal Filho et al., 2021; Verma & Prakash, 2020). Hoang et al. (2021) revealed that technology compatibility has the most significant impact on e-commerce adoption in SMEs in Vietnam, followed by the top management support. At the time of COVID-19, the external support had a minor impact on the e-commerce integration (Hoang et al., 2021). Thus, the financial governmental policy to support SMEs during the pandemic had limited impact on the e-commerce adoption. These findings are partially in line with the research of Iftikhar et al. (2021) who has also identified that management support has a positive impact in blockchain technology adoption in higher education institutes (Iftikhar et al., 2021). Concerning legal clauses, scholars have supported that the absence of government regulatory could generate a non-antagonistic market, as for example the oligopoly of Amazon and Alibaba platforms (Xiao et al., 2022; Zhang & Chen, 2019). Nayal et al. (2021) highlighted that the disruption of COVID-19 has encouraged hotels to resort to technology innovation adoption and implementation in order to ensure organizational survival (Kumar & Ayedee, 2021; Nayal et al., 2021; Pateli, Kourouthanassis, et al., 2020). The results of this study revealed that financial resources, infrastructure and environmental disruption due to COVID-19 had resulted in e-commerce integration within the SMEs (Nayal et al., 2021). Furthermore, the e-commerce readiness was investigated by Priambodo et al. (2021) during the pandemic by adopting the TOE framework. Digital maturity presented itself to have the most significant impact on the firms' ability to cope with the environmental constraints of COVID-19. However, organizational readiness resulted to no effect on the e-commerce readiness of the organizations (Priambodo et al., 2021).

During the pandemic, many MSME firms have ceased operations for several reasons including the non-adoption of ICTs in their operation (Lukman, 2020). TOE framework remains an effective tool to explain decision-making concerning technology adoption and implementation at the firm level (Awa & Ojiabo, 2016). Arinta et al. (2020) explored MSMEs and their digital technology integration during the pandemic. The outcomes indicated that regulatory support is an important environmental factor for ICT adoption (Arinta et al., 2020). Additionally, Wendt et al. (2021) revealed that ICT adoption in SMEs in Germany during COVID-19 not only depended on

TOE characteristics, but in ICTs' affordances and constraints. However, the environmental disruption due to the pandemic has created an impetus for ICT integration within the firm (Wendt et al., 2021).

3.7 Summary

Chapter 3 presents the grounding theorizations of the model to be developed in Chapter 4. The cornerstone of this study is theoretically based on the TOE framework, which was selected from a pool of theories that investigate ICT adoption in the businesses. Additionally, TOE has been tested in different tourism geographical regions such as Africa, India, China and Europe which improves the knowledge concerning the role of culture in the ICT adoption process (Awa et al., 2016; Bhattacharya & Wamba, 2018; Borgman et al., 2013; Pateli, Mylonas, et al., 2020; Sugandini et al., 2019). Over the years, TOE framework has been applied widely, which is strengthening the generalizability of the theory (Awa et al., 2016). At the same time, given the advances of ICTs and innovative technologies, a number of researchers have extended the TOE framework in order to adapt it to their context of study or to improve its predictive power (Abu Bakar et al., 2019; Katebi et al., 2022; Mathur, 2022; Racherla & Hu, 2008). Parker and Castleman (2009) revealed that models and frameworks are used by scholars to test results from data that they have collected (Parker & Castleman, 2009). Thus, there is no “one-size-fits-all” technology adoption model or framework. Molla and Licker (2005) highlighted that frameworks should be designed based on ICT innovation type and context (Molla & Licker, 2005). The TOE framework is well established in investigating digital technology adoption on an organizational level (Gui et al., 2020; Lippert & Michael Swiercz, 2005). This framework corresponds to the aim of the current research, which is to understand ICT adoption and implementation on organizational level in the Greek hospitality industry during the turbulent environment of COVID-19.

4 CHAPTER

Research Development Model

4.1 Introduction

This chapter is aiming to develop a conceptual model capable of explaining the factors on an organizational level that influence the adoption process of ICTs in a hotel during COVID-19. Section 4.2 presents the rationale of the research study by building in the empirical gaps that were unidentified and presented in Chapter 1. Section 4.3 presents the hypotheses development and the actual conceptual model. Followed by 4.4 describes the moderating role of firm innovation index in COVID-19 pandemic and in Section 4.5, the moderating effect of the hotels' size is provided. Lastly, the main hypotheses that underlines this research are summed up in Section 4.6.

4.2 Rationale of the Hypothesized Research Model

The relationship between ICT adoption within the business and its overall performance is a critical subject, especially for SMEs, that has dominated technology research over the last decades (Iskanius & Kilpala, 2006; Mijailovic et al., 2022; Shiels et al., 2003; Taylor, 2015). Many researchers have attempted to understand the factors that affect ICT adoption on both organizational and individual level from the managers, employees and customers perspective in the travel and hospitality sector. For instance, Leung et al. (2015) argues that from the managers standpoint, it has been confirmed that financial readiness and technological maturity were found to be significant determinants affecting the hotels' adoption of digital solutions (Leung et al., 2015). Furthermore, from the clients' perspective results have shown a direct positive prediction of intention to reuse mobile applications for making hotel reservation (Fong et al., 2017). Using UTAUT as the theoretical model, Fong et al. (2017) found that the effort expectancy and social influence are positively associated with the intention to use mobile applications for their hotel reservations (Fong et al., 2017). Moreover, from the employees' point of view, Cheng et al., (2011)

studied the behavioural intentions and usage of ICTs in Hong Kong travel agencies. The study integrated TAM, TPB, and DIT together, to study how attitude, intention, and actual usage are linked towards technology adoption. The findings exhibited that the perceived usefulness, perceived ease of use, trialability and observability of technology solutions were the major factors stimulating the employees' attitude towards ICT adoption (Cheng & Cho, 2011).

The current study is investigating ICT adoption from the hotel owners' and managers' perspective, since hoteliers and top management play a critical role in the decision-making process when it comes to technology adoption and implementation (Lefebvre et al., 1997). Alam et al. (2011) recognised that the management decisions to adopt e-commerce determined the ICT adoption (Shah Alam et al., 2011). In addition, Rowe et al. (2012) and Li and Xie (2012) supported that executive level support to integrate technology such as e-commerce is fundamental (Li & Xie, 2012; Rowe et al., 2012). Singuaw et al. (2000) highlighted that technology-oriented senior management is considered as an essential first step towards ICT adoption and implementation in the hotel (Singuaw et al., 2000). Especially in the hospitality context, Pizam et al. (2022) identified that management support as an important factor regarding the adoption of robotic technologies in hotels (Pizam et al., 2022). Furthermore, Pateli et al. (2020) pointed out that top management support is one of the most important factors out of the seven factors explored in this research. More specifically, with a strong impact over the other factors: relative advantage; presence; interconnections; innovativeness; external pressure and environment uncertainty (Pateli, Mylonas, et al., 2020).

Extending on from this concept, the purpose of the current study is to investigate a wider view of factors that influence the ICT adoption in an unstable environment, such as the COVID-19 pandemic in the hotel sector. Hence, the factors that contribute towards ICT adoption within a hotel business are thoroughly explored by placing emphasis on the environmental uncertainty that has occurred due to the COVID-19 pandemic. Overall, this study is handling four main areas. Firstly, the study identifies the importance of ICT adoption in the organization, guided theoretically by the relevant technology literature as the basis to support the importance of ICT integration in the hospitality industry, especially at the time of a crisis. The idea of examining the value of ICT adoption and implementation in the hotels is also promoted by hospitality literature (Halkiopoulou & Papadopoulos, 2022; Mandić & Praničević, 2019; Sirirak, Islam, & Khang,

2011). Nevertheless, the factors that are affecting this relationship are less explored especially around the time of COVID-19 in the hospitality industry. To a greater extent, also less explored during the COVID-19 pandemic are the ICTs as a wider list. Thus, this study adopts a multi-investigation perspective pertaining to the adoption of digital technologies. Prior examination on technology and hospitality literature revealed that studies integrated a type of ICT (Leung et al., 2015; Mohanty, 2019; Pool et al., 2018; Salavati et al., 2013; Zhong et al., 2022). Thus, this study, investigates the factors on the organizational level that contribute towards the development of ICT adoption in the hospitality industry by a catalogue of ICTs. Past studies highlighted the investigation of one particular type of technology, such as service robots (Tussyadiah & Park, 2018) or mobile applications (Chan et al., 2021a). More specifically, the current study explores a range of digital technologies that include the adoption of internet technologies (e.g., social media strategies), inter-organizational information systems and emerging technologies, such as artificial intelligence (for a full list of the examined digital technologies please refer to Appendix A). Hotels have been adopting such technologies to optimize services at scale in order to respond to customers' and markets' growing demands and needs (Kim et al., 2020). To this extent, different types of technology serve different purposes accordingly within the hotel operation. All in all, these findings provide added knowledge of various digital technologies as a whole rather than partially.

Thirdly, the study elucidates the mechanisms through which the organizational level factors might lead to ICT adoption. Fourthly, the research attempts to add timely knowledge and insights to an emerging body of literature concerning ICT adoption and implementation in the hospitality industry. More specifically, the main aim is to inform interested parties including scholars, managers, hoteliers, entrepreneurs, strategic planners and hospitality strategy developers of how mainly micro and small family-owned hotels at the time of the COVID-19 crisis can strategically embrace ICTs.

4.3 Hypotheses Development and Conceptual Model

The hospitality industry has historically been reluctant to adopt and implement ICTs (Mihalic & Buhalis, 2013), particularly independent and MSME hotels that are not part of a chain affiliation, have often been recognized as late adopters of digital technologies (Khemthong & Roberts, 2006; Sahadev & Islam, 2005; Strebinger & Treiblmaier, 2022). Thus, scholars have given research effort to explore and understand facilitators and inhibitors of ICT integration within the hospitality industry (Hsu & Tseng, 2022; Khan & Hossain, 2018; Yorkulov et al., 2022). Despite the existence of several studies pertinent to ICT adoption and implementation in the hospitality sector, most extant researches were focusing on luxury hotels and chain hotels, or a combination of independent and chain hotels (Ahmad & Scott, 2019; Guemide et al., 2019; Han et al., 2021; Kothari et al., 2007; Murphy et al., 2006; Šerić & Gil-Saura, 2012; Šeric et al., 2016) rather than SME hotels (Leung et al., 2015).

Nowadays, considering the increase in digital savvy hotel clients and the advantages induced by ICT adoption and implementation within the hotels, hoteliers and managers seem to be more interested towards embracing digital technology (Buhalis, 2019; Jaremen, 2016). This phenomenon, was accelerated during the COVID-19 outbreak as ICTs became an alternative way to maintain connection with the hotel guests when physical human touch was restricted (Dube et al., 2021; Gursoy & Chi, 2020). In turn, scholarly attention towards determinants influencing the technology within businesses has grown (Maiti et al., 2022; Rabaey et al., 2008). Surprisingly, despite the existence of a plethora of studies investigating ICT adoption and implementation in the hospitality industry (Law et al., 2014; Masaki et al., 2021; Yorkulov et al., 2022), there is only a handful of studies investigating the technological, organizational and environmental factors influencing SME hotels' adoption and their implementation of ICTs.

More specifically, Kruja et al. (2019) supported that hotel managers are more willing to promote technology adoption than hotel owners. This research has adopted the TOE framework to analyse sample characteristics of the hotels willing to adopt Software as a Service (SaaS) in SME hotels in Albania. Age of the hotelier or manager as well as their experience were positively and significantly affecting the adoption of SaaS technology (Kruja et al., 2019). Mohanty et al. (2019) investigated the barriers of cloud technology by SME restaurants in the hospitality industry

using the TOE framework. The findings revealed that the main barriers in cloud adoption are: 1) technical, 2) legal and 3) organizational (Mohanty, 2019). Lastly, Pizam et al. (2022) investigated the effects of the technological, organizational and environmental (TOE) elements on hotel managers' intentions to adopt robotic technologies in their hotel (Pizam et al., 2022). The results suggested that the managers intention to adopt the robotic technologies were positively influenced by their perceived complexity, relative advantage, complexity, top management support, and competitive advantage. It is obvious that there is a lack of major studies providing an overarching framework that investigates factors on organizational level in the hospitality sector towards ICT adoption and implementation, within the turbulent business environment that the COVID-19 pandemic has created on a global scale, with an exception of Pizam et al. (2022) research study (Pizam et al., 2022). The difference maker in the current study is the exploration of less and non-investigated organizational level TOE framework factors such as digital maturity and its subfactors; culture, insights, organizations and technology, financial resources availability and governmental regulations. This denotes the research question of 'What are the factors influencing hotels and particularly SMEs' on ICT adoption in the pandemic crisis?' Thus, based on the above discussed, the following research questions are investigated:

1. What are the technological factors that influence the SME hotel owners' and managers' intention to adopt ICTs?
2. What are the organizational factors that influence the SME hotel owners' and managers' intention to adopt ICTs?
3. What are the environmental factors that influence the SME hotel owners' and managers' intention to adopt ICTs?
4. Does firm innovation index moderate the relationships between technological, organizational and environmental factors and the SME hotels' owners' and managers' intention to adopt ICTs?
5. Does the hotels' size moderate the relationships between technological, organizational and environmental factors and the SME hotels' owners' and managers' intention to adopt ICTs?

The research aimed to develop a model that identifies six determinants of digital technology adoption in the hospitality industry within the three contexts of the TOE framework: digital maturity, including 'culture' which deals with empowerment of employees with digital

technology, ‘organization’ is the use and adoption of technology, ‘technology’ is the digital strategy, and ‘insights’ involves the customer and business data to measure strategy success; organizational resources, which involves ‘financial resources availability’ to fund business initiatives; and the environment context which is ‘government regulation’. At the same time, the moderating effects of firm innovation index and number of employees towards ICT adoption are explored. This study investigates the technological context of ‘digital maturity’ which for the first time is being investigated in a research study, and especially at the time of the health crisis of COVID-19 it posits that the hotels are more likely to adopt ICTs when their digital maturity levels are higher scored.

4.3.1 Technological Dimension: Digital Maturity

All the technologies that are employed by the firms as well as the technologies being presently utilized within the organization constitute the technological context of the TOE framework (Depietro et al., 1990; Tornatzky et al., 1990). Previous literature examination revealed that technology is a critical strategic asset for the hotels in order to improve their organizational performance and long-term prosperity (Nyheim & Connolly, 2011). Nevertheless, scholarly attention towards understanding facilitators and inhibitors of digital technology adoption has increased, especially as a means to tackle the challenges imposed by the pandemic (Hsu & Tseng, 2022). In addition, the latest information system (IS) literature on accessing an organization’s state of digitalization is investigating its digital maturity (Thordsen et al., 2020). Digital maturity is defined ‘as the status of a business digital transformation’ (Chanias et al., 2019). Digital transformation is possible by the adoption of ICTs (Huijbens & Jóhannesson, 2019). The digital transformation journey is achieved when a firm has transformed digital the processes and business models (Teichert, 2019). Further into this analysis, digital maturity is a dynamic concept since digital advances are continuously changing and upscaling. Thus, the hotels need to access their digital maturity over time (Shahiduzzaman, Kowalkiewicz, Barrett, et al., 2017).

As aforementioned in the research literature presented in Chapter 2 digital maturity has several definitions due to all the different digital maturity models (Teichert, 2019). The current

study adopts the digital maturity model 5.0 (VanBoskirk et al., 2017) as the most appropriate to serve its objectives. Literature examination has revealed that the role of digital culture which ensures the DT, is not systematically investigated in the digital maturity models available (Teichert, 2019). The digital maturity model used by this research study included original cultural attributes such as digital sharing knowledge, a customer-centric approach, communication openness, empowerment of employees to ideate digital technologies, change- ability and, collaboration across firm boundaries (Teichert, 2019). Therefore, this comprehensive digital maturity model helps managers to understand how well technologies are used for their competitive strategy, improvement of customers experience and create operational agility (Gill & VanBoskirk, 2016). Identifying the current digital maturity of the company ensures the creation of the digital road map while providing a benchmark (VanBoskirk et al., 2017). In addition, the digital model assesses the support of the top management for digital strategy and digital staff resourcing. Generally digital maturity models show differences in the maturity dimensions. Some of the digital maturity models available focus on technological variables, while others give attention to the organizational composition (Berghaus & Back, 2016). In the adopted model, four dimensions determine the digital maturity of the company namely culture, technology, organization and insights. The ‘culture’ dimension is seen as the most fundamental hurdle to achieve digital transformation (Buvat et al., 2017; Teichert, 2019). Furthermore, other dimensions such as leadership, digital vision and innovative culture are also addressed in this digital maturity model. More specifically, the dimensional ‘technology’ aspect focuses on organizational digital foundation such as customer experience, technology driven strategies and, budgeting to finance the digital infrastructure. The ‘organization’ aspect involves digital technology-oriented resources that are used to serve the digital strategy (Teichert, 2019; VanBoskirk et al., 2017). The ‘insights’ dimension as a digital maturity characteristic is including customer feedback and employees’ insights. In this regard, the combination of ICTs resources, digital culture and digital-oriented leadership will ensure the DT of the company (Kane et al., 2015a). Hence, also employees in digital technology driven companies describe their culture as innovative and the top management as digitally informed (Kane et al., 2015a).

Literature examination revealed that digital culture, which is reflecting digital maturity, enhances the DT. Generally, digital culture is not systematically investigated in the existing digital models (Teichert, 2019). Especially, in the case of service industries such as the hospitality sector

digital maturity assessment remains clearly under-represented (Thordsen et al., 2020). Nevertheless, the evaluation of digital culture is critical as it is enabling DT and thus, these cultural attributes should be systematically included in the digital maturity models (Teichert, 2019). According to Mowen (Mowen, 2000) and Westjohn et al. (Westjohn et al., 2009) digital maturity is a low stability situational trait, which can shift depending on one's environment and past experiences. Prior research has demonstrated that digital maturity can be linked to customer satisfaction (Kim et al., 2020) and perceived service quality (Li et al., 2019). According to Parasuraman (Parasuraman, 2000), technology readiness strongly affects the probability that people will embrace new technological systems/services. Technology readiness has been linked to technological acceptance (Lam et al., 2008).

In addition, scholars have given a great attention to investigating digital maturity from the guests' (Sun et al., 2020) or hotel employees' perspective (Sunny et al., 2019). In addition, Oliveira & Martins (2010) supported that technological readiness, a pre-stage of the digital maturity concept refers to technology infrastructure and information technology (IT) human resources. Technology infrastructure includes hardware and software technologies and IT human resources deals with the technological skills and 'know-how' (Oliveira & Martins, 2010). Furthermore, it includes the inner and outer technologies that are relevant to the business. Thus, technology that has already been used within the firm as well as the digital technologies that are available in the market but not been used from the firm, make up the technological context (Cruz-Jesus et al., 2019).

Additionally, the technological context of the TOE framework has been widely studied by scholars, using the Rogers' Diffusion Theory (Rogers et al., 2014). Previous literature investigation revealed that the most influential factors concerning the technological context of the TOE framework were relative advantage, compatibility and complexity. Those are characterized as the ultimate factors that influence digital technology adoption within the organizations (Tornatzky et al., 1990). Al Gahtani et al. (2007) supported that cultural values are significantly important in digital maturity (Al-Gahtani et al., 2007). Scholars determine the cultural values of the firm as the cultural backgrounds from hotel employees perspective (Sunny et al., 2019). Chi (2021) highlighted that in order to optimize digital technology adoption, knowledge-sharing strategies should be developed from managers in their decision-making process (Chi, 2021).

It turned out that digital technology adoption is a complex challenge for firms as multi-dimensional aspects are involved in the process. Especially concerning the technological context, VanBoskirk et al. (2017) emphasized that firms that had addressed cultural, organizational, technology and insights could have reached the highest levels of digital maturity. Thus, the investigation of this dimensions allows to plot the digital maturity of the organization (VanBoskirk et al., 2017). It is important to evaluate how well companies leverage customer data to direct their technology. On the other hand, equally important is the company's approach to embrace digital technologies and how the company empowers employees towards this approach (Gill & VanBoskirk, 2016). Among the plethora of models used to measure digital maturity, the current study considers that the recognition of the digital maturity variables beyond the individual characteristics could capture a deeper understanding of the digital technology adoption process as multi-dimensional factors that comprise the technological construct are investigated. The COVID-19 pandemic has made managers more aware of technology solutions. As Effendi et al. (2020b) stated, during the pandemic era the awareness and acceptance of digital technologies is a determinant of technology adoption (Effendi et al., 2020b). On this basis, the following hypotheses are proposed:

Hypothesis 1. (H1): *Digital Maturity has a positive impact on digital technology adoption.*

For this current research study, the 'culture' component of the digital maturity construct is defined as 'a company's approach to digitally driven innovation, and how it empowers employees with digital technology' (VanBoskirk and al., 2016, p.3). Thus, by taking into account this aspect of digital maturity it is fundamental for the leaders and decision-makers to clearly determine the full scope of the company's transition towards digital technologies and at the same time involve their employees by embedding technology into the heart of their business. It has already been discussed that technological acceptance can have a positive effect on technology solutions. According to Lam et al. (2008) technology acceptance itself is linked to parameters of digital maturity connected to scope of the firm (Lam et al., 2008). A variety of studies have linked digital maturity positively with the empowerment of employees in the usage of technology solutions (Pateli, Mylonas, et al., 2020). Moreover, based on Leung et al. (2015) research, employees that work in an supportive climate that influences and provides strategic directions for the adoption of digital technology are more likely to adopt it (Leung et al., 2015).

Moreover, Pumplun et al. (2019) highlighted that the adoption of AI is strongly influenced by the culture of the company. Furthermore, the top management play a significant role in supporting and introducing a technology- oriented culture (Pumplun et al., 2019). In this context, Pumplun et al. (2019) suggested that if the path to a technology innovative culture is not successful within the firm, there is a threat of missing out on novel and important technologies and trends (Pumplun et al., 2019). Culture refers to the purpose of this study to the approach to digitally driven innovation (Naipaul & Wang, 2009). In addition, as managers act as role models, they could foster a culture in their organization that is digitally-oriented (López-Fernández et al., 2011).

This study addresses the relationships of digital maturity and analyses them on the basis of MSMEs in the Greek hotel sector employing a culture-oriented perspective. According to the above, the following hypothesis is proposed:

Hypothesis 1a. (H1a): *The “culture” element of digital maturity has a positive effect on digital technology adoption.*

As ‘organization’ variable of the digital maturity construct is described as the alignment of a company to support digital strategy, governance and execution. It is critical to ensure that the organization is dedicating the appropriate resources to a digital oriented strategy (Gill & VanBoskirk, 2016; VanBoskirk et al., 2017). Hotels could use these resources in order to adopt digital technologies to improve their manage services, order process, demand and customer relationships (Iranmanesh et al., 2022). According to Li et al. (2019) hospitality industries require a workforce that is able to utilize modern technological tools to better serve their customers (Li et al., 2019). Thus, the employees should be trained in advance to support the digital functions of the organization (Gill & VanBoskirk, 2016). Consequently, since new technologies are introduced often, an effective hospitality management needs to find ways to provide training to its employees in order to constantly provide high quality technology solutions and gain the trust of its customers (Sun et al., 2020).

Furthermore, concerning the organization element, it is important to ensure that the firm has the digital skills embedded through its structure and operations (Gill & VanBoskirk, 2016). Therefore, the level of digital technology adoption is refined from the sophistication level of the firms’ digital strategy (Effendi et al., 2020b). To achieve digital maturity of the hotel and

especially its ‘organizational’ competent, it is important for the vendors partners to deliver value that enhances the digital competencies of the hotel (Gill & VanBoskirk, 2016). Therefore, ICTs could be adopted in order to improve suppliers relationship and consequently achieve a successful overall performance including financial performance, competitiveness and quality of services (Lenuwat & Boon-itt, 2021). According to the above, the following hypothesis is proposed:

Hypothesis 1b. (H1b): *The “organization” element of digital maturity has a positive effect on digital technology adoption.*

The hospitality industry can utilize a variety of technological methods to understand people’s acceptance of the various technologies the industry is introducing, maximizing the acceptance of the introduced technology solutions (Kim et al., 2020). Kim et al. (2020) also suggested that understanding people’s level of optimism or not can be utilized to improve their technology acceptance and further the usage of digital technology through the use of other technological solutions (Kim et al., 2020). Therefore, the digital maturity of the hotel to utilize such technologies also contributes to the industry acquiring important information to improve its’ services.

Further into the analysis of the ‘technology’ variable of the digital maturity component as part of the technological context of the TOE framework, a budget should be designed in order to achieve supply or improvement of the technology infrastructure and strategy of the firm (Gill & VanBoskirk, 2016). Managers in the hotel sector compared to other industries such as manufacturing, face a complicated work environment because of the special characteristics of this service industry (Mia & Patiar, 2001; Winata & Mia, 2005). Winata et al. (2005) highlighted that the managers budgetary participation is linked to their willingness towards ICT adoption within the hotel (Winata & Mia, 2005). In the same context, the hotel’s products and services are almost always on the spot and thus are complicated to predict as external factors including employees’ performance and customer perception could affect them (Winata & Mia, 2005).

In addition, the ‘technology’ element involves the concept of leveraging modern technology architectures within the business and measuring the technology teams by business outcomes (Gill & VanBoskirk, 2016; VanBoskirk et al., 2017). The perceived benefits of adopting digital solutions are the judgements coming mainly coming from decision- makers within the firm,

that the adoption and implementation of novel digital technologies would be beneficial for the company (C. L. Iacovou et al., 1995). Lippert et al. (2006) suggested that the greater the perceived benefits are by the organizations then the potential of web adoption services becomes greater (Lippert & Govindarajulu, 2006). Sunny et al. (2019) suggested that the perceived long-term benefits of the adoption and usage of the digital technologies could be considered as a positive impact on the ICT adoption and implementation within the hotel sector (Sunny et al., 2019).

Within the ‘technology’ subfactor of the digital maturity aspect, the customers’ experience and feedback is used as an asset in order to develop future technology design (VanBoskirk et al., 2017). Hence, the identification of the guest’s perception towards using ICTs is a pivotal element for the actual ICT adoption and implementation within the hotel. For example, Lee et al. (2021) explored the customers’ intention to use a hotel robot assistant and came to the conclusion that the hotel guests’ expectations of robot assistants service was affected by technical aspects, this being the most critical reason for choosing the robot assistant (Lee et al., 2021). The potential advantages of the adoption and implementation of ICTs could not be achieved if the hotel guests do not favour and appreciate these technologies (Lee et al., 2021). Thus, customers’ satisfaction or intention to use digital technologies is fundamental in the ICT adoption process (Tussyadiah et al., 2020).

Lastly, in order to completely define the digital maturity construct and its sub-variable ‘technology’, the involvement of the employees is important. More specifically, the usage of digital technology tools and applications to promote the innovation, collaboration and mobility between the employees is investigated. In the tourism and hospitality industry, the general attitude of employees towards ICT adoption and implementation is negative (Napierała et al., 2020). This negative perception stems from the job insecurity and job loss the ICTs might involve for the employees (Osawa et al., 2017). Therefore, hoteliers and managers should assure their employees that the technology advances will improve their job efficacy and performance (Leung, 2019). According to the above, the following hypotheses is proposed:

Hypothesis 1c. (H1c): *The “technology” element of digital maturity has a positive effect on digital technology adoption.*

According to Huang et al. (2008) the success of digital technology adoption depends on the organization’s strategic use of technology (Huang et al., 2008). In addition, Klein and Sorra

(1996) revealed that if employees are rewarded and supported for specific use of technology within the organization, this affects the digital technology adoption process (Klein & Sorra, 1996). The ‘insights’ latent variable of the technology context includes also clear and quantifiable goals for measuring the success of the firms’ digital strategy. The study of Bvuma et al. (2020) in SMEs in South Africa supported that having any type of ICT does not necessarily mean it brings beneficial outcomes for the business. Therefore, setting clear goals for measuring ICT adoption success will enable them to operate their business effectively or encourage future development (Bvuma & Marnewick, 2020). It is also critical for the business that every employee understands how its performance ties to corporate digital goals (VanBoskirk et al., 2017). Thus, the importance of the entrepreneurship and management is significant in the ICT adoption process (Naipaul & Wang, 2009). Concerning the decision of hotel managers in terms of ICT adoption and usage depends on how they perceive the use of such technologies (Ezzaouia & Bulchand-Gidumal, 2020). Ramayah et al. (2016) highlighted that the more positivity shown from the managers, the more likely the chances of the adoption digital technologies such as websites (Ramayah et al., 2016). Olsson et al. (2020) suggested that entrepreneurs in small hotel businesses adopting social media act as drivers in the ICT adoption. Hence, implications for entrepreneurs’ encounters with social media involves learning new skills and knowledge. This is especially important at the time of crises such as COVID-19 (Olsson & Bernhard, 2020). Overall, existing literature highlighted the pivotal role of technology savvy leaders in the ICT adoption and implementation process (Marolt et al., 2020). Moreover, the support of the top management towards an ICT oriented strategy helped overcome employees resistance (Marolt et al., 2020).

Furthermore, the understanding of the customer insights is a critical aspect for the adoption of ICTs within the businesses (VanBoskirk et al., 2017). For example, Sahadev et al. (2005) suggested that the hotels which serve clients from countries with high internet penetration display have a greater prosperity to adopt ICTs (Sahadev & Islam, 2005). To achieve ICT adoption such as for CRM within the hotel the need to allocate time and effort to develop technological skills for the employees is relatively stressed by researchers (Marolt et al., 2020). Additionally, business and management literature highlighted that the customer data base is important for an organization (Hassan et al., 2019). Thus, managing customer information affects the digital technology adoption such as s-CRM (Hassan et al., 2019). The examination on technology literatures suggested that the strategic use of communication technologies affects the firms’ technology

adoption decisions (Huang et al., 2008; Premkumar & Ramamurthy, 1995). Consequently, the below mentioned hypothesis is proposed:

Hypothesis 1d. (H1d): *The “insights” element of digital maturity has a positive effect on digital technology adoption.*

4.3.2 Organizational Dimension

Organizational factors includes descriptive characteristics and resources such as the firm’s size, degree of centralization and formalization of the managerial structure, amount and quality of slack and human resources, top management support and linkage between employees (Depietro et al., 1990; Tornatzky et al., 1990). However, the main factors that comprise the organizational elements are the firms’ scope, size, and top management support (J. L. Chong & K. Olesen, 2017; Nam et al., 2021). Organizational variables are anchored directly on the actual availability and utilization of the inner resources (Wymer & Regan, 2005). More analytically, organizational factors identified upon the examination of technology literature related to types of products and services, efficiency and capital resources (Al-Qirim, 2004; Diochon & Wright, 2003; Riemenschneider & McKinney, 2002). Especially, capital resources have been considered important in the ICT adoption and implementation process. Bacheldor (2003) stated that SMEs have the same technology needs as larger companies and that the financial resources are determinants towards technology integration (Bacheldor, 2003).

In addition, Caldeira et al. (2002) highlighted that SMEs compared with larger firms have fewer financial resources availability and lower technological ‘know-how’. The study of Caldeira and al. (2002) was conducted in the manufacturing industry, which suggested that the lack of financial resources is a significant inhibitor of digital technologies adoption and implementation. However, from the perspective of the top management and key actors, the cost of the process to computerize a business and to develop the hardware systems, was not creating a prevention for future ICT investment. In the study, it was highlighted that the managers of the most successful firms in terms of annual turnovers had a clear idea about the money needing to be spent, in order to achieve their technological goal, in contrast to the less successful firms. The actual cost of the

smaller firms were above the expectations of the top management (Caldeira & Ward, 2002; Lawrence, 2002). Agrawal et al. (2022) supported that adopting blockchain technology depends on the availability of financial resources of the company (Agrawal et al., 2022) and therefore, lack of financial resources develops hindrances for ICT adoption and implementation in the manufacturing industry (Kouhizadeh et al., 2021). In addition, Amelina et al. (2016) explore social CRM adoption within the firm, defining the financial resource availability as the funding to support the adoption and implementation of social CRM. The study revealed that that lack of financial resources in the firms is a barrier to this adoption (Amelina et al., 2016).

Teo et al. (2009) described amongst other organizational context that the managers perception of the degree to which they believe that their firms have the resources available to adopt digital technologies. The resources are described as two dimensions, which include financial and technological readiness. On the one hand, financial readiness is described as the financial resources for EDI (Electronic Data Interchange) adoption that includes the implementation and the ongoing expenses during the utilization (Teo et al., 2009). On the other hand, technological readiness, a closely related term to digital maturity, includes the technological infrastructure and human resources for cloud computing usage and management (Musawa & Wahab, 2012). Hence, the research studies argued that financial support increases the willingness of the managers to adopt ICTs.

Furthermore, the adoption of ICTs including AI does not depend only on the culture, but also on slack resources. Therefore, the larger budget could enable capacities that would lead to financial freedom. The restrictions of financial resources definitely influence technology adoption decision concerning AI adoption and implementation (Pumplun et al., 2019). Bresmer et al. (2017) defined financial resource availability as the budget that determines the adoption and implementation of novel technologies (Bremser et al., 2017). Further into the analysis, the organizational readiness as used in previous studies on technology innovation adoption, assesses if the firm has sufficient financial resources (C. L. Iacovou et al., 1995; Sohrabi et al., 2020). In addition, Iacovou et al. (1995) suggested that financial resources refer to available funds for the adoption and implementation of digital technology (C. Iacovou et al., 1995). Thus, firms that devote greater financial resources are more likely to achieve digital technology adoption and implementation. Concerning, the COVID-19 crisis despite the government response to guarantee

businesses' existence through economic stimulus packages, the hoteliers reconsidered financial adaptability (Dimitrios et al., 2020).

Consistent with the related literature, the most significant barriers to ICT adoption in SMEs include e-commerce adoption (Riemenschneider & McKinney, 2002; Wymer & Regan, 2005); AI adoption (Pumplun et al., 2019); social CRM (Amelina et al., 2016); EDI (Musawa & Wahab, 2012); blockchain adoption (Agrawal et al., 2022); cloud computing (Teo et al., 2009) and IS/IT adoption (Caldeira & Ward, 2002) dealt with financial resources limitation. Hence, according to the above, the following hypothesis is proposed:

Hypothesis 2. (H2): *'Financial resource availability' has a positive impact on digital technology adoption.*

4.3.3 Environmental Dimension

Environmental context refers to the area in which a business conducts its operation and how it is influenced by the sector it is operating in, itself, its market competitors and its interaction with the government (Depietro et al., 1990; Tornatzky et al., 1990). Further to the concept of the environmental context, firms respond to external pressures within their operating environments (Meyer & Rowan, 1977). These external pressures involve government regulations, customer pressure and the pressure from competitors and social communities (Huang et al., 2010). The external pressure of interest concerning the current study are the government regulations. According to Meyer et al. (1977) formal organizational structures arise as reflections of institutional rules (Meyer & Rowan, 1977). The institutional theory suggests that a firms' tendency toward conformity explains the organizational behaviour which includes norms, traditions, formal and informal rules of action that further guide structures and practices of the firm (Meyer & Rowan, 1977). Moreover, institutions constraints can be regulative, normative and cultural-cognitive. Regulative constraints include coerced via rules, laws, legislations and sanctions. Normative constraints are imposed via codes, accreditation and certification. Lastly, cultural - cognitive constraints include mimetic common beliefs and logical consequence of action (Meyer & Rowan, 1977). Based on institutional theory, government regulation is a form of coercive

regulatory isomorphism (Hwang et al., 2016; Meyer & Rowan, 1977). Coercive pressures such as threats or legal accredits could force organizations into certain behaviours (Meyer & Rowan, 1977). Government regulation refers to government encouragement or restrictions (Awa, Ukoha, et al., 2017).

Prior examination on technology literature has agreed that external pressures play a critical role in determining the adoption of ICTs. In the environment context, the role of governmental pressure is characterized as strong and decisive (Delmas, 2002; Lippert & Govindarajulu, 2006; Xu et al., 2004). For instance, environmental pressure from governmental regulatory is characterized as intense in the semiconductor industry in Taiwan (Hwang et al., 2016). Hwang et al. (2016) revealed that Taiwan's Environmental Protection Administration (EPA), in 2006, has regulated that electronics and electrical manufacturing organizations had to comply with specific environmental standards in order to ensure air quality and sustainable development. The companies who have failed to comply were prohibited to import and fabricate products until their successful compliance. In addition, Porter et al. (1995) supported that firms react creatively and are also willing to reevaluate their strategic (Porter, 1995) approach in order to respond to governmental regulations. Lippert and Govindarajulu (2006) studied the factors impacting web service adoption and suggested that organizations with high levels of governmental regulatory are more likely to influence the firm to adopt and implement web services technology. Web service adoption is influenced amongst other from environmental factors including regulatory influence (Lippert & Govindarajulu, 2006). Xu et al. (2004) highlighted that governments can encourage ICTs adoption and especially e-business (EB) adoption by designing business and tax legislation that is advantageous and supportive to the firm (Xu et al., 2004). The researchers also suggested that regulatory environment is fundamental for developing countries such as China, given the fact that the markets are still relatively immature (Xu et al., 2004).

Pan et al. (2008) conducted a research study to explore the factors within the TOE framework that affect the decision to adopt Enterprise Resource Planning (ERP) in the communication sector. The findings revealed that the external environment including the governmental regulatory policy has little influence on the decision whether or not to adopt ERP (Pan & Jang, 2008). On the contrary, Zhu et al. (2004) suggested that the regulatory environment is a fundamental environmental factor affecting e-business (Zhu et al., 2004). In a similar context,

Williamson (1980) described that government policy is categorized into two categories concerning the technological innovation diffusion. In the first category governments take certain actions such as implementing tax to encourage technological development. In the second category, governmental regulatory is altering the environmental climate in order to trigger innovations (Williamson, 1980). Accordingly, governments could encourage the adoption and implementation of ICTs by establishing supportive laws and regulations (Zhu et al., 2004).

Furthermore, Zhang et al. (2007), by analysing survey data of 14 different industries across Shanghai including manufacturing firms and local businesses concluded that within the factors influencing information technology implementation, government policies are included. In turn, governmental impact is important on the firms' IT adoption. More specifically, although the government policies could not directly affect the firms' IT adoption, they could indirectly have a significant impact on IT usage (Zhang et al., 2007). Chang et al. (2007) adopted the TOE framework to investigate the factors influencing e-signatures and supported those adopters of ICTs have forecasted the government policy concerning e-signatures and were willing to adopt e-signature. On the other hand, non-adopters of technology advances were reluctant to adopt the concept. The government policy construct contributed significantly in the e-signature adoption of the organisation (Chang et al., 2007). In agreement, Gibbs and Kraemer (2004) developed an integrated model to explore the dimensions that influence the e-commerce use within 2,139 establishments. The model derived the institutional theory and the TOE framework, suggesting that the most significant predictors of intention to implement e-commerce is due to legislation barriers and government promotion (Gibbs & Kraemer, 2004). Government policies have been identified as fundamental drivers in e-commerce adoption and usage particularly in developing countries such as Taiwan and India (Chanana & Goele, 2012; Chen, 2003; Kalia et al., 2018), and have shown to be less significant and effective in developing countries such Germany and France (Banerjee & Golhar, 1993; Brousseau, 2003; Erdmann & Ponzoa, 2021).

Kuan and Chau (2001) using the TOE framework proposed that in small businesses government pressure positively and significantly affected EDI adoption. They supported that a pressing and practical reason for small businesses to adopt and implement digital technology is government regulatory (Kuan & Chau, 2001). For example, in January 1996, in the United States, the federal government required federal agencies to convert to e-commerce in line with the paper

reduction policy (Vladimir, 1996). According to Salwani et al. (2009) government regulations are critical in the adoption and implementation of digital technology (Salwani et al., 2009) and as Baker (2012) revealed when governments impose constraints in the industry, digital technology adoption can be forced (Baker, 2012). At the time of the COVID-19 pandemic, except regulatory support, government restriction was also applied to minimize the impact towards casualties. Dergiades et al. (2020) flag the importance of government decisiveness in taking action and highlighted that the government interventions on COVID-19 was paramount to control the virus at an early stage (Dergiades et al., 2020). Therefore, the following hypothesis is proposed:

Hypothesis 3. (H3): *‘Government regulations’ have a positive impact on adoption of digital technology solutions.*

The proposed hypothesized conceptual research model is illustrated in Figure 4-1.

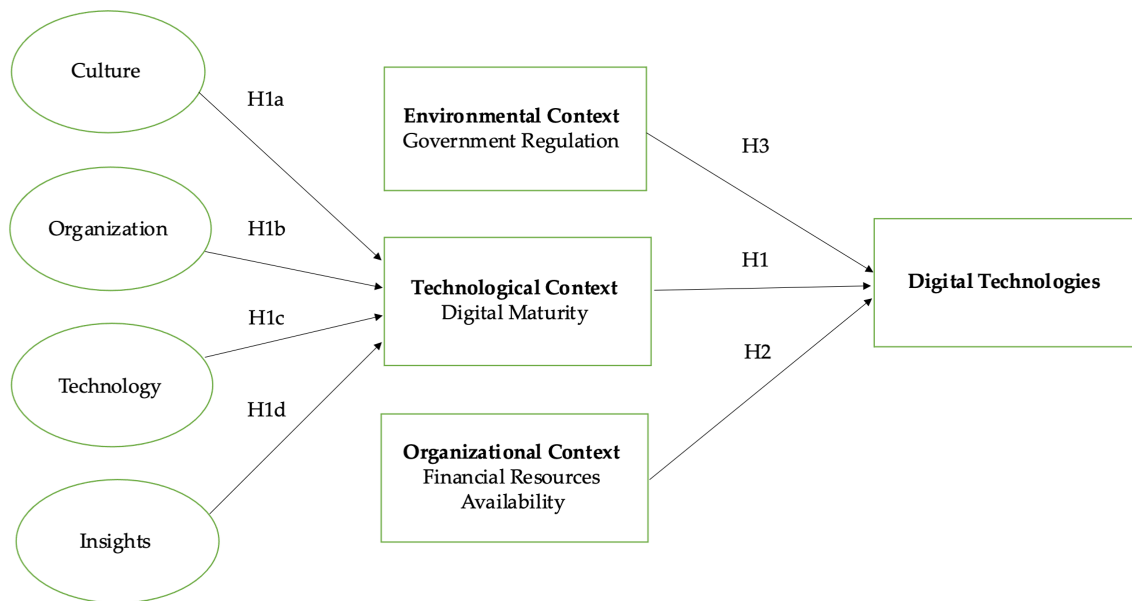


Figure 4-1. Hypothesized conceptual framework.

4.3.4 The Moderating Role of Firm Innovation Index

Innovation has been transforming businesses including the hospitality industry in fundamental ways (Khan et al., 2020). The contemporary literature is considering firm innovation as a core element of businesses (Ruvio et al., 2014). In terms of definition, firm innovation refers to the creation and implementation of novel products, ideas or processes within the firm and has demanding requirements in terms of infrastructure and organizational characteristics (Gopalakrishnan & Damanpour, 1997; Kessler et al., 2015). There are different conceptualizations of firm innovation important to a firms' innovation success (Guimaraes & Paranjape, 2017). Foxcall et al. (1984) defines firm innovation as the tendency and capability of a business to adopt and implement innovation (Foxall, 1984). Additionally, firm innovation seems to be the intention to innovate new products or services (Damanpour, 1991). This study adopts the firm innovation index as a five-item measurement variable which was based on multi-criteria evaluation of five dimensions (creativity, openness, future orientation, risk taking and proactiveness) referring to the firm's ability to develop ideas and innovation. The adoption of the multi-dimensional measure captures the complexity of the firm innovation (Ruvio et al., 2014). Increased popularity of firm innovation is perceived in the business literature (Acar & Özşahin, 2018; Brockman et al., 2012; Ruvio et al., 2014; Sun et al., 2022). Firm innovation is also recognized as important in the tourism and hospitality industry (Lynch et al., 2010). In the context of increasingly strong competition within the hotel sector it is becoming important to create competitive advantages via firm innovation (Binder et al., 2016). The entrepreneur has a strong influence on innovative power (Naipaul & Wang, 2009).

However, innovation within the tourism and hospitality industry has received limited attention especially SMEs (Lynch et al., 2010). The influence of innovation on the relationship between ICT adoption and the technological, organizational and environmental contexts has not yet been evaluated in the hotel sector during the pandemic of COVID-19. The study considers firm innovation index as a moderator to influence the relationship between the above-mentioned factors and ICT adoption within the hotels leading to greater ICT adoption. Singuaw et al. (2006) suggested that firm innovation index has both a direct and indirect influence on a hotels' performance, and ensures long-term growth and success of the hotel (Siguaw et al., 2006). Currently, investing in innovation equals to higher productivity, even though by doing so could

occasionally come across difficulties from employees or even customers, training outlays and, undeniably, a significant financial cost (Mihalic & Buhalis, 2013). Overall, previous studies have revealed that digital maturity and innovation potential form the basis for exhibiting digital transformation (Moldabekova et al., 2021). In addition, Phuong et al. (2015) suggested that, cloud computing as an advanced technology innovation has positively affected digital maturity and innovation as organizational factors of the TOE framework within SMEs (Phuong et al., 2015). Sun et al. (2022) highlighted that firms with high innovation levels are more likely to break the rules and take more risks compared to other firms (Sun et al., 2022). On this basis, the following hypothesis is proposed:

Hypothesis 4. (H4): *The degree of firm innovation index moderates the relationship between ICT adoption of the TOE framework, such as digital maturity, increasing the positive effect of ICT adoption upon high innovation groups.*

The proposed hypothesized conceptual research model is illustrated in Figure 4-2.

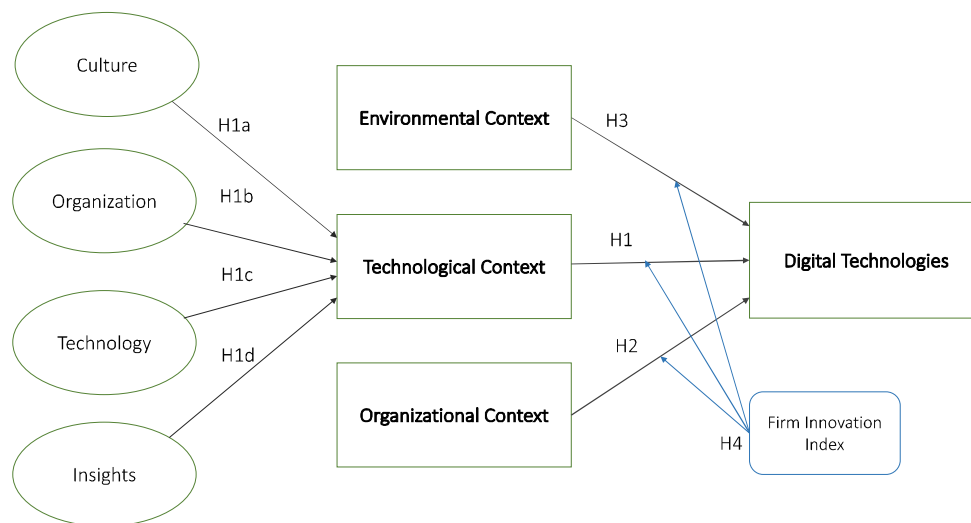


Figure 4-2. Hypothesized conceptual framework with moderator firm innovation index.

4.3.5 The Moderating Role of Hotels' Size (Number of Employees)

According to the European Commission definitions, micro-enterprises employ less than 10 employees and consist of the 97,3% of Greek businesses (Kottika et al., 2020; Nassr et al., 2016; OECD & Outlook, 2019). Small enterprises employ 11-50 employees and medium-sized enterprises 51- 250 employees. Prior literature defined that organization size is consistently referred to as being based on the number of employees, and as such is defined in the current study (Bukola et al., 2019; Lippert & Michael Swiercz, 2005; Racherla & Hu, 2008; Rosman & Stuhura, 2013). According to Zhu et al. (2004) structural characteristics, including organizational size plays a critical role in the ICT adoption and implementation process by organizations (Zhu et al., 2004). Additionally, organizations size is a predictor (Damanpour, 1991), although previous studies offered conflicted conclusions regarding the impact of size on ICT adoption (Racherla & Hu, 2008) and pursue of innovation (Baldrige & Burnham, 1975).

All in all, organizational size has been contemplated to capture administrative and bureaucratic complexity (Pawar & Eastman, 1997). A smaller firm is more flexible and requires less communication and coordination to achieve a task (Zhu et al., 2004). On the other hand, smaller firms have constraints in financial and technical resources and are not willing to take a risk for novel and unknown technologies (Lippert & Govindarajulu, 2006). Notably, organizational size is a fundamental factor that influences how undemanding it will be to implement internal changes within the firm (Walter & Bruch, 2010). Vaccaro et al. (2012) focused on the impact of organizational size and its moderating role, revealing that smaller and less complex organizations benefit from more leadership behaviours that will lead to management innovation.

Rajan et al. (1995) suggested that larger firms are more capable to become diverse and thus face lower risk (Rajan & Luigi, 1995). Moreover, larger firms could use equity capital and therefore are willing to take risks (Chen & Chen, 2011). On the contrary, larger organizations need to deal with complexity that becomes an inhibitor when it comes to new managerial practises and processes that include technology advantages (Vaccaro et al., 2012). Despite this, the fact that insignificant relationships have been identified concerning technology adoption and size of the organization. For example, Alhammadi et al. (2015) who studied the moderating effect of firm size on cloud computing adoption has revealed that the size is not statistically significant concerning cloud computing in Saudi Arabia (Alhammadi et al., 2015). In addition, Ramayah et

al. (2016) suggested that the hypothesized level of web adoption is moderate on the relationship between SMEs' size and website continuance. Nevertheless, is not supported revealing an insignificant relationship of web adoption level and size of the SMEs in Malaysia (Ramayah et al., 2016). However, the majority of the studies have supported a positive relationship between size of the firm and digital technologies adoption (Alam & Noor, 2009; Salah et al., 2021) including e-marketing in the tourism sector (El-Gohary, 2012) and cloud computing adoption by SMEs in the Northeast of England (Yazn Alshamaila et al., 2013).

Overall, literature examination revealed that the environmental context depends on contextual conditions such as the structure of the industry, the competitive pressure, the government regulatory and the macroeconomic context (Depietro et al., 1990; Tornatzky et al., 1990). In the current study, the focus is on the environmental turbulence as a result of the COVID-19 outbreak. Previous studies revealed that an environment lack of certainty could negatively affect the adoption of ICTs (J. L. Chong & K. Olesen, 2017; Li et al., 2011). In addition, Effendi et al. (2020) suggested that firms experiencing a period of high uncertainty such as COVID-19, are reluctant to adopt innovative ICTs (Effendi et al., 2020a). Based on the above discussion, the following hypotheses is proposed:

H5. Organizational size (number of employees) moderates the relationship between ICT adoption of the TOE framework, such as small hotels (11-50 employees) have a negative effect on ICT adoption.

The proposed hypothesized conceptual research model in Figure 4-3.

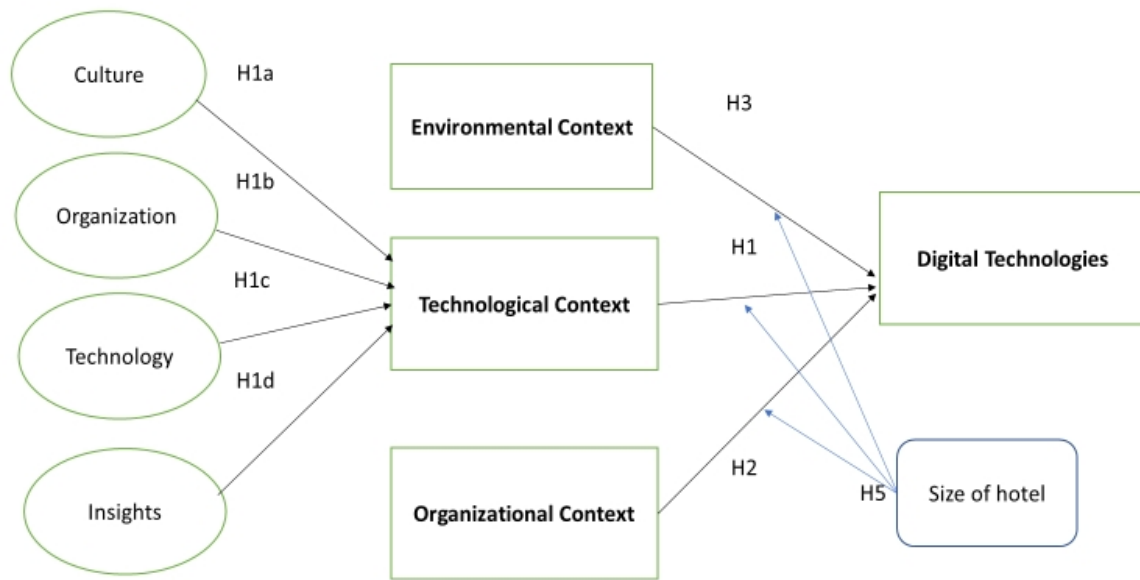


Figure 4-3. Hypothesized conceptual framework with moderator size of the hotel.

4.4 Summary

Chapter 4 underpins the development of the hypothesized conceptual model as part of the current research. Moreover, the assumptions and relationships that capture the hypotheses are thoroughly discussed. Prior to the present study, no other empirical studies have investigated in the technology context of the TOE framework the digital maturity dimension that includes multidimensional sub-variables (culture organization, technology, insights). In this sense, the exploration and investigation of a novel context in the hotel and technology literature is valued research. The hypothesized conceptual model presents factors that influence ICT adoption within the hotel sector, as well as the mechanisms which enable a hotel to strengthen its overall performance by the adoption of digital technologies, especially at the time of the COVID-19 pandemic.

Furthermore, the investigation of the moderating effect of the firm innovation index and organizational size allows the explanation of a more precise description of the relationship

between technological, organizational and environmental factors; namely digital maturity, financial resources availability, and government regulations towards ICT adoption within the hotel sector (Ro, 2012). The moderator is characterized as the ‘changer of a relationship’ (Little et al., 2007). Thus, the investigation of moderation within advanced statistical procedures such as PLS-SEM, is providing a richer understanding of the examined phenomenon (Ro, 2012).

The next chapter, explores and discusses the design and data of the empirical study that was conducted, in order to test the six above mentioned hypotheses of the research model. In chapter 6, these hypotheses are tested, followed by statistical analysis and the results. The ICT adoption is turning out to be the forefront of opportunity and at the same time the management’s biggest challenge. Thus, adopting new digital technologies within the hotel sector, which is predominantly composed of micro, small and medium-sized enterprises entail complex decision-making that calls for inputs from powerful research study. The current research contributes to the understanding of the hotels’ technology adoption process by investigating non and less explored factors and at the same time, investigates the moderating effects on the relationship between TOE perceptions of technology adoption. Prior examination revealed that technology itself has less to do with the technology adoption and more to do with strategy orientation (Strassmann, 1990). Hence, investigating digital maturity which involves aspects of dealing with technological strategic orientation and the perception of the company, could impose knowledge on the hoteliers and managers, resulting to transform them to technology adopters.

5 CHAPTER

Research Design and Data

5.1 Introduction

This chapter describes the research design employed for the current study to empirically make actual the hypotheses in Chapter 4. Section 5.2 outlines the research philosophy and its approach to provide a theoretical foundation for the study. The next section describes the primary research design by presenting details concerning its formulation. Continuing from this, section 5.4 provides the data collection process including research instrument adopted while the constructs with the measurement items are delineated. Section 5.5 is aiming to explain the decision of adopting the data method of Partial Least Squares Structural Equation Modeling (PLS-SEM) as well as presenting the constructs of the research within the technological, organizational and environmental context. Next, section 5.6 is defining the targeted population of the study by explaining the logic of this selection. Section 5.7 provides information about the data operationalization. Lastly, in Section 5.8 the ethical considerations are presented throughout the study.

5.2 Research Philosophy and Approach

Deciding on the appropriate research philosophy is an important step, as it shapes the frames in order to investigate the phenomenon in question (Holden & Lynch, 2004). There are four defined research philosophies in business and management research including pragmatism, positivism, realism and interpretivism (Saunders et al., 2003). In the context of the current study, the view regarding what constitutes acceptable knowledge concerning ICT adoption and implementation is an observable phenomenon that could provide credible data. Furthermore, as the study focuses on causality relationships between adoption factors at different levels of technological, organizational, and environmental factors is willing to create law-like

generalisations (Johnson & Duberley, 2000). Moreover, this study is willing to generate a research strategy to collect data by using the existing theory of the TOE framework to develop hypotheses. Accordingly, the current research adopts a positivism research philosophy. The research approach adopted for the current study is deductive, as the research starts with a theory that emerged from previous literature examination followed by the design of the research strategy to test the theory. More analytically, the logic of the deductive approach confirms the principal that '*when the premises are true, the conclusion must also be true*' (Saunders et al.(2003) pg. 144) (Saunders et al., 2003). Furthermore to the deductive approach, to test the propositions, quantitative data is collected and highly structured methodology is adopted to facilitate replication (Johnson & Gill, 2010).

5.3 Research Design

The research design consists of the overall plan for connecting the conceptual research questions with empirical research (Cresswell & Clark, 2007). It is also the link between philosophy and choice of methodology to collect and analyse data (Denzin & Lincoln, 2008). For this study, the adopted research design is linked with the nature of the research, and its aims and objectives which are clearly identified and presented in Chapter 1. The main purpose is to investigate the technological, organizational and environmental factors that influence the adoption of digital technologies in the hotel sector. To achieve the goals, the current research adopted the principals of a survey, which is exclusively linked to quantitative research design (Saunders et al., 2003). The selection of one single data technique (quantitative) and the corresponding analytical procedure is defined as mono-method. Therefore, the methodological choice of this study is mono-method using exclusively quantitative data. The data type of the quantitative data is presented in Figure 5-1. Concerning the time horizon, the 'snapshot' time horizon is defined as cross-sectional research in the research field (Saunders et al., 2003). Hence, this study is characterized as cross-sectional, as it explores ICT adoption in the hotel industry at a particular time.

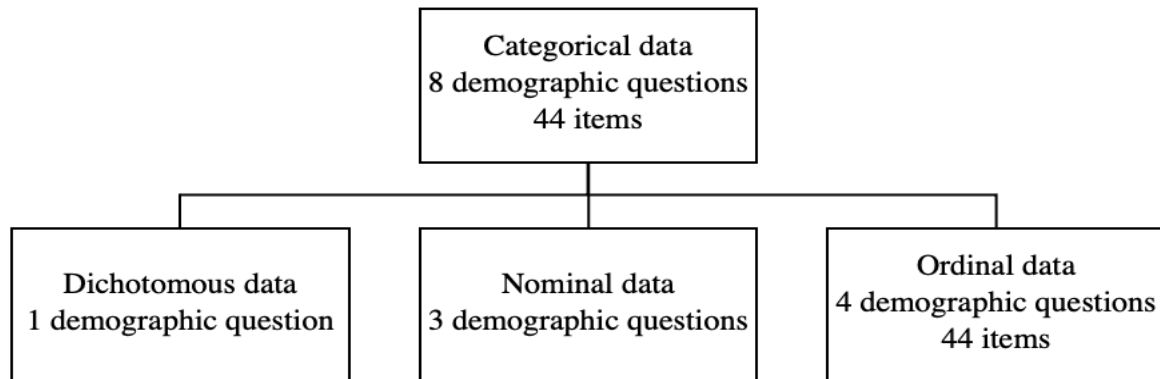


Figure 5-1. Quantitative data type.

To address the questions relating to digital technologies adoption in the hotel sector, this study focused on hoteliers, managers and executive officers that are the main decision-makers when it comes to digital technology integration within the hotel. Specifically, the research focused on Greek hotels that were characterized by high environmental uncertainty as the pandemic hit at the time of the study. During the establishment of the database of respondents to participate in the research, all Greek hotels were included in order to gain an entire and better understanding of the ICT adoption process.

In addition, the focus of the study is not restricted to any particular type of digital technologies, but rather, emphasizes on a wider catalogue of digital technologies. Studies of technology in a hospitality context have been confined to the adoption of digital technologies of one specific type of technology such as service robots (Tussyadiah & Park, 2018) and mobile applications (Chan et al., 2021a). In this regard, this study is distinct from prior research that investigated one particular digital technology in the hotel, as it explores a range of digital technologies stretching from website to Artificial Intelligence (AI) (Appendix A, Table 5-9). Hotels have been adopting technologies to optimize services at scale in order to respond to customers' and markets' growing demands (Kim et al., 2020). To this extent, different types of technology serve a different purpose within the hotel operation. All things considered; a wider

range of digital technologies provides knowledge of various digital technologies entities rather than partially. The research design is summarized and presented in an illustration in Figure 5-2.

Research philosophy and approach	Positivism Deduction
Methodological choice	Mono-method quantitative
Strategy	Case study
Time horizon	Cross-sectional
Data collection	Online questionnaire
Data analysis	SEM model evaluation, Multi-group analysis (MGA), T-tests
Type of variables	DV: Digital Technologies, IV: Digital maturity, government regulations, financial resources, Moderators: Firm innovation index, size of the hotel

Figure 5-2. Research design and methods.

This research seeks to identify the technological, organizational, and environmental factors that influence the adoption of digital technologies in the Greek hospitality sector. It is also willing to propose a strategy that will assist the successful adoption of ICT during a period of environmental turbulence in the organizations. Hence, at a pre-stage an exploratory research is adopted which permits the understanding and discovery of what is happening and allows to gain insights about the topic of interest (Saunders et al., 2003). Although ICT adoption and implementation is investigated extensively in technology and business literature, little is known about its adoption in the Greek hospitality industry during the pandemic. Therefore, in order to collect and collate the appropriate data for quantitative research, online questionnaire was conducted. In addition, the current study utilised description through descriptive research to be a prosecutor of explanation. Thus, a descripto-explanatory study is adopted to investigate the phenomenon in question. From this summary, the research commenced with an exploratory phase, allowing identification on the key-respondents' standpoint of ICT adoption. This led to a

descriptive stage, which was used as a forerunner to an explanatory phase, allowing explanation and discussion of the relationship between technological, organizational and environmental factors, and the adoption of ICTs based on the hoteliers and managers perceptions.

5.4 Data Collection

The key informants of the current study are hotel owners, managers and high-level executives. High level executives are employees that are aware of technical and business aspects and are contained in the current survey. The current research was conducted under the auspices of the Greek Ministry of Tourism. All members of the Hellenic Chamber of Hotels were invited to join the study. The survey took place in Greece between September and November 2020. During this period, the hotels came across the unprecedented consequences of the pandemic which has led the majority of them to cease their operational activities (Kourgiantakis et al., 2021). Although the majority of the hotels were not in full operation the research team has managed to contact them. However, the strict government regulations to secure physical isolation and the suspension of the hospitality industry to limit the COVID-19 spread, has negatively affected the industry and furthermore reduced the response (Le & Nguyen, 2021; Sigala, 2020). Of the 5,800 total online questionnaires mailed, 428 were returned undeliverable due to wrong addresses. Leaving 5,372 presumed to have been delivered to all the hotels in Greece. The response rate was around 10%. A total of 508 firms accepted the invitation to participate in the research, providing a total of 502 usable online questionnaires. Thus, the final population of the study were 502 hotels, yielding a valid response rate consistent with comparable studies (Awa & Ojiabo, 2016; Chiu et al., 2017). The process of finding contact details of the key respondents involved the Hellenic Chamber of Hotels. A validated list was delivered including all Greek hotels with contact details. The most suitable way to contact the key respondents was via the email addresses provided, as emails were complete and available from all hotels. Hence, emails with the online questionnaire attached were sent out to key respondents. To ensure a collective response the emails with the online questionnaire were sent out three times. The duration of the data gathering process was approximately three months (September 2020 to November 2020). Following the initial invitation to complete the online questionnaire for the survey, three email reminders were addressed with

two interval weeks between them. Since non-response bias is a common complication in larger scale research studies the reminders action plan was designed to ensure a representative response rate (Saunders et al., 2003).

At the end of the completion of the data collection phase, all responses were compared in order to ensure that the answers did not differ significantly. Two groups of responses were defined: the early and late respondents. Early respondents had replied to the first and second email within September and October 2020. The late respondents group consisted of those that had answered in the final month when the third and last email with the online questionnaire was sent. For this comparison, t-tests between group means were conducted. The results indicated no significant differences amongst the early and late respondents' groups (Table 5-1).

Table 5-1. Data collection phase.

	Early (N=302)	Late (N=200)	t (p)
Digital Maturity			
<i>Culture, Mean (SD)</i>	3.34(0.88)	3.4(0.89)	-0.838(0.403)
<i>Organization, Mean (SD)</i>	3.27(0.92)	3.41(0.91)	-1.736(0.083)
<i>Technology, Mean (SD)</i>	3.21(0.95)	3.35(1.02)	-1.62(0.106)
<i>Insights, Mean (SD)</i>	3.11(0.99)	3.15(1.03)	-0.397(0.691)
Digital technologies, Mean (SD)	2.75(0.97)	2.71(0.97)	0.377(0.706)
Financial resources availability, Mean (SD)	2.87(1.09)	2.75(1.13)	1.271(0.204)
Government regulation, Mean (SD)	3.81(0.78)	3.8(0.84)	0.147(0.883)

Harman's single factor test was adopted by the current study and revealed that there was no common method bias as the total variance extracted by one factor was 45.06% which is less than the recommended threshold of 50% (Kock, 2020).

5.5 Research Instrument and Online Questionnaire Design

The choice of questionnaire reflects on research questions and ability to meet its objectives (Saunders et al., 2003). For the current study, the research instrument adopted is an online

questionnaire consisting of single-select multiple-choice, close-ended with one dichotomous question. To avoid non responded questions, the online questionnaire did not further proceed when a question was not answered. The online questionnaire was distributed via Google forms to all the members of the Hellenic Chamber of Hotels. The questions are scaled by a five unipolar Likert-type scale. The scale is anchored from 1 to 5 (1-strongly disagree to 5-strongly agree) to collect empirical data (Appendix B). The Likert scale is widely used in surveys in measuring a respondents opinion or attitude toward a given subject (Saunders et al., 2003).

The online questions were designed in a logical sequence in order to avoid the respondents confusion (Saunders et al., 2003). In addition, the online questionnaire was pretested to ensure its quality (Rogelberg & Stanton, 2007). An introductory note was included in the online questionnaire, in order to introduce the purpose and objectives of the study to the respondents. The respondents were also informed that their identities were confidential and their participation voluntary. All the data was securely saved. In the first part of the online questionnaire, eight questions were included that collected information about job title, hotel type category, geographical region, star rating, number of employees, rooms quantity, annual income and operation mode. The second and last part included 44 items on a Likert scale question. The online questionnaire was selected as the most appropriate for the purpose of this study after considering advantages and disadvantages (Table 5-2).

Table 5-2. Advantages and disadvantages of online questionnaire.

Type of data collection	Advantages	Disadvantages
Online questionnaire	Wide geographic region is reached	Differences in understanding and interpretation
	Respondent can respond at convenience	Unanswered questions
	Ease to administer	Difficulty in conveying feelings and emotions
	Significant cost-cutting	Questionnaire completion fatigue
	Faster	High level of non-response
	Accessibility from any device	Lack of flexibility
	Scalability	
	Provide anonymity	
	Data accuracy	

Source: (Sekaran & Bougie, 2016; Zhou et al., 2016)

The final selection of the online questionnaire fulfilled both practical and methodological factors. Therefore, as the COVID-19 pandemic forced strict social distancing, the only considerable, faster and available way to contact the large volume of respondents across Greece was via the online questionnaire. Moreover, from the researchers' standpoint, the online questionnaire enabled the rapid processing and analysis of the collected data.

5.6 Sample Size

After the description of the research instrument and the establishment of the online questionnaire the determination of the sample size is following. Chrisnall (1997) supported that the size of the sample depends on the characteristics of the population, the type of information investigated and the cost (Chisnall, 1997). In addition, the larger the sample of the research, the greater the representative of the population and thus more accurate results would be provided (Chisnall, 1997). The appropriate sample size for the research study depends on several factors such as the research design and type of study (Dell et al., 2002).

However, the sample size is just one aspect of the research design and it is critical to be considered alongside with other factors such data collection processes and statistical methods of analysis (Adcock, 1997).

For the present study the sample size was developed considering the determination of minimum sample size for a given population size for continuous and categorical data (Table 5-3). Thus, given that the population size was 5,800 hotels, the minimum sample size is 362 respondents. Therefore, the sample size of 502 respondents is well accepted.

Table 5-3. Determination of minimum sample size for a given population size for continuous and categorical data.

Population size	Sample size					
	Continuous data (margin of error=.03)			Categorical data (margin of error=.05)		
	alpha=.10 t=1.65	alpha=.10 t=1.96	alpha=.10 t=2.58	p=.50 t=1.65	p=.50 t=1.96	p=.50 t=2.58
100	46	55	68	74	80	87
200	59	75	102	116	132	154
300	65	85	123	143	169	207
400	69	92	137	162	196	250
500	72	96	147	176	218	286
600	73	100	155	187	235	316
700	75	102	161	196	249	341
800	76	104	166	203	260	363
900	76	105	170	209	270	382
1000	77	106	173	213	278	399
1500	79	110	183	230	306	461
2000	83	112	189	239	323	499
4000	83	119	198	254	351	570
6000	83	119	209	259	362	598
8000	83	119	209	262	367	613
10000	83	119	209	264	370	623

Source: (Kotrlík & Higgins, 2001)

5.7 Data Methodologies

To investigate the formulated hypotheses of the current study Partial Least Squares Structural Equation Modeling (PLS-SEM) methodology was employed. Variance-based structural equation modeling (SEM) has grown in popularity over the years in business and management literature (Henseler et al., 2015; Nasution et al., 2020; Ringle et al., 2020). In addition, due to the main objective of a research study being to make sense of facets of the real world, SEM is able to bridge the gap between theoretical and empirical research (Bagozzi & Yi, 1988). It is recognized by researchers as the most widely used statistical techniques for testing complex models that include several independent and dependent variables (La Du & Tanaka, 1989; Maydeu-Olivares,

2017). In addition, researches on complex phenomena of business and technology management literature features are usually composed of items that could not be directly observed and thus leading to observational errors, SEM contributes to investigate these unobservational variables (Awa et al., 2010; Shmueli et al., 2016). Again, SEM depicts the most noticeable research methods in a wide area of disciplines (Ali et al., 2018). SEM has also gained significant approval in tourism and hospitality studies where it is adopted to test and explore various types of theoretical models (Ali et al., 2018; Nunkoo & Ramkissoon, 2011, 2012; Nunkoo & So, 2016).

In the research field several SEM techniques are available, including the generalized structured component analysis (CB) (Hwang et al., 2010), path analysis (Lastovicka & Thamodaran, 1991) and partial least squares structural equation modeling (PLS-SEM) (Hair et al., 2011). Variance based SEM methodology such as partial least squares path modeling (PLS) (Geladi, 1988; Wold, 1982) employ linear composites of observed variables as intermediaries for the latent variables in order to investigate the models' relationships (Hair et al., 2011; Hair et al., 2019a). Further, PLS -SEM is a prediction-oriented approach to SEM (Ali et al., 2018). Especially, in contrast to CB-SEM, in PLS-SEM a cause-and-effect relationship is efficiently investigated when the model includes several formative and reflective constructs (Hair Jr et al., 2017; Rigdon et al., 2017). Over the recent years, PLS-SEM is attracting researches' interest (Awa, Ukoha, et al., 2017; Kloutsiniotis & Mihail, 2020; Kloutsiniotis et al., 2022) due to the fact that it is a causal modelling approach that is focusing on explaining maximum variances (Hair et al., 2011; Hair et al., 2013).

PLS -SEM is flourishing in the hospitality sector research and is published in several hospitality management disciplines such as *International Journal of Contemporary Hospitality* (Castellanos-Verdugo et al., 2009; Kim et al., 2013), *Cornell Hospitality Quarterly* (Aslanzadeh & Keating, 2014; Beldona et al., 2015; Lai, 2015), *International Journal of Hospitality Management* (Pizam et al., 2022) and *Journal of Hospitality and Tourism Research* (Kang et al., 2014; Sui & Baloglu, 2003; Wu et al., 2018). In the hospitality literature, PLS-SEM has developed to become methodologically well-established which included depending on the research aim to develop theory, estimation of complex models, moderation analysis and predictive analysis (Ali et al., 2018). Furthermore, the hospitality researches use PLS-SEM to investigate mainly reflective

constructs or in a smaller percentage a combination of reflective and formative measured constructs (Ali et al., 2018).

The current study was conducted through “Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS 3.2” (Ringle et al., 2005; Sarstedt et al., 2014). For the purpose of this study, the PLS –SEM was selected for the following reasons:

- o For its ability to assess unobservable variables in measurement model in the observation level (Joseph F Hair et al., 2012).
- o Testing the hypothesis between latent variable in the structural model in the theoretical level (Joe F Hair et al., 2012). The construct ‘digital maturity’ included four latent variables namely culture, organization, technology and insights.
- o Testing complex models that include dependent and independent variables, several in the same model (MacCallum & Austin, 2000; Wong, 2013). The current study included one dependent variable, which is ICT and four independent variables included digital maturity, government regulations and financial resources availability.
- o Its ability to easily incorporate the combination of reflective and formative variables (Kloutsiniotis et al., 2022) and especially reflective constructs (Ali et al., 2018). This research included one formative construct which was the dependent variable of the study.
- o Predictive purposes (Awa, Ukoha, et al., 2017).
- o Its high levels of statistical power (Loeb & Sourirajan, 1962; Shine, 2020).
- o Testing research models including moderators in the hospitality sector (Ro, 2012).

5.8 Constructs of the Research

5.8.1 Technological Context

“Digital maturity” was developed as a Type I second order construct (reflective first order-reflective second-order) comprised of four reflective latent variables. The dimensions that comprise the digital maturity are: 1) culture, 2) organization, 3) technology and 4) insights as analytically described in Chapter 4. Digital maturity was measured by 22 items on a “five-item scale” of (Gill & VanBoskirk, 2016) (Table 5-4).

Table 5-4. Digital maturity.

Dimensions and Items	
<i>Digital maturity (22 items) (1-strongly disagree to 5-strongly agree)</i>	
<i>Culture (7 items)</i>	
DMC1	The business strategy is based on digital technologies
DMC2	Business management supports the digital strategy of the business
DMC3	We have the proper staff to manage digital technologies in the business
DMC4	We invest in the training of our staff for the use of digital technologies
DMC5	The management of the company communicates its digital strategy to the staff of the company
DMC6	The company takes all necessary actions to support innovation
DMC7	We are interested in enhancing the experience of our customers by utilizing different service channels (e.g., through a website, call centre, social media, etc)
<i>Organization (4 items)</i>	
DMOR1	We commit the necessary resources (human and / or financial) to design, redefine and execute our digital strategy
DMOR2	Our staff has the necessary digital skills to use information and communication systems
DMOR3	Our company follows specific procedures for the management of our information systems
DMOR4	We use digital channels to communicate with our business partners (e.g., suppliers, banks, etc)
<i>Technology (6 items)</i>	
DMTECH1	We have set a specific budget for the supply / upgrade of our digital infrastructure and systems
DMTECH2	Our business is flexible in changes related to its digital strategy
DMTECH3	Our company uses and utilizes modern information systems and infrastructures
DMTECH4	Our company evaluates the performance of its information systems and infrastructures in terms of their contribution to the achievement of business goals
DMTECH5	Our company utilizes feedback from its customers to reshape its digital strategy
DMTECH6	Our company uses digital technologies to promote innovation and collaboration with its staff
<i>Insights (5 items)</i>	

DMIN1	Our company has set clear and quantitative targets for measuring the success of its digital strategy
DMIN2	Every employee of the company understands how their performance is related to specific corporate digital goals
DMIN3	Our business staff understands the ways in which physical and digital channels work together to achieve the desired result
DMIN4	The views of the company's customers are used to develop new digital services
DMIN5	We use the experience from the implementation of our digital actions in the shaping of our digital strategy

5.8.2 Organizational Context

“Financial Resources availability” was developed as a reflective first order construct. Financial resources availability was measured by a three item scale ($\alpha = 0.911$) from Wiklund and Shepherd (2005) and Story, Boso, and Cadogan (2015) (Story et al., 2015; Wiklund & Shepherd, 2005) (Table 5-5).

Table 5-5. Financial resources availability.

Dimensions and Items	
<i>Financial Resources Availability (3 items)</i>	
<i>Indicate the extent to which your business has financial availability to support its business activities during the pandemic (1-strongly disagree to 5-strongly agree)</i>	
FIN1	If we need financial help for our business activities, we can receive them
FIN2	We have financial resources to finance our business initiatives
FIN3	We are able to obtain financial resources in a short period of time to support the operation of our business

5.8.3 Environmental Context

“Government regulations” was developed as a reflective first order construct. Government regulations were measured with a three-item questionnaire (Table 5-6).

Table 5-6. Government regulations.

Dimensions and Items	
<i>Government regulations (3 items)</i>	
<i>To what extent do you agree with the following statements (1-strongly disagree to 5-strongly agree)</i>	
GOV1	The training of the staff in the COVID-19 health protocols is a costly undertaking for the hotel
GOV2	The compliance with COVID-19 health protocols increases the cost of the hotels' services
GOV3	The alignment with COVID-19 health protocols requires investments to improve hotels' digital infrastructure

'Firm Innovation Index' was measured in this study as a moderator. The firm innovation index was calculated as a mean value of five items (Table 5-7) and also as a moderator are measured the number of employees by one item question (Table 5-8).

Table 5-7. Firm Innovation Index

Dimensions and Items	
<i>Firm Innovation Index (5 items)</i>	
<i>To what extent do you agree with the following statements (1-strongly disagree to 5-strongly agree)</i>	
FIRMINN1	Innovation is promoted in our business
FIRMINN2	Our company develops new responses to everyday problems
FIRMINN3	The company sets realistic goals
FIRMINN4	The company believes that it is worth the risk as it can bring greater rewards
FIRMINN5	Executives are constantly looking for new business opportunities

Table 5-8. Number of employees.

Dimensions and Items	
<i>Number of employees (1 item)</i>	
<i>How many employees does your firm have</i>	
NUMEPL1	1-10
NUMEPL2	11-50
NUMEPL3	51-250
NUMEPL4	>250

5.8.4 Dependent Variable: Information Communications Technology (ICT)

The dependent variable “ICT” or “digital technologies” was developed as a formative first order construct. The digital technologies were measured using an eight-item questionnaire (Table 5-9). All measures were self-reported.

Table 5-9. ICT list.

Dimensions and Items		
<i>Digital Technologies (8 items)</i>		
<i>To what extent do you agree with the following statements (1-strongly disagree to 5-strongly agree)</i>		
<i>Website</i>	DIGSOL1	Enrich website with information on COVID-19 policy (e.g., prevention program, cancellation policy, frequently asked questions about COVID-19)
<i>Social Media</i>	DIGSOL2	Social media campaign /publication series to inform hotel guests concerning COVID-19 policy
<i>Mobile & Tablet applications</i>	DIGSOL3	Development of customer service applications on mobile and tablet (e.g., mobile check-in, communication with the staff via mobile)
<i>QR</i>	DIGSOL4	QR codes to avoid the use of printed material (e.g., menu scanning, brochure codes, etc.)
<i>Remote Control Systems</i>	DIGSOL5	Remote control systems (e.g., virtual TV remote control, touchless digital menu)
<i>Advanced Policy Management</i>	DIGSOL6	Advanced policy management (e.g., personalized or dynamic pricing)
<i>CMR</i>	DIGSOL7	Advanced customer management systems to improve customer communication and loyalty (CMR)
<i>AI</i>	DIGSOL8	Advanced artificial intelligence systems (e.g., robotics systems, guest chatbots, demand forecasting systems)

5.9 Defining Research Targeted Population

The targeted population and sampling process is considered as one of the most significant factors of research effectiveness (Sekaran & Bougie, 2016). The rationale behind defining the target population is associated with the research context and purpose. Hence, the key-respondents are required to be conversant with the ICT application level within the hotels and be involved in the strategic management of the firm. The majority of the respondents 55 % were the owners of the hotel property and 38% were CEO and senior executive managers. The total of 93% held critical participation in the strategic decision-making processes of the hotel. The strategic decision

making process usually involves long-consequences for the firm (Rantapuska & Ihanainen, 2008). However, the decision-making process of ICT adoption is a complex task and could affect adoption and implementation because of the unfamiliarity of the novel technology (Griffith, 1999) (Table 5-10).

Table 5-10. Position of respondents.

Position	Number of respondents
Hotel Owner	278
Chief Executive Officer (CEO)	134
Senior Executive	58
Other (sales manager, service manager)	32
Total respondents	502

5.10 Data (Constructs) Operationalization

The hypothesized theoretical model adopted in the current study involves unobservable variables known also as latent variables. Thus, a second-order latent variable to measure multiple indicators should be adopted (Hair et al., 2019b). Prior examination of literature revealed that most commonly, second-order variables are measured using reflective indicators (Diamantopoulos & Siguaw, 2006; Mikulić & Ryan, 2018). In the current hypothesized model, the first-order reflective factors are used to formulate the second-order variable, which is digital maturity. Both latent variables of the current study (reflective indicators) and the main factor (formative indicator) have been used in previous studies in the technology and management field (Awa et al., 2010; Awa & Ojiabo, 2016; Awa et al., 2016; Effendi et al., 2020a).

5.11 Ethical Issues

Certain ethical principles were taken into consideration when designing and executing the current research. Starting from privacy issues as a key principle. The first step to ensuring that this

principal specific action was taken, was that the survey was voluntary. Furthermore, confidentiality and anonymity were ensured to all key-respondents. In terms of collecting data, the identities of the key respondents were secured. The data analysis and reporting of finding were motivated by the principle of ensuring privacy. Confidentiality of data was ensured but could be retrieved anytime upon request of the research participants. While internet and email lists are helping to facilitate fast access to a larger scale of participants, this raises dilemmas concerning ethical considerations (Saunders et al., 2003). Thus, the purpose of the study is clearly clarified and therefore participants could pull out of the research at any time. All in all, the ethical considerations mentioned in this section conform to the Ionian University research ethics and deontology committee.

5.12 Summary

This chapter aimed to describe the requirements and the nature of the empirical data that was used to test the research model previously presented in Chapter 4. In addition, regarding the operational environment, a diversity on the environmental conditions should be noted, as at the time of the study the pandemic drastically affected all aspects of human life. These conditions of operation are particularly interesting when examining the adoption of ICT within the hotels. By presenting the research design and data collections process while defining the constructs, this chapter is verifying that the research's aims and objectives are met through a rigorous process of steps. Further and more analytical and sophisticated analyses are described in the next chapter.

6 CHAPTER

Analysis and Results

6.1 Introduction

This chapter presents the findings of the statistical analyses on the collected empirical data. Section 6.2 describes the data and the demographics of the research. The following section 6.3 present the actual analyses and results including the measurement and the structural model as well as the multi-group permutation tests that explore the moderating effects of firm innovation index in comparison to the number of employees.

6.2 Data Description

With regards to the demographics, the vast majority were Micro, Small and Medium-sized Enterprises (MSMEs) the percentage calculated was over 97% of the total sample. More analytically, 49% of the hotels had less than 10 employees and 34% had 11 to 50 employees. Only 3% of the hotels included in the research had more than 250 employees and are characterized as medium hotels. Another distinctive characteristic of the sample that is important to highlight, is that 90% of the sample had less than 200 rooms and approximately 80% less than 2 million annual turnovers. Furthermore, the owners were 55. 4% of the sample, and 85. 6 % were independent hotels. Concerning the geographical region of the businesses, approximately 45% of the respondents operate in the mainland of Greece and around 55% operate in the Greek islands. The survey included both seasonal and full-year hotels. The sample included a total of 60% of hotels that operate during the summer season. A summary of demographics is presented in Table 6-1.

Table 6-1.Demographic characteristics of the sample.

		Frequency	Percentage (%)
Position	Owner	278	55.4
	CEO	134	26.7
	Senior executive	58	11.5
	Other	32	6.4
Hotel Category	Independent Hotel	430	85.6
	Member of big chain hotel	20	4.0
	Member of a small chain hotel	52	10.4
Geographical region	Thrace	4	0.8
	Macedonia	75	14.9
	Thessaly	34	6.8
	Epirus	22	4.4
	Central Greece	42	8.4
	Peloponnese	50	10.0
	Crete	70	13.9
	Ionian Islands	102	20.3
	Aegean Islands	103	20.5
Stars	5	18	3.6
	4	101	20.1
	3	177	35.3
	2	133	26.5
	1	73	14.5
Number of employees	1-10	245	48.8
	11-50	171	34.1
	51-250	73	14.5
	> 250	13	2.6
Rooms quantity	Less than 200 rooms	452	90.0
	200 - 399 rooms	35	7.0
	400 - 699 rooms	10	2.0
	More than 700 rooms	5	1.0
Annual Income	< 2 million euros	245	48.8
	2-10 million euros	172	34.3
	11-50 million euros	77	15.3
	More than 50 million euros	8	1.6
Operation mode	Full year	200	39.8
	Seasonal	302	60.2

6.3 Respondent Profile

6.3.1 Position

The positions of the respondents that participated in the study are presented in Figure 6-1. The majority of the respondents were owners of the firm, who are involved in the business strategy and future planning of the business, also including technology adoption and implementation decisions. Henceforth, 27% of the sample respondents were CEOs' who are also knowledgeable about the firms' strategy and technology investments.

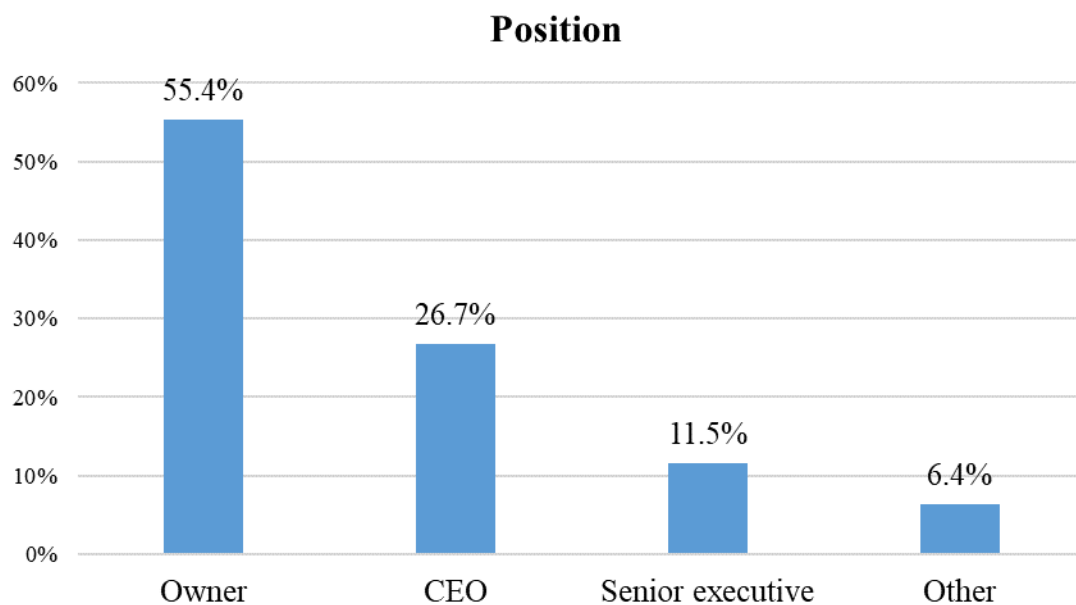


Figure 6-1. Distribution of position.

6.3.2 Hotel Category

Concerning the hotel category, the vast majority were independent hotels. The hospitality sector is rapidly expanding in sophistication and return of investment (ROI) and small independent

hotels are shifting to become large chains in international level (Bailey & Ball, 2006). In Greece, small independent family-owned hotels are remaining the main hotel category (Balomenou et al., 2005). Hence, the demographic outcome of 86% of independent hotel, as presented in Figure 6-2, is expected. Hotels who are members of an international chain represented 4% of the sample and hotels as member of a small hotel chain were 10.4% (Figure 6-2).

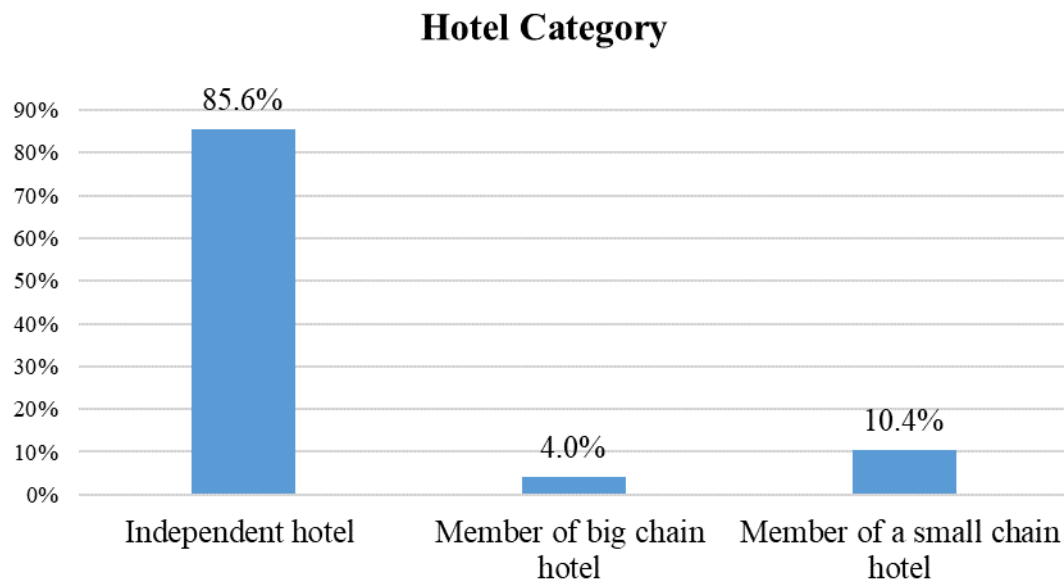


Figure 6-2. Distribution of hotel category.

6.3.3 Hotel Geographical Region

Regarding the geographical region of the hotels, Figure 6-3 presents the frequency of responses of the sample. In the Greek islands, including Aegean and Ionian 41% of the hotels were included. Following in responses were the region of Macedonia (15%) and Crete (14%). Central Greece is represented by 8%, Thessaly 7% and Epirus 4% of the total sample. The least represented region was Thrace with 1%.

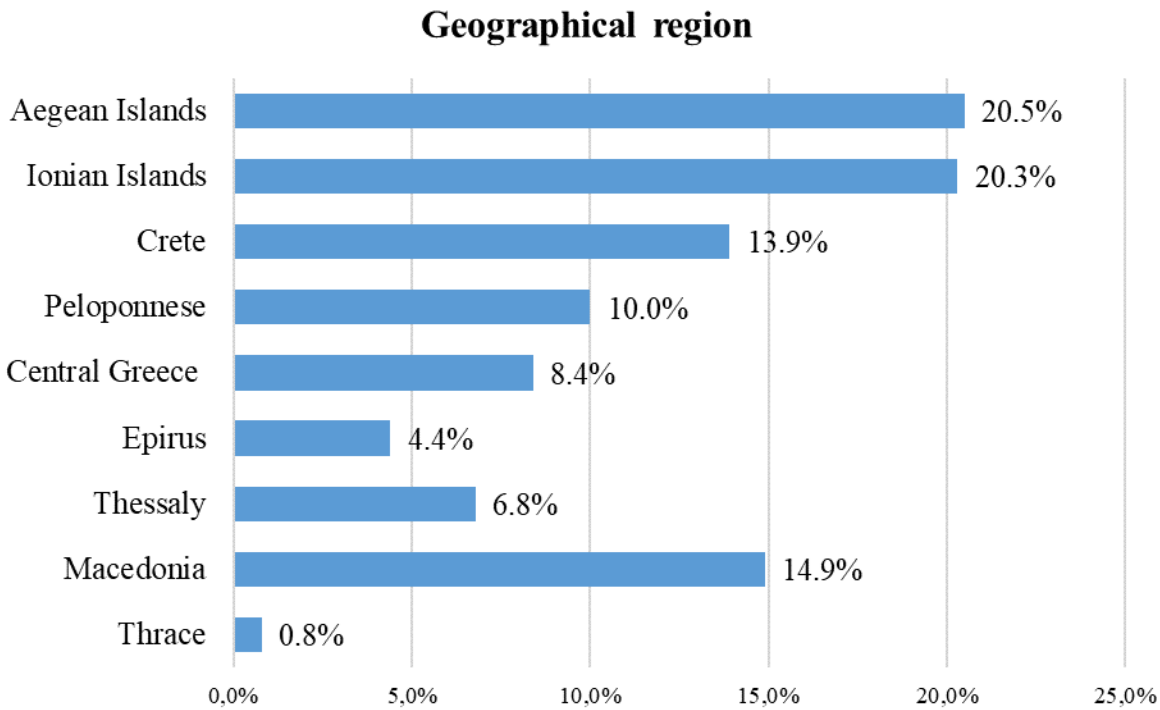


Figure 6-3. Distribution of geographical region.

6.3.4 Hotel Star Rating

In Figure 6-4 presented below, the star rating of the hotels that have participated in the study are depicted. From the vast majority of the sample, the 35% were 3-star hotels, and the second largest portion were 2-star hotels (26.5%). The third group were 4-star hotels (20.1%). The sample also included 14.5% of 1-star hotels. The last group were 5-star hotels, which consists of 3.6% of the total sample. Hotel rating systems allow tourists to compare hotels and provide a basis of service expectations that helps them to select the hotel that corresponds to their demands and expectations (Nunkoo et al., 2020; Su & Sun, 2007). The current hotel rating system applicable in Greece assesses structural features and facilities rather than the quality of services (Rompura et al., 2021). Lately, Greek hospitality has replaced the class designation with a star rating system, and since 2020, Greece is included in a system of 17 European countries following a common list of 250 certification criteria. The procedure is still in the processing phase and is expected to be finalized in 2025 (Rompura et al., 2021). The updated 250 criteria list will cover all areas of the

hotel services, with an emphasis given on digitalization, customer service, and the adoption of green practices (e.g. electric vehicle recharge system) (Sufi & Singh, 2018). Hence, hotels adopting digital technology practices such as customer-friendly online reservations management systems will be positively evaluated. This 250 criteria list will be updated every three years to follow trends and ongoing digital developments (Union, 2015). So far, no international classification has been adopted although over the years many attempts took place from government and public initiatives (Minazzi, 2010).

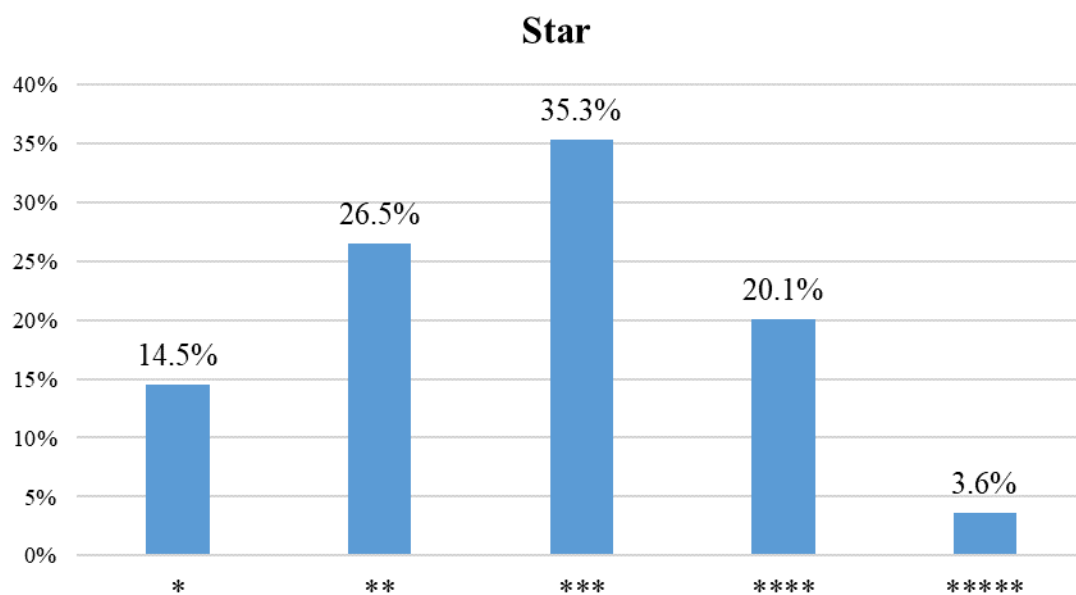


Figure 6-4. Distribution of stars.

6.3.5 Firm Profile

The largest percentage of the sample, which is 49 % had 1 to 10 employees (Figure 6-5). In addition, the responses of annual income of less than 2 million euros consisted of 79.3% of the sample and 90% of the sample were hotels with less than 200 rooms (Figure 6-6, Figure 6-7). The cumulative percentage of Micro, Small-Medium Enterprises (MSMEs) accounted for the vast majority of the sample. Moreover, as presented in Figure 6-5, the 34.1% of the respondents had

11-50 employees. Concluding that, in total, 83% of the sample had less than 50 employees in their hotel. Regarding the number of employees 14.5% of the hotels employ 51-250 employees and 2.6% less than 250 employees. Regarding the number of rooms 3% of the respondents have more than 400 rooms and 7% between 200-399 rooms (Figure 6-6). The annual income of the hotels 5% is 2-10 million euros and between 11-50 million has the 4.6 % of the sample. Lastly, as shown in Figure 6-7, 1% of the hotels have reported an income of more than 50 million euros yearly.

6.3.6 Size of the Firm

The categorization of a firm as an SME includes, depending on the country, the number of characteristics such as sales on annual basis, the number of employees and market capitalization. In Europe, Small and medium-sized enterprises (SMEs) are defined in the European Union (EU) recommendation 2003/361. The traits that determine whether a firm is an SME are the following: 1) employees' headcount and 2) either annual turnover or balance sheet (Lukács, 2005)(Table 6-2). Prior literature defined that organization size is consistently referred to number of employees (Lippert & Govindarajulu, 2006; Racherla & Hu, 2008) and as such is defined in the current study for the statistical analysis of its moderating effect. The Figure 6-5 presents the number of employees of this study.

Table 6-2. SME definition.

Company category	Number of employees	Turnover	or	Balance sheet
Medium	< 250	≤ € 50 m		≤ € 43 m
Small	< 50	≤ € 10 m		≤ € 10 m
Micro	< 10	≤ € 2 m		≤ € 2 m

Source: European Commission, 2018

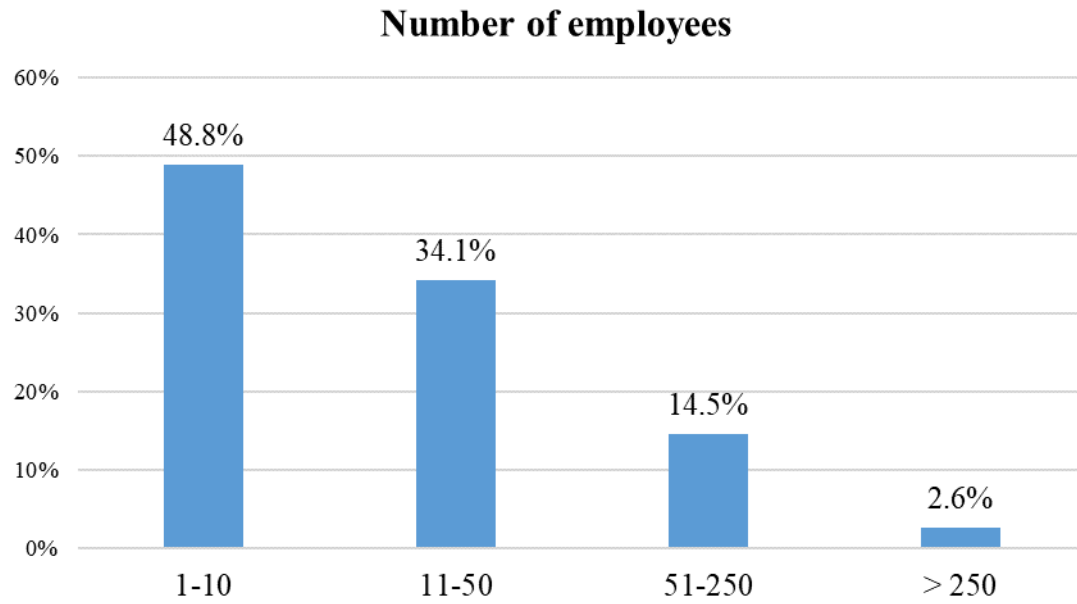


Figure 6-5. Distribution of number of employees.

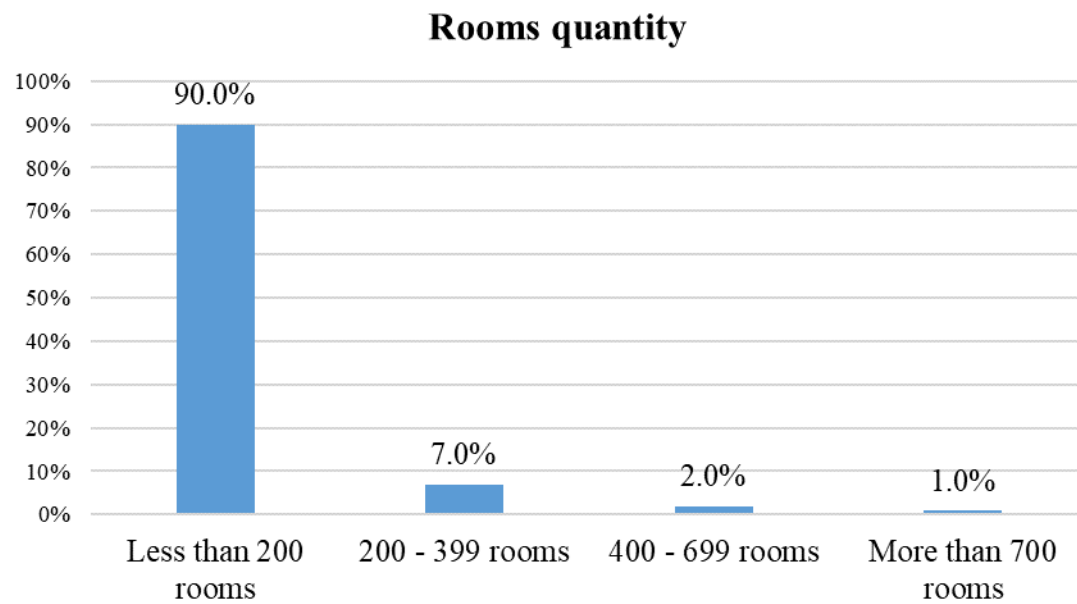


Figure 6-6. Distribution of rooms quantity.

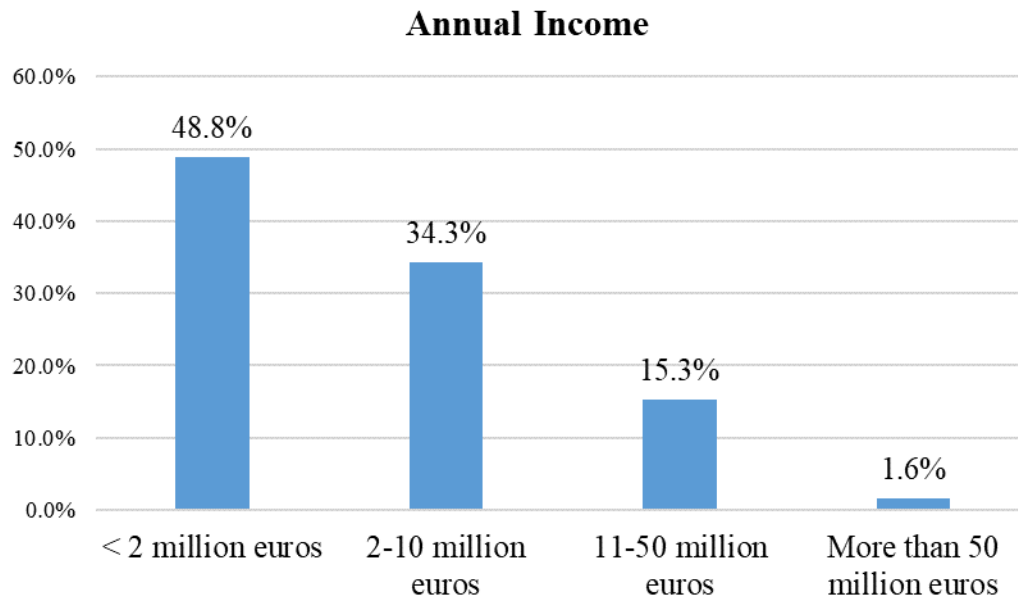


Figure 6-7. Distribution of annual income.

6.3.7 Hotel Operation Mode

In terms of hotel operation, the hotels in Greece are operating either for the full year or exclusively during the summer season. More specifically, as it is presented in Figure 6-8, the largest proportion of responses were received by hotels that operate seasonally (60.2%). The rest of the sample are hotels that operate for the full year (39.8%).

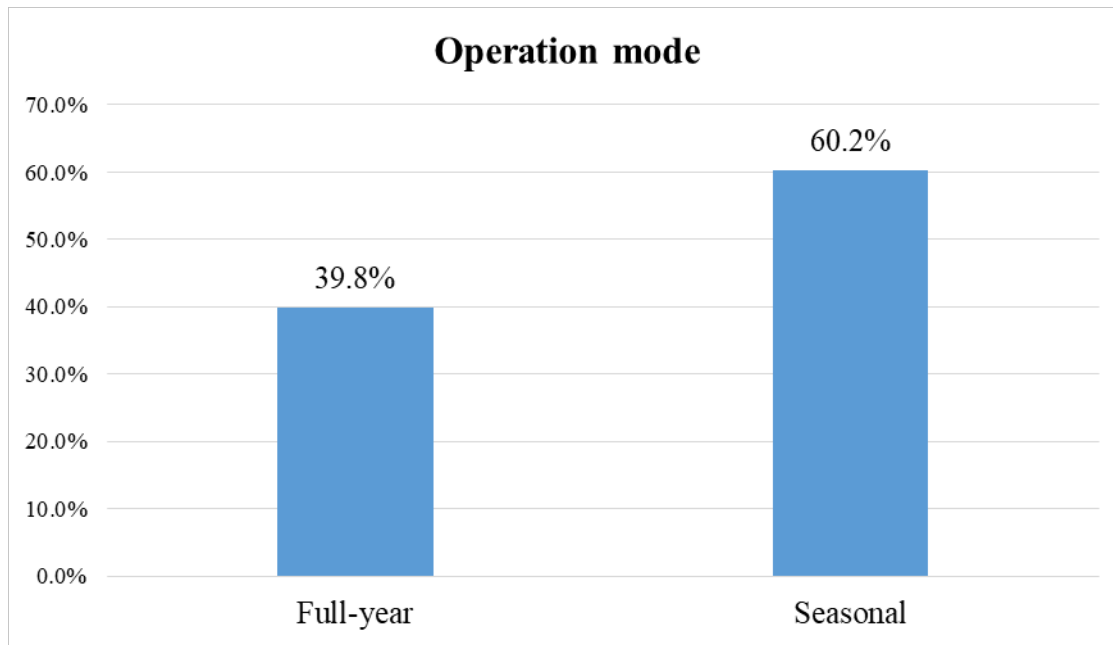


Figure 6-8. Distribution of operation mode.

6.4 Results

6.4.1 Measurement Model

Most commonly, second-order variables are measured using reflective indicators (Diamantopoulos & Siguaw, 2006; Mikulić & Ryan, 2018). In the current model, first-order reflective factors are used to formulate the second-order variable, which is digital maturity. For the examination and evaluation of the measurement model, it is necessary to assess the internal consistency, convergent validity and discriminant validity via Cronbach's alpha coefficient, Average Variance Extracted (AVE) and Fornell and Larcker criterion. More analytically, Table 6-3 shows the Cronbach's alpha coefficient, composite reliability and the Average Variance Extracted (AVE) (Appendix C). The reliability coefficient Cronbach's alpha for all the construct were within an acceptable level of reliability (Hair Jr, Hult, Ringle, Sarstedt, et al., 2021; Tenenhaus et al., 2005). The Composite Reliability and the Average Variance Extracted values for all constructs was higher than 0.7 and 0.5, respectively (Chin, 2010; Hair Jr et al., 2017).

Fornell-Larcker criterion was used to assess the discriminant validity of the measurement model. More specifically, the correlation coefficients among constructs were lower than the square root of each AVE value (Hair et al., 2019b) (Table 0-5). In addition, the Confidence Interval (CI) of Heterotrait-Monotrait ratio of correlations (HTMT) excluded 1.00, which means that the assumption of discriminant validity was met (Hair Jr et al., 1995) (Appendix D). There is no evidence of collinearity among the digital technology construct as the variance inflation factor (VIF) value was lower than 5 (Table 0-6). As presented in Table 6-4 (Appendix C), the items of digital technology were considered valid when the outer loadings were more than 0.5 (Hair Jr, Hult, Ringle, & Sarstedt, 2021) (Appendix E).

a

Table 6-3. Results of the reflective construct assessments.

Constructs	Items	Factor Loadings	Mean (SD)	CR	AVE
<i>Culture ($\alpha=0.924$)</i>	DMC1	0.835	3.33 (0.96)	0.940	0.692
	DMC2	0.839	3.58 (1.02)		
	DMC3	0.827	3.12 (1.14)		
	DMC4	0.877	3.13 (1.12)		
	DMC5	0.883	3.18 (1.16)		
	DMC6	0.882	3.31 (1.04)		
	DMC7	0.659	3.90 (0.99)		
<i>Environment ($\alpha=0.774$)</i>	GOV1	0.669	3.22 (1.15)	0.765	0.540
	GOV2	0.685	4.27 (0.92)		
	GOV3	0.965	3.92 (1.02)		
<i>Insights ($\alpha=0.938$)</i>	DMIN1	0.887	2.96 (1.15)	0.953	0.801
	DMIN2	0.907	2.81 (1.15)		
	DMIN3	0.891	3.02 (1.10)		
	DMIN4	0.869	3.49 (1.12)		
	DMIN5	0.920	3.35 (1.09)		
<i>Organization ($\alpha=0.869$)</i>	DMOR1	0.855	3.19 (1.11)	0.911	0.720
	DMOR2	0.855	3.17 (1.05)		
	DMOR3	0.909	3.37 (1.09)		
	DMOR4	0.769	3.57 (1.07)		
<i>Organization Financial Resources ($\alpha=0.896$)</i>	FIN1	0.903	2.90 (1.24)	0.935	0.828
	FIN2	0.902	2.80 (1.16)		
	FIN3	0.925	2.78 (1.24)		
<i>Technology ($\alpha=0.932$)</i>	DMTECH1	0.811	2.91 (1.22)	0.946	0.747

Digital Maturity ($\alpha=0.973$)	DMTECH2	0.874	3.38 (1.09)	0.975	0.644
	DMTECH3	0.902	3.17 (1.14)		
	DMTECH4	0.915	3.18 (1.15)		
	DMTECH5	0.796	3.78 (1.10)		
	DMTECH6	0.881	3.19 (1.13)		
	DMC1	0.737	3.33 (0.96)		
	DMC2	0.758	3.58 (1.02)		
	DMC3	0.779	3.12 (1.14)		
	DMC4	0.814	3.13 (1.12)		
	DMC5	0.821	3.18 (1.16)		
	DMC6	0.851	3.31 (1.04)		
	DMC7	0.654	3.90 (0.99)		
	DMOR1	0.844	3.19 (1.11)		
	DMOR2	0.755	3.17 (1.05)		
	DMOR3	0.837	3.37 (1.09)		
	DMOR4	0.678	3.57 (1.07)		
	DMTECH1	0.761	2.91 (1.22)		
	DMTECH2	0.813	3.38 (1.09)		
	DMTECH3	0.853	3.17 (1.14)		
	DMTECH4	0.876	3.18 (1.15)		
	DMTECH5	0.757	3.78 (1.10)		
	DMTECH6	0.869	3.19 (1.13)		
	DMIN1	0.851	2.96 (1.15)		
	DMIN2	0.818	2.81 (1.15)		
	DMIN3	0.816	3.02 (1.10)		
	DMIN4	0.804	3.49 (1.12)		
	DMIN5	0.869	3.35 (1.09)		

Note. CR: Composite Reliability, AVE: Average Variance Explained

Table 6-4. Results of the formative construct assessments.

Title	Items	VIF	Outer Loadings	95% CI	Outer Weights	95% CI
Digital Technologies	Website	1.674	0.586	0.484,0.687	0.135	0.017,0.27
	Social Media	1.886	0.676	0.571,0.750	0.215	0.061,0.339
	Mobile & Tablet Applications	2.033	0.797	0.711,0.851	0.262	0.103,0.407
	QR	1.738	0.709	0.603,0.793	0.177	0.045,0.337

Remote Control Systems	1.545	0.626	0.503,0.714	0.119	-0.039,0.242
Advanced Policy Management	1.873	0.669	0.582,0.738	0.080	-0.036,0.213
CRM	1.907	0.747	0.642,0.818	0.270	0.112,0.432
AI	1.344	0.566	0.479,0.640	0.197	0.097,0.29

Table 6-5. Discriminant validity (Fornell-Larcker criterion).

	Culture	Government Regulations	Insights	Financial Resources	Organization	Technology
Culture	0.832					
Government Regulations	0.209	0.735				
Insights	0.795	0.178	0.895			
Financial Resources	0.270	-0.065	0.243	0.910		
Organization	0.831	0.179	0.818	0.271	0.848	
Technology	0.829	0.192	0.870	0.279	0.851	0.864
Digital technologies	0.611	0.257	0.561	0.292	0.562	0.621

The path-weights of the first-order construct were examined in order to evaluate the significant value on second-order construct. Furthermore, to check multicollinearity the variance inflation factor (VIF) was assessed; it revealed that all constructs had values lower than 5 and are statistically significant, except for the ‘technology’ construct where the corresponding value was marginal higher than 5 (Ringle et al., 2012) (Table 6-6). This outcome is slightly higher but falls in line with the acceptable level of VIF less than 10 (Hair Jr et al., 1995).

Table 6-6. Multicollinearity diagnostics and path weights of first-order constructs on second-order construct.

	Path Weights	Variance Inflation Factors (VIF)
Culture	0.322*	4.019
Insights	0.259*	4.627
Organization	0.184*	4.657
Technology	0.304*	5.858

* $p < 0.001$

6.4.2 Structural Model

The results in Figure 6-9 present the hypothesized conceptual framework structural model. In addition, Table 6-7, depicts the outcomes of the research model. Culture ($b=0.322$, $p<0.001$), insights ($b=0.259$, $p <0.001$), organization ($b=0.184$, $p <0.001$) and technology ($b=0.304$, $p <0.001$) were significantly correlated with the ‘digital maturity’, indicating that higher values of independent variables were associated with higher values of digital maturity. Moreover, regarding the analysis, the ‘culture’ variable of the digital maturity construct refers to the clearly delivered technology-oriented strategy and management of the hotel. Therefore, management can act upon and communicates to all stakeholders including office executives, employees and customers, guiding them towards an ICT driven strategy. The likelihood being that they can then adopt and implement these technologies during the pandemic. Concerning the ‘organization’ variable, the outcomes revealed that if the resources (human and non-human) of the hotel are technology oriented, as well as external communication with partners and suppliers and staff having the technology “know-how”, then the adoption of technology solutions could be achieved. Furthermore, the “technology” element is referring to the hotel’s transitional approach towards technology by setting up a specific budget for technology application and process updates; being open to technology strategy changes; by using ICTs effectively when it comes to strategy targets; taking into account the customers’ feedback when planning the hotels’ strategy and by using technology solutions for the promotion of innovation with the employees’ cooperation. When the above-mentioned goal is reached, the hotel is expected to fully adopt and implement ICTs. Lastly, concerning the fourth variable of the technological context, ‘insights’ is considered as the achievement of the measurement of the successful implementation of the digital solutions within the business. In addition, ‘insights’ uses the experience of the firm in order achieve the integration of ICTs. Moreover, the ‘insights’ variable is trying to link each employee’s performance in the workplace to a certain technology strategy. It seems that if the above mentioned ‘insights’ are achieved within the organization then the hotel owners and managers are more likely to adopt and implement ICTs in their hotel. To sum up, the four elements of the technological context of the TOE framework which form the digital maturity seem to have the strongest impact ($b=0.563$, $p<0.001$) on ICT adoption and implementation in the hotels in Greece during the COVID-19 pandemic. Further to the analysis of the digital maturity construct, the sub-variable ‘culture’

($b=0.322$, $p<0.001$) also had the strongest impact on digital technologies adoption followed by ‘technology’ ($b=0.304$, $p<0.001$). The sub -variable ‘insights’ ($b=0.259$, $p<0.001$) is in third place and thus indicates a moderate impact in the ICT adoption process and ‘organization’ ($b=0.184$, $p<0.001$) indicator had the lowest impact of all latent variables. The lowest impact concerning all constructs was detected in the organizational context as the ‘financial resources availability’ ($b=0.142$, $p<0.001$) item. Concerning the environmental context, the ‘government regulations’ ($b=0.151$, $p<0.001$) variable indicated as slightly lower in comparison to the entire construct of the study.

In order to assess the predictive power of the model, the coefficient of determination (R^2) was calculated. R^2 was 0.44 and translated to about 44% of variability in digital technologies (Hair Jr, Hult, Ringle, & Sarstedt, 2021). The structural model explains 100% of the variability of digital maturity on ICTs. The Stone-Geisser's was calculated in order to assess the predictive relevance of the model. The Q^2 value of digital maturity ($Q^2=0.640$) and ICTs ($Q^2=0.196$) was greater than zero, indicating the predictive relevance of the model (Hair Jr, Hult, Ringle, & Sarstedt, 2021). The standardized root mean square residual (SRMR) value was 0.066, larger than 0.08, which supports a good model fit (Hair Jr, Hult, Ringle, & Sarstedt, 2021).

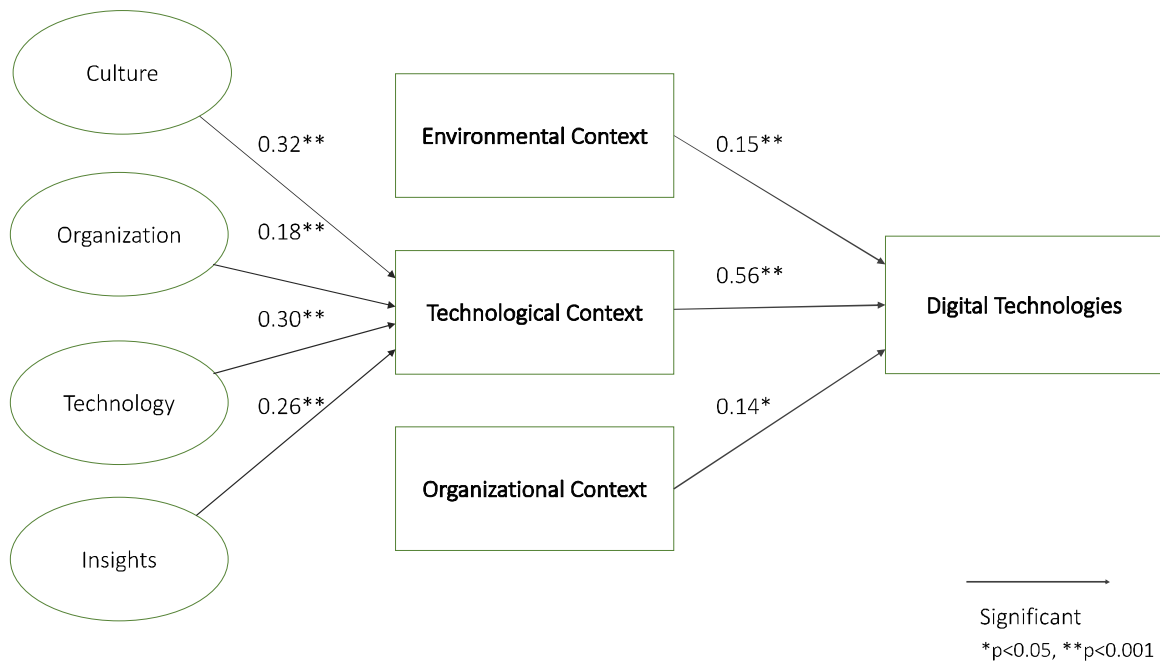


Figure 6-9. Results for the structural model analysis.

Table 6-7. Structural model path coefficients and significance level.

Hypotheses	Effects	b	t-value	p	Support
H1	Digital Maturity -> Digital Technologies	0.563	16.853	<0.001	Yes
H1a	Culture -> Digital Maturity	0.322	61.936	<0.001	Yes
H1b	Organization -> Digital Maturity	0.184	45.338	<0.001	Yes
H1c	Technology -> Digital Maturity	0.304	66.081	<0.001	Yes
H1d	Insights -> Digital Maturity	0.259	53.908	<0.001	Yes
H2	Financial Resources-> Digital technologies	0.142	3.465	0.001	Yes
H3	Government regulations -> Digital Technologies	0.151	4.251	<0.001	Yes

6.5 Results of the Moderators

6.5.1 Measurement Model

To deal with the complexity of the multiple reflective first order constructs a second order-latent construct was conducted. Second-order latent constructs are used in business management literature (Zhu et al., 2004). A structural equation model was used to assess the moderating effect of innovation groups (low vs high) and number of employees (1-10 vs 11-50 vs ≥ 51) on the relationship between technological, organizational, environmental context and adoption of digital technologies in the hospitality industry. Concerning the measurement model, the assumption of discriminant validity was tested using Fornell and Larcker criterion and Heterotrait-Monotrait ratio of correlations (HTMT) (Hair et al., 2019a). The results showed that the correlation coefficients among constructs were lower than the square root of each AVE value (Hair et al., 2019a) (Table 6-8). HTMT values were lower than 0.80 (Henseler et al., 2015), so the discriminant validity between constructs was established (Table 6-9).

Table 6-8. Fornell-Larcker criterion.

	Government Regulations	Financial Resources	Digital Maturity	Digital Technologies
Government Regulations	1			
Financial Resources	-0.390	1		
Digital Maturity	-0.116	0.285	1	
Digital Technologies	-0.198	0.290	0.635	1

Table 6-9. HTMT ratio.

	Government Regulations	Financial Resources	Digital Maturity
Government Regulations			
Financial Resources	0.390		
Digital Maturity	0.116	0.285	
Digital Technologies	0.198	0.290	0.635

6.5.2 Structural Model

The structural model is presented in Table 6-10. The results are reflecting the statistically significant relationships between technological, organizational, environmental elements and adoption of digital technologies in the hospitality industry. Government regulations ($b=-0.096$, $p=0.001$) was negatively associated with digital technologies, while financial resources availability ($b=0.081$, $p=0.044$) and digital maturity ($b=0.600$, $p < 0.001$) were positively and significantly associated with digital technologies. Government regulations were adopted to eliminate the COVID-19 pandemic which has led to mass disruption on a global scale (Arumugam & Kanagavalli, 2020; Ozili & Arun, 2023). The coefficient of determination (R^2) was calculated and was equal to 0.42 (Hair Jr, Hult, Ringle, & Sarstedt, 2021). The Stone-Geisser's Q^2 value of Digital Technologies ($Q^2=0.415$) was greater than zero, indicating that the predictive relevance of the model is established (Hair Jr, Hult, Ringle, & Sarstedt, 2021).

Table 6-10. Structural model.

	b	t-value	p
Government Regulations -> Digital Technologies	-0.096	2.598	0.001
Financial Resources -> Digital Technologies	0.081	2.022	0.044
Digital Maturity -> Digital Technologies	0.600	21.083	<0.001

Multi –group permutation tests were conducted to test the moderating effects of firm innovation index, and the number of employees (Henseler et al., 2009). The interaction effect of firm innovation index was tested on the relationship between the technological, organizational and environmental context of the hotels and digital technologies (second-order formative construct) as graphically exhibited in Figure 6-10. Furthermore, two groups of innovation were formed using the median as cut-off threshold (high and low innovation groups). Multigroup analysis was an appropriate method because the moderator ‘number of employees’ was a categorical variable. Furthermore, firm innovation index was a continuous moderator that was converted into a categorical to apply MGA (Rasoolimanesh et al., 2021).

The results of the multi-group analysis are presented in Table 6-11. PLS multi- group test results according to firm innovation index group. Results reflect that the environmental element establish a significantly negative relationship with digital technologies in low and high innovation groups, while technological and organizational elements establish a significantly positive

relationship with digital technologies in low and high innovation groups. Moreover, statistically significant differences were found between the two groups in terms of technological factors. This indicates, that firm innovation index had a moderating effect on the relationship between the technological factors and the adoption of digital solutions. The findings of the research supported the formulated hypotheses.

The interaction effect of number of employees was tested on the relationship between the technological, organizational and environmental context of the hotels and digital technologies as graphically exhibited in Figure 6-11. The multi-group analysis with the number of employees as a moderator variable, revealed that technological factor was positively correlated with digital technologies in hotels with 1-10 employees, 11-50 employees and more than 51. Organization was not a significant element for digital technologies in any of the three groups. On the other hand, environment context was found to be a statistically significant construct for digital technologies adoption and implementation in hotels with 11-50 employees and more than 51 employees. Statistically significant differences were observed among the two groups in terms of the environment variable, as hotels with 1-10 and 11-50 employees proved to have a negative effect on digital technologies adoption. Hotels with 11-50 employees have a stronger relationship between environmental context and the adoption of digital technologies than hotels with 1-10 employees (Table 6-12-Table 6-14). Figure 6-12 and Figure 6-13 are an illustration to better understand the moderating effects of firm innovation index and organizational size.

Lastly, the strength of the moderating effect was evaluated using the effect size f^2 (Rasoolimanesh et al., 2021). The effect of the moderator variable firm innovation index was small on the relationship between digital maturity and ICT adoption because f^2 was equal to 0.006. Furthermore, the effect of the number of employees was medium on the relationship between environment and ICTs ($f^2=0.009$) (Chin et al., 2003; Rasoolimanesh et al., 2021). Table 6-15 presents the effect sizes of the moderators.

Table 6-11. PLS multi-group test results according to firm innovation index group.

	Low		High		Difference (Low vs High)	
	b	t-value (p)	b	t-value (p)	diff (b)	t-value (p)
Government Regulations	-0.103	2.058 (0.040)	-0.174	3.037 (0.003)	0.071	0.974 (0.331)

Financial Resources	0.097	1.634 (0.103)	0.052	0.895 (0.371)	0.045	0.543 (0.587)
Digital Maturity	0.488	10.361 (<0.001)	0.618	12.079 (<0.001)	-0.129	1.912 (0.051)

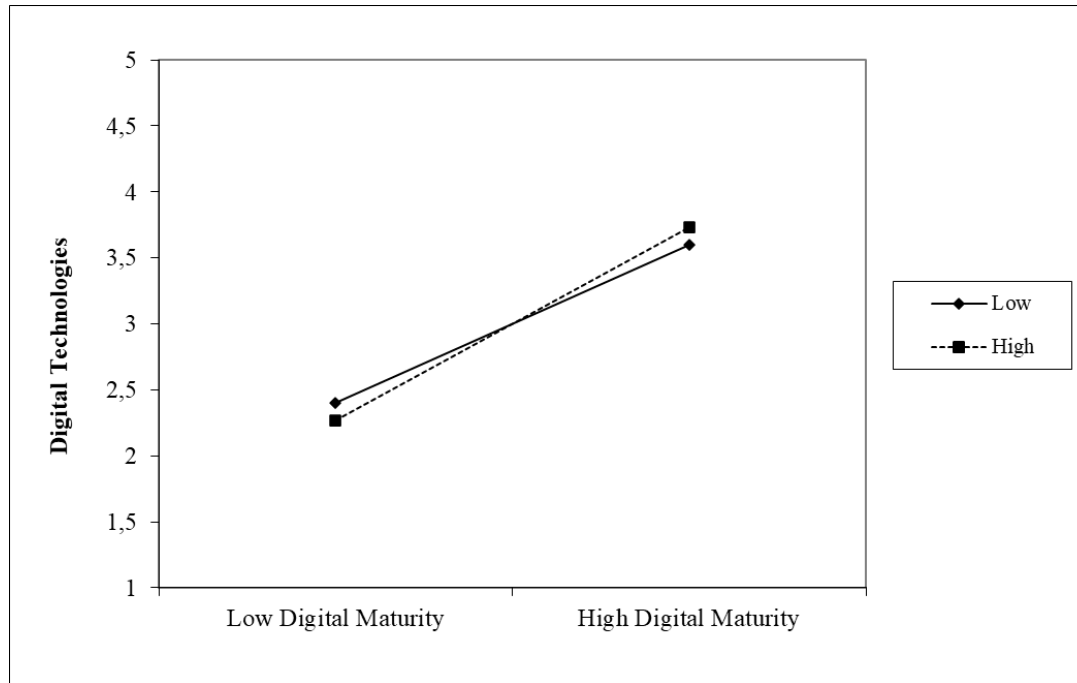


Figure 6-10. Moderating effect of firm innovation index in the relationship of digital maturity on digital technologies.

Table 6-12. PLS multi-group test results according to number of employees.

	1-10		11-50		≥51	
	b	t-value (p)	b	t-value (p)	b	t-value (p)
Government Regulations	-0.063	1.192 (0.234)	-0.258	3.954 (<0.001)	-0.194	2.245 (0.025)
Financial resources	0.067	1.136 (0.256)	-0.082	1.264 (0.207)	0.015	0.159 (0.874)
Digital maturity	0.619	14.534 (<0.001)	0.534	11.151 (<0.001)	0.656	11.291 (<0.001)

Table 6-13. Differences between the groups according to number of employees.

Difference (1-10 vs 11-50)		Difference (1-10 vs ≥51)		Difference (11-50 vs ≥51)	
diff (b)	t-value (p)	diff (b)	t-value (p)	diff (b)	t-value (p)

Government Regulations	0.195	2.429 (0.016)	0.132	1.276 (0.203)	-0.064	0.612 (0.541)
Financial resources	0.149	1.802 (0.072)	0.053	0.501 (0.616)	-0.096	0.893 (0.373)
Digital Maturity	0.085	1.346 (0.179)	-0.038	0.48 (0.631)	-0.122	1.545 (0.124)

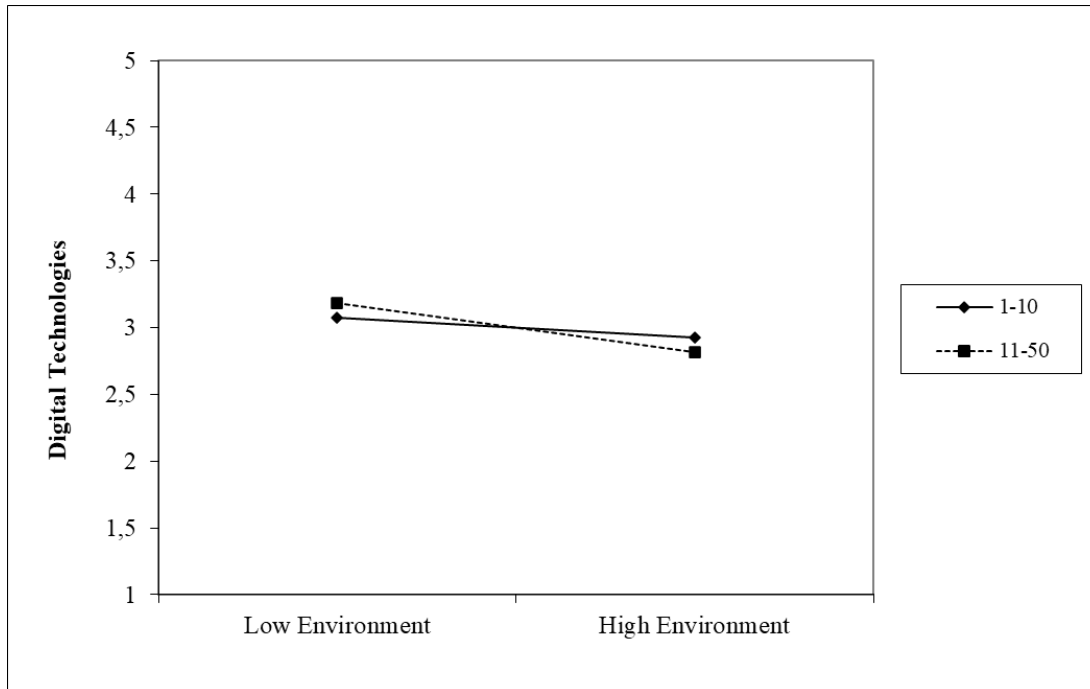


Figure 6-11. Moderating effect of hotel size in the relationship of digital maturity on digital technologies.

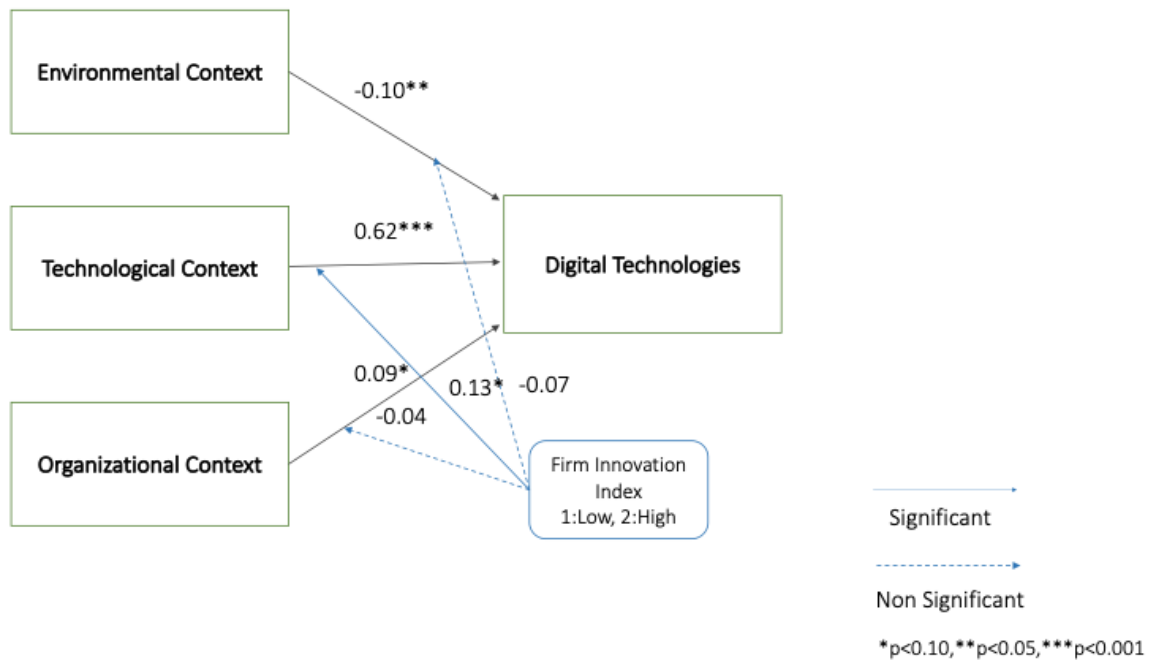


Figure 6-12. Hypothesized conceptual model with moderating effect of firm innovation index.

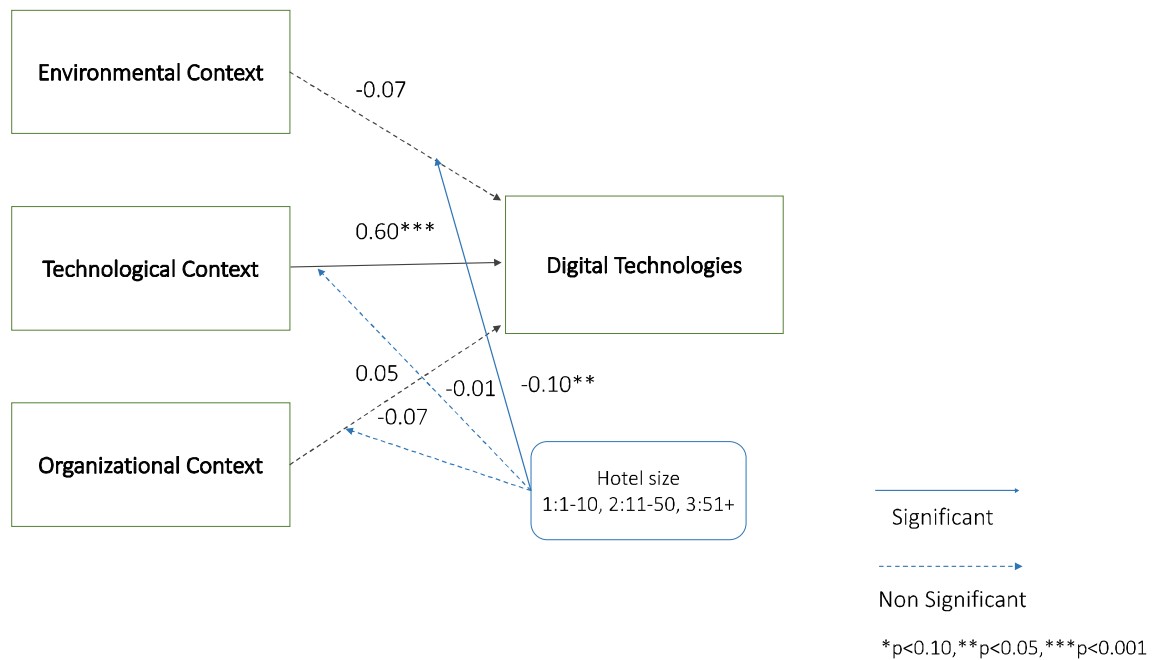


Figure 6-13. Hypothesized conceptual model with moderating effect of hotel size.

Table 6-14. Hypotheses development.

Moderator variables	Hypothesis direction	b	t-value	p
Firm Innovation Index				
Environment -> Digital Technologies	-	-0.103	1.975	0.049
Group -> Digital Technologies	+	0.000	0.000	1.000
Group*Environment -> Digital Technologies	-	-0.071	0.886	0.376
Group*Digital Maturity -> Digital Technologies	+	0.130	1.810	0.071
Group* Technology Resources -> Digital Technologies	-	-0.045	0.554	0.580
Technology Resources -> Digital Technologies	+	0.097	1.783	0.075
Digital maturity -> Digital Technologies	+	0.618	11.592	<0.001
Number of employees				
Environment -> Digital Technologies	-	-0.077	1.473	0.141
Group -> Digital Technologies	+	0.000	0.000	1.000
Group*Environment -> Digital Technologies	-	-0.106	2.119	0.035
Group* Digital Maturity -> Digital Technologies	-	-0.009	0.201	0.841

Group*Technology Resources -> Digital Technologies	-	-0.071	1.356	0.176
Technology Resources -> Digital Technologies	+	0.053	0.960	0.337
Technology Maturity -> Digital Technologies	+	0.603	13.657	<0.001

Table 6-15. Effect sizes of moderators.

Moderators	f-square
Innovation*Environment	0.002
Innovation* Financial resources	0.001
Innovation*Digital Maturity	0.006
Employees*Environment	0.009
Employees* Digital Maturity	0.000
Employees* Financial resources	0.004

6.6 Summary

This chapter describes the methodologies and the findings of the empirical data analysis using PLS-SEM analysis. As part of the PLS-SEM methodology, a measurement, structural and moderator analyses were conducted. The measurement model included analyses of the relationship between the latent variables and their indicators. It also includes assessment of the quality of the constructs including reliability and validity. The structural models confirmed all the hypotheses, thus confirming the associations formulated in the research model. The outcomes revealed the critical factors within the framework of TOE that influences ICT adoption in the hotel sector in Greece during the pandemic. Concluding that firm innovation index and the size of the hotel had a moderating effect on ICT adoption.

7 CHAPTER

Discussion and Implications

7.1 Introduction

This chapter will explore in-depth the outcomes of the research and discusses its practical and research implications. It will also investigate the contribution of the study in the health crisis, hospitality and management literature. Section 7.2 is presenting the outcomes of the study research. The outcomes are structured into five major sections addressing each of the five research questions:

1. What and how the technological factors are influencing the adoption of digital technologies in the Greek hotel sector?
2. What and how the organizational factors are influencing the adoption of digital technologies in the Greek hotel sector?
3. What and how the environmental factors are influencing the adoption of digital technologies in the Greek hotel sector?
4. How does firm innovation index moderate the relationships between technological, organizational and environmental factors and the SME hotels' owners' and managers intention to adopt ICTs?
5. How does the hotels' size moderate the relationships between technological, organizational and environmental factors and the SME hotels' owners' and managers intention to adopt ICTs?

The next section 7.3, proceeds with the descriptions of the research implications from a theoretical perspective. Followed by the presentation of section 7.4 which includes the practical implications and how they could affect decisions made by practitioners. Lastly, section 7.5 is presenting the key points of chapter 7 in terms of its overall contribution.

7.2 Research Outcomes

The main objectives of the current study were to explore and investigate a structural model based on TOE theoretical framework, that describes the impact of the technological, organizational, and environmental elements on the adoption of digital technologies in hotels during the pandemic. For this purpose, the study has developed and tested a comprehensive research model that provides the determinants of ICT adoption by hotels. The outcomes revealed that there are six factors that influence the adoption of digital technology solutions in the hospitality industry. Those factors are grouped into a tripartite. The first group is digital maturity, this includes four technological sub-features of digital technology adoption which are (1) ‘culture’, (2) ‘organization’, (3) ‘technology’ and (4) ‘insights’. The organizational context included one factor which is ‘financial resources availability’. Lastly, the environmental context included the variable ‘government regulations’ as a measure to limit the COVID-19 spread.

Moreover, this research aims to advance the understanding of the moderating effect of firm innovation index and organizational size and how it affects the relationship between ICTs adoption and the technological, organizational and environmental elements of the technology-organization-environment theoretical framework (TOE) in the hospitality industry during the pandemic. The results indicated that firm innovation index has a moderating effect on the relationship between ICTs and digital maturity of the hotel. In addition, concerning the size of the hotel, small hotels with 11-50 employees are a moderator on the adoption of ICTs within the environment context.

7.2.1 Digital Maturity as a Predictor of Technology Adoption

As mentioned above, four hypotheses were formulated to reflect the digital maturity of the hotel. Digital maturity was found to be a critical factor of digital technology adoption in the hospitality industry; thereby confirming Hypothesis 1 (H1a, H1b H1c, H1d). Generally, the technological component includes the internal and external technology equipment or process characteristics of the company (Depietro et al., 1990; Tornatzky et al., 1990). In this study, the digital maturity of a firm is decomposed into four dimensions, namely culture, technology, organization and, insights (Gill & VanBoskirk, 2016; VanBoskirk et al., 2017). The present studies

are aligned with past studies, which highlighted that technology readiness, a closely related term with digital maturity, consists of an important determinant of technology adoption (Baker, 2012; Zhu et al., 2004).

More analytically, the ‘culture’ dimension is defined as the digital-driven approach to project the company towards digital advances (Gill & VanBoskirk, 2016). Previous examination of the literature has emphasized on the technological knowledge (Lippert & Govindarajulu, 2006). However, the empowerment of the employees and the supportive climate are fundamental in the digital technology adoption process (VanBoskirk et al., 2017). The empirical outcomes of the current study revealed the great impact of this dimension on digital technology adoption in the hotel sector. More analytically, the ‘culture’ dimension is reflecting the business strategy which is based on digital technologies and ensures that the managers, the employees and the customers are empowered towards digital technologies.

Further in the discussion, the ‘organization’ dimension, which has been identified as the degree of alignment on digital strategy, governance and execution, is critical for the technology adoption and implementation (VanBoskirk et al., 2017). In effect, the existence and availability of digital technology infrastructure and trained human capital within a firm may alleviate risks pertaining to the adoption of advanced information and communication technologies (J. Chong & K. Olesen, 2017). The organization dimension was found to be a factor influencing the digital technology adoption, which supports the hypothesis. This result is in consistent with previous studies (J. Chong & K. Olesen, 2017; Gangwar et al., 2015).

The ‘technology’ dimension had previously been mostly highlighted from the business and technology literature as the technological infrastructure and on the importance of perceived benefits (Aboelmaged, 2014; Iskandar & Ramantoko, 2018; Sunny et al., 2019). However, the budget to finance the digital technology initiatives remains an important factor to successfully adopt them (Winata & Mia, 2005). In the same vein, the customers’ perception is pivotal in the digital adoption process (Gill & VanBoskirk, 2016). Thus, the findings of the study contributed to the ongoing technology and hospitality literature as accountable factor.

Lastly, regarding the ‘insights’ element, the literature revealed that managers are identified as a prime antecedent of technology adoption in the hospitality industry (Pateli, Kourouthanassis, et al., 2020). Likewise, managerial support may affect the awareness of technology adoption

(Matikiti et al., 2018). These outcomes are aligned with the findings of the current study. However, the ‘insights’ dimension clarifies that successful managerial support is vital, in order to ensure that the employees understand that their performance is tied to the company’s digital goals. Hence, this research has contributed to the hospitality literature. Lastly, there is a positive effect of the customer feedback values for measuring the success of the technology adoption. Overall, digital maturity involves the sophistication level of technology usage in the firm (Ramdani et al., 2013). In our study, we posit that hotels that can identify the value provided from their digital maturity may have greater possibility for adopting digital technologies. Interestingly, the technological dimension in the TOE framework was found to be the most statistically significant predictor of technology adoption. Out of the four technological features, ‘culture’ is found to be the most significant factor affecting digital technology adoption, while ‘technology’ and ‘insight’ follow closely in significance. ‘Organization’ is found to be the least significant one compared to the aforementioned.

The results concerning the ‘digital maturity’ feature was found to be significantly and positively related to the adoption of digital technologies in the hotel industry during the COVID-19 outbreak. This means that the hotel owners and managers that support technology maturity are more likely to adopt digital technologies in their business. Previous examination on literature, has identified digital maturity as an important determinant of technology adoption (Zhu et al., 2004). According to Parasuraman (2000) technology readiness, a closely linked term with digital maturity, may strongly affect the probability in which people will embrace new technological systems and services (Parasuraman, 2000). Zu et al. (2004) examined the digital maturity dimension as 1) the technology infrastructure in use including intranet and EDI, 2) front-end website functionalities including online services, and 3) back-office systems integration (Zhu et al., 2004). Chong and Olesen (2017) suggested that the explanation to this is that firms that do not have robust digital technology infrastructure and trained experts in the field are not willing to risk the adoption of these technologies (J. L. Chong & K. Olesen, 2017). Moreover, Matikiti et al., (2018) suggested that managerial support affects the awareness of technology adoption (Matikiti et al., 2018) The digital maturity is referred as the sophistication level of technology usage in the firm (Ramdani et al., 2013).

Further to the research, the most investigated and significant features of technology adoption is highlighted as relative advantage (J. L. Chong & K. Olesen, 2017; Pateli, Mylonas, et al., 2020; Ramdani et al., 2013; Wang et al., 2016). Also consistently related to digital technology adoption are compatibility (Wang et al., 2016) and complexity (Pizam et al., 2022). Hotels that are able to identify the value provided from ‘digital maturity’ have greater possibility for adopting and implementing digital technologies.

7.2.2 Organization Element and Technology Adoption

Concerning the organizational context, the model demonstrates that ‘financial resources availability’ were significantly and positively associated with the adoption of digital technologies. More specifically, a hotel’s ability to considerably manage its financial resources, for example, finance its business initiatives in a short-term period or is able to seek financial support anytime, is more likely to adopt digital strategies. Financial resources constitute an important feature acknowledged in the business literature (C. L. Iacovou et al., 1995). Implementing digital technology requires financial investment and commitment (Ramamurthy et al., 1999; Zhu & Kraemer, 2005). Zhu and Kraemer (2005) suggested that firms with greater financial commitment are more likely to adopt e-business implementation (Zhu & Kraemer, 2005). Thus, the findings are in line with the outcome of the proposed research model. However, previous results indicate that the firms’ size is a good predictor of technology adoption in the organizations (Lippert & Govindarajulu, 2006). Larger firms have more resources and can therefore afford greater risks associated with technology adoption and implementation (Ramdani et al., 2013). Moreover, in the organizational context, the study revealed that ‘financial resources availability’ seem to have the lowest affect, although statistically significant in the digital technology adoption process. On the contrary, Chong and Olesen (2017) found out that financial resources are not significant for Green IT adoption, which shares similar basic characteristics that traditional digital technology does (J. Chong & K. Olesen, 2017). In this study, the vast majority of the hotels are MSME independent hotels. Generally independent hotels, have limited resources compared to high-end hotels or hotels that are affiliated with hotel chains (Mao et al., 2021). The assessment of the intention to adopt

digital technology in the hotel business generates additional knowledge on the issue (Şengel et al., 2022).

In terms of financial resources, Greece is considered as a developed country with an economy primarily based on the service industry (Lekha, 2015). The tourism and hospitality industry are the most important Greek industries (Papachristos, 2022). Greece was the 7th most visited country in Europe and (Nikoli & Lazakidou, 2019) has the largest economy in the Balkans (Keridis, 2006). Thus, compared to developing countries, the financial obstacles are less for ICT adoption (Aljowaidi et al., 2015). For example, Aljowaidi et al. (2015) conducted research to investigate the factors influencing the e-commerce adoption in Saudi Arabia, which highlighted that the main constraint is the insufficient budget for e-commerce adoption; they argued that the successful e-commerce adoption in the Saudi Arabian retail industry could be facilitated if firms consider e-commerce as a future investment strategy in order to devote financial resources to digital technology adoption projects (Aljowaidi et al., 2015).

7.2.3 Environment Element and Technology Adoption

In the context of environment, ‘government regulations’ are also considered a critical factor with moderate effect that influences digital technology adoption within the TOE framework in the hotel sector. It means that that hotels under government regulation are positively related with the intention to adopt digital technology solutions. Further into the context of the analysis, the hoteliers and managers that comply with the governmental regulatory environment are more likely to adopt ICTs within their hotel. Government regulations could become either facilitators or inhibitors, in the digital technology adoption process (Awa et al., 2016; J. Chong & K. Olesen, 2017). In this study, ‘government regulations’ tend to be forcing the technology adoption process, although many studies recognize that competitive pressure is the game changing factor concerning the adoption of digital technology rather than the governmental regulatory (Lippert & Govindarajulu, 2006; Pizam et al., 2022). The finding that government regulation is an inhibitor is aligned with Delmas (2002) (Delmas, 2002), who is suggesting that the adoption of the ISO standards have led the firms to experience higher costs, however meaning that they more likely to

adopt technology (Lippert & Govindarajulu, 2006). In the similar context, although the government regulation has forced hoteliers to finance the training of their employees to coincide with COVID-19 health protocols, they are still more likely to adopt digital technology.

Xu et al. (2004) suggested that the environmental factor, amongst other government regulations, have emerged as fundamental factors shaping e- business adoption (Xu et al., 2004). Furthermore, in this research study the researchers highlighted the governmental policies more critical in developing countries. They came to the conclusion that governments could accelerate e-business adoption by establishing a supportive regulatory environment in the early stages of the e-business development. This outcome is in line with the current study, that supports that the government regulations positively and significantly affected the adoption of digital technologies in the Greek hotel sector. Furthermore, Aljowaidi (2015) supported the notion that the government's failure to implement suitable policies or regulations could stimulate the absorption of the e-commerce in the Saudi Arabian retail business, this was highlighted as a critical factor that has delayed the adoption of e-commerce in Saudi Arabia (Aljowaidi et al., 2015).

7.2.4 Moderating effects of Firm Innovation Index and Size of the Hotel

7.2.4.1 Moderating Effect of Firm Innovation Index

This research developed a conceptual model that explores the moderating effects of firm innovation index, and organizational size between ICTs and technological, organizational and environmental context of the TOE framework. These moderating effects present a new perspective in the ICT adoption in the hospitality sector. A statistically significant and positively relationship was identified between the digital maturity dimension and the ICTs adoption in the low scored group and the high scored groups. In particular, hotel managers of high firm innovation index scores are affecting the relationship between digital maturity and the extent of adoption of ICTs as the statistical difference was significant. In addition, the outcomes revealed that a significantly and negatively relationship was noted between the environmental context and the ICTs adoption

in both low and high levels groups of firm innovation index. Nevertheless, no significant difference between those groups was noticed.

Previous studies suggested that top management consider that ICTs are not contributing to the fulfilment of strategic objectives of the firm (Law & Jogaratnam, 2005; Racherla & Hu, 2008). On the other hand, various researches highlighted that the influence of top management is significant concerning ICT innovation adoption such as Customer Relation Management (CRM) and Big Data analysis (Alshourah et al., 2018; Gonzalez et al., 2019). Hence, technology advances could not commence without the commitment of the hotels' management team (Kale, 2004). Given the paradox in the top management level concerning ICTs and technology innovation adoption, a gap is identified in theoretical and practical knowledge. The current study brings into the equation the digital maturity element within the technological context of the TOE framework and the moderating influence of firm innovation index in the ICT adoption and implementation process. Pham et al. (2018) stated that digital maturity is positively related to clients satisfaction which in the long run ensures the operational growth and success of the hotel (Pham et al., 2018). This study demonstrated a possible trend highlighting that the hotel owners and managers perceiving higher firm innovation index scores will be more likely to adopt ICT when they have already achieved digital maturity at an operational level.

Indeed, the current study is developed from the perspective of the hotel management, with only few papers conceived from a holistic point of view, which takes into consideration the clients' perspectives (Gonzalez et al., 2019). Thus, it might be interesting for future research to explore the moderating influence of firm innovation index and hotel size in relation to TOE theoretical framework and ICT adoption, from the customers standpoint to further compare the results.

7.2.4.2 Moderating Effect of Hotels' Size

In addition to the moderators, the findings revealed that the organizational size of the hotel was also a moderator on the relationship between the environmental turbulence due to government regulations and the likeliness to adopt and implement ICT within the hotel. Testing the hypothesis revealed that hotels with 11-50 employees are more likely to adopt less ICTs when operating in an unstable environment compared to hotels with 1-10 employees. Furthermore, the findings

practically mean that the COVID-19 outbreak has led micro hotels to potentially adopt more ICTs compared to small hotels, although both are reluctant towards ICTs adoption and implementation in the pandemic. In addition, the outcomes revealed that the relationship between the environment turbulence and the adoption of ICTs was negative regardless of the hotels' size. This means that the greater the uncertainty of the environment was, because of the government regulations, the less intention was identified from the managers to use ICTs. Moreover, the small and large -sized hotels had a significant relationship between government regulations and digital solutions adoption. However, a statistically significant difference applies between the small and micro-sized hotels. The impact of the government regulations was detected in the small-scaled hotels compared to micro hotels.

Previous studies suggested that micro hotels have greater exposure to the environment compared to larger hotels which influences their survival greatly (Vivel-Búa et al., 2019). This study identifies that micro-sized hotels at the time of the pandemic have transformed their flexibility and have become more likely to adopt ICT, compared to small hotels to ensure their long-term survival.

7.3 Implications of Research Study

7.3.1 Research and Theory Implications

The contribution of the current research is on the health crisis, hospitality and technology management literature, through the theoretical and empirical investigation of the effects of the technological, organizational and environmental context for the adoption of digital technologies in the hotel sector during the pandemic of COVID-19. The study of crisis management originated with large scale industrial and environmental disasters in the 1970s (Zamoum & Gorpe, 2018). Concerning the crisis management, its response includes action including crisis prevention, crisis assessment, crisis handling and crisis termination (Coombs, 2021). The main aim of crisis management is to be as well as possible prepared for the crisis and plan for the crisis termination accordingly (Smith, 1990). Thus, the additional building block of evidence that was produced from

the current study at the time of the pandemic COVID-19 health crisis could be used as the base to trigger the necessary response mechanisms for future health crisis planning. Further to this, on a theoretical level, it is the first time the evidence of the current study extends on the hospitality and technology management literature as the conducted research based on an adequate sample is establishing a comprehensive model concerning the adoption of ICTs in the hotel sector during the pandemic. It adds to the existing theoretical knowledge by investigating the digital maturity dimension, that remained slightly unexplored previously. This is exactly why this study adds significant theoretical contribution to the existing hospitality and technology management literature.

Most of the previous research on ICT adoption in the hotel sector during the pandemic has been conducted in both developing (Effendi et al., 2020a) and developed countries (Pizam et al., 2022) with less attention given to Greece (Varelas et al., 2021). Therefore, these studies could not be applied in Greece as each country especially non-European developing countries share different culture, economy, government and infrastructure (Aljowaidi et al., 2015). This study enhances the emerging hotel and technology literature, in relation to digital technology adoption in developed countries by focusing on Greece during the pandemic. It provides a better understanding of the ICT adoption process in the hotel sector by including factors that have not been explored previously. However, the new knowledge obtained from the current study could be used as a baseline and applied to other industries. Previous examination on technology adoption-related literature argued that the role of learning digital solutions should be better understood in the whole adoption process (Davis et al., 1989). Thus, the current research study gives a closer look at how ICT adoption works in the hotel sector by exploring factors on organizational level and provides a coherent and updated state-of-the-art-picture of the ICT adoption process during the pandemic.

Further into the context of research and theory implications, the study offers insights on the intention to adopt digital technologies in the hotel industry within the TOE context from the owners and managers viewpoint. Through the theoretical and empirical investigations, the study highlights the fact that the factors affecting digital solution adoption adds knowledge concerning the moderating effects of the firm innovation index and hotels' size in the relationship between TOE framework factors and the ICT adoption within the hotel. As such, this research study contributes to theory in several ways. For the hotels, the technologies are the vanguard of

opportunities and at the same time can present major challenges for the hoteliers and managers. The adoption of ICTs included complex decision making that requires evidence and knowledge from well build research initiatives. The proposed model adds to the theoretical foundation provided by the TOE framework via the integration of organizational level factors that have been under-researched, therefore shaping the digital technology adoption model of this research.

Heart and Pliskin (2002) suggested that SMEs confront obstacles when it comes to digital adoption. An explanation to this predicament is the lack of resources, limited budgets, lack of technological ‘know-how’ and insufficient understanding of technological implications (Heart & Pliskin, 2002a). These limitations make hotels struggle to meet the demands of the fast-growing technological-based environment (Wang & Qualls, 2007). Thus, the current model that describes the process of technology adoption within MSME hotels adds to the existing body of knowledge in the search of MSME technology adoption behavior. Strassman (1990) suggested that the correlation between buying ICTs and profitability is limited (Strassmann, 1990). In this context, the strategic orientation and the knowledge of the hotel create a critical role in accruing a return on technology investment.

An additional major contribution stems from the outcomes of the literature review. By exploring previous studies, the area of firm innovation index as a moderator on an organizational level between the TOE elements and the ICT adoption in the hotel sector during the pandemic of COVID -19 is found to be under-researched. This is one of the first studies that attempted to highlight the moderating role of firm innovation index and was found to produce significant results which provides further comprehensive evidence surrounding the hoteliers and top management willingness to adopt ICTs. One attempt is from Pizam et al. (2022), who investigated personal innovativeness and concluded that it moderates the relationship between intention to adopt robotics technology and relative advantage, compatibility, complexity, cost, top management, organizational readiness and competitive pressure (Pizam et al., 2022). Therefore, the current study provides evidence on an organizational level in the technology and innovation adoption literature that have not been presented previously.

Prior examination on the hospitality industry literature has revealed that there has been a general interest in researching digital technology adoption from the customers’ perspective (Lin & Mattila, 2021; Šerić et al., 2014; Vo-Thanh et al., 2021; Zoubi & Al-Harazneh, 2021). On the

other hand, from the managers perspective Pizam et al., (2022) suggested that top management should clearly indicate their support via several communication channels which may reduce concerns when adopting new technology (Pizam et al., 2022). A handful of studies have investigated the ICT adoption from the managers and decision-makers standpoint in the hotel industry (Pizam et al., 2022). In addition, the current study increases the depth of the knowledge concerning the digital solutions adoption in the hotel sector on an organizational level by adopting the TOE framework. Unlike, other studies, which have analysed the factors that influencing the ICT adoption in the hotel sector by using theories on an individual level such TAM, UTAUT and DOI (Cobos et al., 2016; Khalilzadeh et al., 2017; Talantis et al., 2020).

Moreover, concerning the theoretical implication of the current research model could be used in applied settings including research, hospitality education and training, commerce and government. For example, in research setting the application could be to further enhance the understanding of factors affecting the ICT adoption in the hotel sector. The outcomes of the current research could be used as a tool for teaching digital technology adoption with emphasis on the factors on an organizational level during the pandemic providing additional educational knowledge for academics.

Furthermore, the research contributes to methodological considerations by adopting a multidimensional approach. Bryman (2008) suggested that by using multidimensional variables in the research the theory building is improved (Bryman, 2008). Most studies in Greece have adopted descriptive methods (Belias et al., 2021). In theoretical terms, this study sheds light across the understanding of the circumstances that reinforce the relationship between the technology, organization and environment context and the effects of firm innovation index and organizational size on ICTs adoption during the pandemic in the hospitality sector. In particular, the adopted firm innovation index is multidimensional measurement variable which provides accurate conclusions compared to unidimensional scales (Ruvio et al., 2014). As firm innovation index is considered a strong contributor to a firms' operational performance (Gopalakrishnan & Damanpour, 1997) the current study presents a wide-ranging view of the moderating effect of firm innovation. Thus, the findings present a more comprehensive understanding of firm innovation index suggesting that managers with high innovation levels combined with the hotel's digital maturity, are more likely to adopt ICT within the COVID-19 turbulent environment.

Summarizing the current research study has contributed to multiple theoretical fields. Firstly, to the emerging literature of health management crisis by demonstrating that ICT adoption in the hotel sector could be affected from the hotels' digital maturity, financial resources availability and the governmental regulatory during the pandemic of the COVID -19 virus. Secondly, to the field of hospitality literature by the in-depth description of the multidimensional factors on an organizational level that influence the digital solution adoption and the moderating effects between these relationships, and lastly to the strategic and business management literature, by empirically exploring the technological, organizational and environmental elements from the managers perspective in the hotel sector, concerning the ICT adoption and the determinants that form them.

7.3.2 Practical Implications

The empirical findings of the current research provide practical implications. The contribution of the study to policies and practices is generated by providing information concerning the factors that influence the ICT adoption on an organizational level in the hotel sector. Additionally, the research offers an insight into the adoption of digital technologies within the TOE context from the owners and managers insightful. Previous analysis from the hospitality industry literature has revealed that there has been a general interest in researching digital technology adoption from the customers' perspective (Lin & Mattila, 2021; Šerić et al., 2014; Vo-Thanh et al., 2021; Zoubi & Al-Harazneh, 2021). Thus, the knowledge of the study could be useful to hospitality technology vendors when designing digital technology tools and applications. The successful design of technology tools and applications requires knowledge (Buhalis, 2019; Kurnia et al., 2015). Moreover, the proposed model might be useful to technology vendors in making investment decisions in the hospitality industry by taking into account the elements that affect the digital technology adoption process (Kourgiantakis et al., 2021).

For hotel owners and managers, the evidence of the study offers the opportunity to benchmark their cultural, organizational, technology and insights capabilities and allows them to create a starting point of future technology planning. Moreover, the study involves the connection

between customer insight and business strategy, shedding light on technology adoption literature. VanBoskirk et al. (2017) suggested that more technology mature firms determine how customers' needs are met (VanBoskirk et al., 2017). For instance, Tesla is prioritizing this procedures and uses data to build performance models to improve customer experience (Hopkins et al., 2018).

In the context of constantly improving business performance together with the increasing demand for more sophisticated and high-quality services in the hospitality industry, it is vitally crucial that hotels become more reliant on digital technology in their business (Buhalis, 2019). Navio-Marco et al. (2018) suggested that the most powerful tool to uplift tourism is the adoption of digital technology (Navío-Marco et al., 2018) and Sharma et al. (2021) demonstrated that digital technology innovations, products, and processes via technological tools could transform hospitality services more effectively during the pandemic (Sharma et al., 2021). Thus, the proposed model could provide useful updated knowledge for public and private stakeholders to design the future business planning. Overall, skills development and lifelong learning plays a major role in order to boost productivity improvement and development within their firms for the managers and employees (Organization, 2019). Therefore, the produced evidence of the current study provides knowledge that could act as inhibitor to foster transition to the post-COVID-19 period.

The study makes an important distribution by presenting the effect of COVID-19 turbulence and the hotels' decision to adopt digital technologies. Since the COVID-19 pandemic the hospitality industry has transformed from 'high touch' and 'low tech' to 'low -touch' and 'high- tech' experience (Racherla & Hu, 2008; Sharma et al., 2021). Thus, technology plays a critical role in the daily hospitality operation, it might be beneficial for hotel owners and managers to stay informed and use the evidence of the current theoretical model to support their business operations and managerial decision making (Ham et al., 2005). Furthermore, through the understanding of the influence of these determinants, hotels could gain an increased return on investment (ROI) from their ICT adoption (Lippert & Govindarajulu, 2006).

In the context of practical implications, governmental policy makers could use the recommended theoretical model as a tool for understanding the determinants affecting the ICT adoption in the hotel sector. Ongari et al. (2010) suggested that the government should take initiatives to establish a legal framework to trigger ICTs' adoption and implementation in SMEs

(Ongori & Migiyo, 2010). For example, Chiware & Dick (2008) highlighted the importance of government ICTs policies which include tax reductions for investing in digital technologies, simplifying registration procedures and creating training centres (Chiware & Dick, 2008). It is assumed by scholars that firms will benefit from government initiatives that encourage the ICTs adoption and usage (Mutula & van Brakel, 2006).

For policymakers, owners and managers in the hospitality industry considering the moderating effect of firm innovation index and organizational size the outcomes provide evidence that could help them make informed decisions and strategically plan their future growth and success of their business. Indeed, the practitioners with the study's evidence should consider how to encourage the development of an innovation culture as well as to increase innovation -related technologies and processes in their business practices as this ensures the ICTs adoption and implementation in the business (Mihalic & Buhalis, 2013). In addition, the study offers an important base for the hotels' future strategy design concerning the post-COVID-19 crisis recovery. Moving a step further, the outcomes of this study provide some useful perception taking into consideration the COVID-19 issues and advancing the literature concerning the pandemic.

Indeed, the current outcomes elucidate the role of the top management that scored highly in terms of firm innovation index in boosting the adoption and implementation of ICTs. This is consistent with higher business performance (Turulja & Bajgoric, 2018). Managers should be aware of the importance of innovation as a trigger even if digital maturity is already accomplished. The results also imply a negative influence of the turbulent environment created from the government regulations imposed to eliminate the COVID-19 uncertainty, especially for medium-sized hotels when it comes to ICT adoption. The result is partially in line with Wong (2014), who stated that the environmental turbulence is a constraint or an opportunity for firms (Wong, 2014). However, with firm innovation index in the equation, a hotel could potentially achieve better overall performance as firm innovation index seems to boost the ICT adoption and implementation.

Furthermore, micro and small hotels show incompetence of achieving advantages from the share market (Mihalic & Buhalis, 2013). On the other hand, higher-scale hotels that are part of an international chain are shown to perform managerial attitudes towards ICT innovations integration. Prior examination on literature suggested that ICT is one of the most effective ways to achieve rapid and cost-effective communication with business partners and clients and ensure

long-term development and growth (Garbin Praničević & Mandić, 2020). In this case, as micro and small-sized hotels are less likely to adopt and implement ICT because of the government regulations, it is important to be aware of this outcome to process down the gap with more technologically advanced hotels. Hence, policymakers could design programs and incentives to boost the micro and small- sized awareness or create funding that would offer business opportunities and changes concerning ICT adoption. In the same context, implications from the managers' perspective on the adoption of ICT is a significant component of a firms' effectiveness (Lippert & Govindarajulu, 2006), enhances the competitiveness (Ongori & Migiro, 2010), improves external communication (Stockdale & Standing, 2004), helping to manage resources economically (Ongori & Migiro, 2010) and, strengthens accountability and control of operations (Carlos, 2007). The better understanding of those factors could foster the managers decision to adopt and implement digital technologies and further improve the overall performance of the organization. Additionally, the developed theoretical evidence from the current study could assist the hoteliers and hotel managers and other hospitality sectors such as Airbnb.

Hospitality managers have a 'ready-to-use' framework, the variables of which they could take into account before their decision making on the ICT adoption. Thus, the current model could be applied in order to design and develop their own ICT adoption strategy. More analytically, the hotel or strategic managers could accentuate the preferable factor or factors (technological, organizational, environmental) and use them in order to successfully proceed to go ahead with the adoption of the ICTs within their business.

The fact-growing and continuous changes in industries that contribute to the economies including the hotel industry (Marullo et al., 2020; Salazar, 2018) forces managers to be highly considerate about the factors that would ensure their long term prosperity. Researches argue that technology has transformed tourism and hotels, by improving their competitive advantage (Buhalis & Cheng, 2020a). Moreover, the adoption of technology within the hotel sector contributes greatly by generating the saving of costs while enhancing customer experience (Buhalis & Leung, 2018; Neuhofer et al., 2015).

The unparalleled circumstance of the COVID-19 pandemic has paved the way for concerns over the future of the tourism and hospitality industry, which is one of the worst-affected industries by the pandemic (Tidey, 2020). In this context, hotels have adopted digital technologies

in a range of practices to ensure their operation. For example, the hotels adopted contactless services during the service delivery process by using contactless check-in and payment encounters via mobile applications and automated room cleaning machines (Bagnera et al., 2020; Pandey & Kulshrestha, 2021). Therefore, this study could play a key role in developing the necessary knowledge for the digitalization of the hotel sector and becoming the base of long-term recovery strategies as a response to the COVID-19 health crisis in the hotel industry. Additionally, as the tourism and hospitality industry faced the devastating consequences of the pandemic the knowledge of the factors affecting the digital solutions adoption could impact on boosting the profitability of the hotels by the growth and development potential of ICT adoption. Researches agree that digital technologies will continue to advance in the hospitality industry (Buhalis, 2019). Meanwhile, crises such as the COVID-19 pandemic have created challenges concerning the technology adoption due to social distancing restrictions (Zeng et al., 2020). Thus, it might be beneficial for hoteliers and managers to stay informed and use the evidence of the current theoretical model to support their business operations and prepare in advance for possible similar future crises.

Studies of technology in the hospitality context have been confined to the adoption of digital technologies of one specific type of technology such as service robots (Tussyadiah & Park, 2018) and mobile application (Chan et al., 2021). In this regard, this study is distinct from prior research that investigated one particular digital technology in the hotel and explores a range of digital technologies stretching from website to Artificial Intelligence (AI) (Appendix A). Hotels have been adopting technologies to optimize services at scale in order to respond to the growing demands of the market and its customers (Kim et al., 2020). To this extent, different types of technology serve a different purpose accordingly within the hotel operation. All in all, the findings provide practitioners with a knowledge of various digital technologies.

To bridge the gap on the literature, the present study is investigating the influence of digital maturity from a broader point of than the individuals' perspective. Thus, the added knowledge could help the decisions makers to identify and understand the wide-ranging variables concerning digital maturity within their hotel and greatly facilitate the technology adoption process.

7.4 Summary

In this chapter, the theoretical and practical implications that have emerged from the outcomes are presented. In terms of theoretical implications, the research study added to the emerging literature of the health crises management, the hospitality and strategic management literature. Building on ICT adoption, the outcomes demonstrated that certain technological, organizational and environmental variables could influence the adoption of ICTs in the hotel industry especially at the turbulent time of the COVID-19 pandemic. Thus, the study provides added knowledge to a broad academic and non-academic audience including scholars, practitioners, policy makers and consumers in the hospitality and tourism sector which is meaningful and significant. In the context of implications, the study is academically rigorous by providing a clear theoretical approach that advances the understanding of the technological, organizational and environmental factors that influence the intention to adopt ICTs within the hotel sector.

Moreover, the current study recognises that the hospitality and tourism sector contribute to theory to irrelevant disciplinaries such as the technology and management literature. Lastly, the study cultivated a model that extends further the understanding of the factors that affect the ICT adoption as well as its moderating effects on the relationship between these factors and the actual ICT adoption. The advantages resulting from ICT adoption in the hospitality industry have been confirmed from a number of researches (Buhalis, 2019). Armed with the evidence that ICT adoption and usage brings challenges and opportunities for the hotel sector, the current study, contributes by developing a theory and building on the idea that captures the complexities and dynamics of the ICT adoption in the hotel industry.

8 CHAPTER

Limitations, Future Research and Conclusions

8.1 Introduction

This chapter provides the future directions for research, the limitations and the conclusions of the study. The chapter starts with the limitations on the content, design, and methodology. After presenting the limitations of the study, the future research studies are presented, as its limitations provide avenues to researchers.

8.2 Research Limitations

Although the study took place with a rigorous and systematic approach, limitations could not be excluded. These limitations are further described. Firstly, the increasing complexity of the ICT adoption process, as well as the fact that digital technologies afford more advances who further enable new forms and connections concerning the journey towards ICT adoption, is considered as a limitation. Consequently, fewer variables and their operating environment could not be controlled and investigated within a study (Vial, 2021).

8.2.1 Limitations on Content

Regarding the aim of the current study, the TOE theoretical framework was adopted to explore the factors that influence ICT adoption. As described in chapter 4, the constructs of the research are decomposed into three main levels: the technological, the organizational and the environmental context including digital maturity, financial resources availability and government

regulation constructs. The factors that could affect this relationship and trigger the adoption of digital technology advances suggest an immensity that is difficult to be included in a single research model. As such, one considerable limitation of the study is as handful of specific factors are included in the research model. However, literature suggested that the ICT adoption process includes a nexus of factors.

8.2.2 Limitations on Design and Methodology

This study adopted a quantitative analysis approach, as the data collection was achieved via the distribution of an online questionnaire in order to investigate the hypothesized conceptual model. Despite the contribution of this type of analysis in the study, methodological limitations were addressed. Firstly, as mentioned above the research design of the current study is mono-method and this choice is more likely to trigger weaknesses associated with adopting only one method (Saunders et al., 2009). Therefore, mixed methods combine the best of quantitative as well as qualitative methods. However, mixed methods are not considered a panacea in the tourism sector (Echtner & Jamal, 1997).

Additionally, another potential limitation are the internal factors and individual characteristics of the current sample such as skills, experience, temperament and motives that potentially influence the owners and managers behaviour and could result in key-informant bias (Hughes & Preski, 1997). The online questionnaire has measured subjective assessments of firm innovation index and TOE elements, although in order to minimize the bias, multiple questions were applied (Gauvin & Sinha, 1993). However, the online questionnaire is one of the most widely used data collection methods (Dillman et al., 2014). Although, considerable effort was undertaken to reach high data quality standards biases could not be limited. The model utilized a self-reported questionnaire to investigate the factors that influence ICT adoption, which jeopardizes the accuracy and the validity of the outcomes (Venkatesh et al., 2012).

Furthermore, the TOE framework shares this limitation and faces threats of common method variance with other technology adoption and acceptance models such as TAM, TAM2, UTAUT and UTAUT2 (Sharma et al., 2009; Straub & Burton-Jones, 2007). Moreover, the

generalizability limits could be identified as this study is limited in exploring the hypothesized conceptual model including hotels in Greece.

This research is exclusively investigating the moderating role of two variables namely firm innovation index and size. However, the combination of mediated-moderation and moderated-mediation models are likely to provide a richer understanding of the phenomenon in many research contexts. A third variable is able to play different roles in explaining the predictor and outcome variable relationship (Ro, 2012).

Lastly, as hotels are exclusively included in the research and no other hospitality accommodation category, this is considered as a limitation. However, the strict government regulations regarding secure physical isolation and the suspension of the hospitality industry to limit COVID-19 spread, have negatively affected the industry and reduced the response (Le & Nguyen, 2021; Sigala, 2020). Therefore, a larger sample of hotels would provide more robust outcomes and allow cross-country comparisons.

8.3 Future Research

The study adopts the perspective of the decision-makers influencing ICT adoption. The decision-makers, who are at this case the hotel owners and managers are chosen as they have the final purchase power (Oliveira & Martins, 2010). An interesting field for future research could be to examine the actual use of technology and the factors that affect this, either from the employees' or customers' point of view. This extension of research would provide a better understanding of technology adoption in the hospitality industry. As already mentioned, the findings of the research might not be generalized, as the study has been restricted to hotels exclusively in Greece. Future studies could explore across wider populations and different cultures. It would be interesting to test the model using countries outside of Europe and conduct comparisons as cross-cultural research offer interesting outcomes that contribute to the management and strategic planning of the hospitality industry.

Since the COVID-19 pandemic is a changing dynamic condition (Gursoy & Chi, 2020; Ntounis et al., 2022). It would be helpful to evaluate findings in the different stages of the pandemic. Longitudinal studies could also be designed to investigate the role of digital technology adoption compared with hotels in the pre- and post- pandemic era to expand the findings and apply various perspectives. Furthermore, different impacts and scenarios could be explored by comparing the outcomes. Moreover, to gain a more holistic view of the adoption and implementation of digital technologies in the hospitality sector the investigation of the Ambient Intelligence era (2020 - future) which still remains unexplored could offer interesting insights in comparison.

Previous studies in the field assessed specific digital technology, e.g., CRMs, and social media (Pateli, Mylonas, et al., 2020; Racherla & Hu, 2008). The current study evaluated a wide list of digital technologies, including devices, applications, and processes for both in-house and external use in SME hotels (Appendix A). The added knowledge of digital technology adoption practices could be helpful for independent SME hotels to improve their strategic planning and to enhance their operation performance by comparing and imitating larger hotels or hotel of a chain depending on their customer profile and the available resources. The SMEs hotels are characterized as late adopters of digital technology by scholars (Strebinger & Treiblmaier, 2022). Thus, this knowledge provides policymakers with an important base for their future strategy design, concerning the post-COVID-19 crisis recovery. Moving a step further, the outcomes of this study provide some useful perspectives by taking into consideration COVID-19 and advances the literature regarding the pandemic.

Concerning the moderator effects, the current study was restricted to include in the analysis the moderating effect of firm innovation index and organizational size. Future research could investigate digital technologies combined with other moderators such as operational mode, type of hotel and star rating, which are proven to affect the hotels' overall performance (Leung et al., 2015). These results might attribute to the various impacts and scenarios by comparing the findings. Furthermore, longitudinal studies could also be designed to investigate the impact and moderator role of firm innovation index and size, in the post- and recovery COVID-19 era to expand the findings and apply various perspectives. Thus, these helpful insights would provide

the confidence for hotels in the future to move towards ICT adoption, implementation and integration.

Concerning the TOE theoretical framework there are several studies that utilize TOE in investigating the factors that contribute to the adoption and implementation of digital technologies nevertheless the findings are fragmented (Sophonthummapharn, 2009). Therefore, for future researchers it would be useful to address the inconclusive outcomes on the factors that would motivate a firm to adopt ICTs by conducting a meta-analysis of the relevant literature. Hence, by addressing all potential determinants that could affect the organizational ICT adoption, researches would be adding useful knowledge to the existing literature. Additionally, research could begin based on the evidence of the current study and could further design new research projects that could add outcomes to the existing research.

The research was conducted via quantitative methods of analysis by using an online questionnaire. This is considered to be suitable method of primary data collection. Future research could use mixed methods. For example, qualitative with quantitative methods that could provide ‘a richer and more comprehensive response to the research question in comparison to mono-method design’ (Saunders et al., 2009)p.167).

This research study focused on the positives of digital technology adoption. However, a dark side of technology advances adoption is in existence (Buhalis, 2019; Korstanje, 2020). Specifically, scholars have recently revealed that the COVID-19 has worsen already challenging and vulnerable situations in the tourism and hospitality sector (Sigala, 2020). Furthermore, future research could be conducted to investigate the negative impacts of COVID-19 (e.g. on hotel employees’ mental and psychological health) as a consequence of the working conditions such as remote working, virtual teams (Sigala, 2020) and service automation (Ivanov, Webster, et al., 2020). Likewise, future research can address issues like indifference for others and problems with worker unions in the hospitality industry. Together with the blossoming developments of ICT usage in the hospitality industry cybersecurity issues are one of the main concerns of ICT adoption and implementation, as they could hinder the digital transformation of the hotel. Surprisingly, this field remains quite unexplored in the hospitality industry (Iranmanesh et al., 2022). Therefore, future studies could investigate the cybersecurity issues that come along with the usage of ICTs within the hotels.

The current study is limited to investigate the factors influencing ICT adoption in the hotel sector, meaning it could be interesting to conduct similar research to other hospitality businesses such as Airbnb and different industries in order to strengthen the prediction power.

Finally, since we have already entered the metaverse era and the potential to extend the physical world by adopting augmented, and virtual reality technologies (Dwivedi et al., 2022) it would be of a great interest to explore this transformative impact of the metaverse world and compare the scenarios.

8.4 Conclusions

Consequently, the objectives of the study are fourth fold. Firstly, to identify relevant factors that influence ICT adoption in the hotel industry. Secondly, to derive a theoretical framework that incorporates these influential measures. Thirdly, to propose relevant propositions and lastly, to discuss the research and practical implications and the directions for future research in this field. ICT adoption in the hotel sector is an ongoing effort, rather than a fixed state, as the pace of the market is constantly changing, together with the turbulence of COVID-19. Therefore, exploring the determinants of technology adoption in the Greek hotel industry is essential to gain a deeper understanding of the process. The findings of the study provide useful insights to hotel owners, managers and policy makers, and highlight approaches for future studies, as well as adding a building block of knowledge in the DT journey.

Prior examination on literature has revealed that the DT has emerged as a fundamental phenomenon in the ICT strategic and management literature (Vial, 2021). In addition, practitioners recognise its value and consider DT important for their business (Fitzgerald et al., 2014). DT is characterized as the actions taken in society and by industries via the adoption and implementation of digital technologies (Majchrzak et al., 2016). The usage of ICT enables major business improvements (Piccinini et al., 2015). These digital technologies become the drivers towards changes into the digital world (Nwankpa & Roumani, 2016) and are considered as the prerequisites for DT (Vescovi, 2021). Hence, DT involves the changes imposed by the adoption of these digital technologies as a means to compete effectively in an increasingly digital reality (Heavin & Power,

2018; Kane et al., 2015b). The current study is aiming to identify the factors that influence the ICT adoption process and helps solve the complex puzzle of the DT journey, as in fact the majority of companies are not ready for it yet (Peter et al., 2020). The examination of literature revealed that a handful of companies have successfully achieved their DT (i.e. Adobe and The New York Times) (Hinterhuber et al., 2021; Vial, 2021). The main problem is identified as the managers' lack of guidance (Chanias & Hess, 2016). Thus, recognizing the above-mentioned points concludes that the study makes an important contribution in a theoretical and practical way.

8.5 Summary

Despite the current limitations, this research contributes to the filling the void in research related to the adoption of ICT in independent SME hotels, from the managers perspective and adds evidence in hospitality, technology and crisis management literature. Whilst, at the same time, the study contributes to understanding and suggesting the important effects of firm innovation index and organizational size as moderators towards digital technology adoption and the technological, organizational and environmental factors during the COVID-19 pandemic. The outcomes revealed that technological, organizational and environmental factors have a transformative impact on ICT adoption. Having summarized the main contributions of this research, its limitations, this study further intends to suggest the directions for future research.

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APPENDIX A

Digital Technologies	Items
<i>Website</i>	Enrich website with information on COVID-19 policy (e.g., prevention program, cancellation policy, frequently asked questions about COVID-19)
<i>Social Media</i>	Social media campaign / publication series to inform hotel guests concerning COVID-19 policy
<i>Mobile & Tablet applications</i>	Development of customer service applications on mobile and tablet (e.g., mobile check-in, communication with the staff via mobile)
<i>QR</i>	QR codes to avoid the use of printed material (e.g., menu scanning, brochure codes, etc.)
<i>Remote Control Systems</i>	Remote control systems (e.g., virtual TV remote control, touchless digital menu)
<i>Advanced Policy Management</i>	Advanced policy management (e.g., personalized or dynamic pricing)
<i>CMR</i>	Advanced customer management systems to improve customer communication and loyalty (CMR)
<i>AI</i>	Advanced artificial intelligence systems (e.g., robotics systems, guest chatbots, demand forecasting systems)

APPENDIX B



Digital transformation in the Greek hotel sector during the pandemic

The aim of the following questionnaire is to capture the degree of response of Greek hotel businesses to the new conditions that have developed due to the COVID-19 pandemic. The research is carried out by the Department of Tourism of the Ionian University under the auspices of the Ministry of Tourism.

The questionnaire is addressed to the manager of the company or to a responsible member of the top management.

We point out that the questionnaire and the processing of the data are anonymous and are carried out by researchers of the Ionian University exclusively in the context of this research. If you wish to submit questions regarding the survey, you can contact the email tourism.survey@ionio.gr with the phrase [PAN-HELLENIC TOURISM SURVEY FOR COVID-19] as the subject.

Thank you in advance for your participation.

Section A. Demographic characteristics

A1. What is your position in the company?

Owner

CEO

Senior executive

Other

A2. Which of the following categories does your business fall into?

Independent Hotel

Member of big chain hotel

Member of a small chain hotel

Other

A3. In which geographical region of the country does your business operate?

Thrace

Macedonia

Thessaly

Epirus

Central Greece

Peloponnese

Crete

Ionian Islands

Aegean Islands

A4. What star rating does your business belong to?

5 stars

4 stars

3 stars

2 stars

1 star

Other

A5. How many employees does your business employ in the tourist season?

1-10

11-50

51-250

> 250

A6. How many rooms does your unit manage?

Less than 200 rooms

200 - 399 rooms

400 - 699 rooms

More than 700 rooms

A7. Your company's annual turnover is calculated on:

< 2 million euros

2-10 million euros

11-50 million euros

More than 50 million euros

A8. In terms of operating period, your business is:

Full-year

Seasonal

Section B. Estimates for the future of tourism during pandemic

To what extent do you agree with the following statements:

B1. The training of the staff in the COVID-19 health protocols is a costly undertaking for the hotel

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
☐	☐	☐	☐	☐

B2. The compliance with COVID-19 health protocols increases the cost of the hotels' services	☐	☐	☐	☐	☐
B3. The alignment with COVID-19 health protocols requires investments to improve hotels' digital infrastructure	☐	☐	☐	☐	☐
Section C. Digital solutions/ practices for your industry during pandemic					
<u>What additional digital solutions/practices have been proposed for the industries you have created or are considering using in the immediate term (3-6 months) from today?</u>	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
C1. Enrich website with information on COVID-19 policy (e.g., prevention program, cancellation policy, frequently asked questions about COVID-19)	☐	☐	☐	☐	☐
C2. Social media campaign /publication series to inform hotel guests concerning COVID-19 policy	☐	☐	☐	☐	☐
C3. Development of customer service applications on mobile and tablet (e.g., mobile check-in, communication with the staff via mobile)	☐	☐	☐	☐	☐
C4. QR codes to avoid the use of printed material (e.g., menu scanning, brochure codes, etc.)	☐	☐	☐	☐	☐
C5. Remote control systems (e.g., virtual TV remote control, touchless digital menu)	☐	☐	☐	☐	☐
C6. Advanced policy management (e.g., personalized or dynamic pricing)	☐	☐	☐	☐	☐
C7. Advanced customer management systems to improve customer communication and loyalty (CMR)	☐	☐	☐	☐	☐

C8. Advanced artificial intelligence systems (e.g., robotics systems, guest chatbots, demand forecasting systems)

☐ ☐ ☐ ☐ ☐

Section D. Digital Maturity

To what extent do you agree with the following statements:

Strongly Disagree **Disagree** **Neither agree nor disagree** **Agree** **Strongly Agree**

D1. The business strategy is based on digital technologies

☐ ☐ ☐ ☐ ☐

D2. Business management supports the digital strategy of the business

☐ ☐ ☐ ☐ ☐

D3. We have the proper staff to manage digital technologies in the business

☐ ☐ ☐ ☐ ☐

D4. We invest in the training of our staff for the use of digital technologies

☐ ☐ ☐ ☐ ☐

D5. The management of the company communicates its digital strategy to the staff of the company

☐ ☐ ☐ ☐ ☐

D6. The company takes all necessary actions to support innovation

☐ ☐ ☐ ☐ ☐

D7. We are interested in enhancing the experience of our customers by utilizing different service channels (e.g., through a website, call centre, social media, etc)

☐ ☐ ☐ ☐ ☐

D8. We commit the necessary resources (human and / or financial) to design, redefine and execute our digital strategy

☐ ☐ ☐ ☐ ☐

D9. Our staff has the necessary digital skills to use information and communication systems

☐ ☐ ☐ ☐ ☐

D10. Our company follows specific procedures for the management of our information systems

☐ ☐ ☐ ☐ ☐

D11. We use digital channels to communicate with our business partners (e.g., suppliers, banks, etc)	☐	☐	☐	☐	☐
D12. We have set a specific budget for the supply / upgrade of our digital infrastructure and systems	☐	☐	☐	☐	☐
D13. Our business is flexible in changes related to its digital strategy	☐	☐	☐	☐	☐
D14. Our company uses and utilizes modern information systems and infrastructures	☐	☐	☐	☐	☐
D15. Our company evaluates the performance of its information systems and infrastructures in terms of their contribution to the achievement of business goals	☐	☐	☐	☐	☐
D16. Our company utilizes feedback from its customers to reshape its digital strategy	☐	☐	☐	☐	☐
D17. Our company uses digital technologies to promote innovation and collaboration with its staff	☐	☐	☐	☐	☐
D18. Our company has set clear and quantitative targets for measuring the success of its digital strategy	☐	☐	☐	☐	☐
D19. Every employee of the company understands how their performance is related to specific corporate digital goals	☐	☐	☐	☐	☐
D20. Our business staff understands the ways in which physical and digital channels work together to achieve the desired result	☐	☐	☐	☐	☐
D21. The views of the company's customers are used to develop new digital services	☐	☐	☐	☐	☐

D22. We use the experience from the implementation of our digital actions in the shaping of our digital strategy

☐ ☐ ☐ ☐ ☐

Section E. Innovation in business

To what extent do you agree with the following statements:

Strongly Disagree **Disagree** **Neither agree nor disagree** **Agree** **Strongly Agree**

E1. Innovation is promoted in our business

☐ ☐ ☐ ☐ ☐

E2. Our company develops new responses to everyday problems

☐ ☐ ☐ ☐ ☐

E3. The company sets realistic goals

☐ ☐ ☐ ☐ ☐

E4. The company believes that it is worth the risk as it can bring greater rewards

☐ ☐ ☐ ☐ ☐

E5. Executives are constantly looking for new business opportunities

☐ ☐ ☐ ☐ ☐

Section F. Financial Resources

Indicate the extent to which your business has financial availability to support its business activities during the pandemic:

Strongly Disagree **Disagree** **Neither agree nor disagree** **Agree** **Strongly Agree**

F1. If we need financial help for our business activities, we can receive them

☐ ☐ ☐ ☐ ☐

F2. We have financial resources to finance our business initiatives

☐ ☐ ☐ ☐ ☐

F3. We are able to obtain financial resources in a short period of time to support the operation of our business

☐ ☐ ☐ ☐ ☐

APPENDIX C

Table C-1. Reflective Constructs

Constructs	Items
<i>Culture</i>	DMC1 The business strategy is based on digital technologies
	DMC2 Business management supports the digital strategy of the business
	DMC3 We have the proper staff to manage digital technologies in the business
	DMC4 We invest in the training of our staff for the use of digital technologies
	DMC5 The management of the company communicates its digital strategy to the staff of the company
	DMC6 The company takes all necessary actions to support innovation
	DMC7 We are interested in enhancing the experience of our customers by utilizing different service channels (e.g., through a website, call centre, social media, etc.)
<i>Environment Government regulations</i>	GOV1 The training of the staff in the COVID-19 health protocols is a costly undertaking for the hotel
	GOV2 The compliance with COVID-19 health protocols increases the cost of the hotels' services
	GOV3 The alignment with COVID-19 health protocols requires investments to improve hotels' digital infrastructure
<i>Insights</i>	DMIN1 Our company has set clear and quantitative targets for measuring the success of its digital strategy
	DMIN2 Every employee of the company understands how their performance is related to specific corporate digital goals
	DMIN3 Our business staff understands the ways in which physical and digital channels work together to achieve the desired result
	DMIN4 The views of the company's customers are used to develop new digital services
	DMIN5 We use the experience from the implementation of our digital actions in the shaping of our digital strategy
<i>Organization</i>	DMOR1 We commit the necessary resources (human and / or financial) to design, redefine and execute our digital strategy
	DMOR2 Our staff has the necessary digital skills to use information and communication systems
	DMOR3 Our company follows specific procedures for the management of our information systems
	DMOR4 We use digital channels to communicate with our business partners (e.g., suppliers, banks, etc)
<i>Tech Resources</i>	FIN1 If we need financial help for our business activities, we can receive them
	FIN2 We have financial resources to finance our business initiatives
	FIN3 We are able to obtain financial resources in a short period of time to support the operation of our business
<i>Technology</i>	DMTECH1 We have set a specific budget for the supply / upgrade of our digital infrastructure and systems
	DMTECH2 Our business is flexible in changes related to its digital strategy
	DMTECH3 Our company uses and utilizes modern information systems and infrastructures
	DMTECH4 Our company evaluates the performance of its information systems and infrastructures in terms of their contribution to the achievement of business goals
	DMTECH5 Our company utilizes feedback from its customers to reshape its digital strategy
	DMTECH6 Our company uses digital technologies to promote innovation and collaboration with its staff

Table C-2. Formative constructs

Construct	Items
<i>Digital Technologies</i>	Enrich the site with information on COVID-19 (e.g., prevention program, cancellation policy, frequently asked questions about COVID-19) Social media campaign / post for information on the company's policy in relation to COVID-19 Development of customer service applications on mobile and tablet (e.g., mobile check-in, communication with the staff via mobile) QR codes to avoid the use of printed material (e.g., menu scanning, brochure codes, etc.) Remote control systems (e.g., virtual TV remote control, touchless digital menu) Advanced pricing policy management systems for customers (e.g., personalized or dynamic pricing) Advanced customer management systems to improve customer communication and loyalty Advanced artificial intelligence systems (e.g., robotics systems, guest chatbots, demand forecasting systems)

Table C-3. Moderator firm innovation index

Moderator	Items
<i>Firm innovation index</i>	Innovation is promoted in our business Our company develops new responses to everyday problems The company sets realistic goals The company believes that it is worth the risk as it can bring greater rewards Executives are constantly looking for new business opportunities

Table C-4. Moderator number of employees

Moderator	Answers
Number of employees	1-10 11-50 51-250 >250

APPENDIX D

Table D-1. HTMT Ratio

HTMT ratio	Culture	Environment	Insights	Financial Resources	Organization	Technology
Environment	0.186(0.11-0.243)					
Insights	0.852(0.817-0.882)	0.162(0.084-0.215)				
Financial Resources	0.294(0.202-0.379)	0.076(0.031-0.148)	0.263(0.161-0.345)			
Organization	0.923(0.886-0.953)	0.146(0.085-0.197)	0.902(0.866-0.931)	0.306(0.22-0.396)		
Technology	0.892(0.859-0.919)	0.162(0.086-0.211)	0.929(0.899-0.95)	0.305(0.217-0.387)	0.944(0.919-0.963)	
Digital Maturity	0.984(0.973-0.994)	0.173(0.111-0.217)	0.971(0.958-0.981)	0.304(0.217-0.382)	1.002(0.987-1.016)	0.998(0.99-1.007)

APPENDIX E

Table E-1. Correlation matrices of reflective and formative constructs

	DMC1	DMC2	DMC3	DMC4	DMC5	DMC6	DMC7	DMOR1	DMOR2	DMOR3	DMOR4	DMTECH1	DMTECH2	DMTECH3	DMTECH4	DMTECH5	DMTECH6	DMIN1	DMIN2	DMIN3	DMIN4	DMIN5
DMC1	1.00																					
DMC2	0.79	1.00																				
DMC3	0.65	0.62	1.00																			
DMC4	0.66	0.63	0.73	1.00																		
DMC5	0.63	0.66	0.70	0.83	1.00																	
DMC6	0.67	0.68	0.67	0.73	0.79	1.00																
DMC7	0.48	0.51	0.43	0.48	0.48	0.55	1.00															
DMOR1	0.60	0.64	0.63	0.67	0.68	0.74	0.63	1.00														

Appendix D

DMOR2	0.50	0.50	0.70	0.59	0.62	0.61	0.49	0.64	1.00															
DMOR3	0.56	0.59	0.64	0.65	0.67	0.68	0.57	0.69	0.75	1.00														
DMOR4	0.41	0.46	0.46	0.48	0.49	0.52	0.46	0.54	0.50	0.62	1.00													
DMTECH1	0.47	0.51	0.53	0.59	0.58	0.61	0.45	0.67	0.52	0.61	0.57	1.00												
DMTECH2	0.55	0.61	0.58	0.60	0.61	0.65	0.51	0.65	0.60	0.69	0.63	0.70	1.00											
DMTECH3	0.62	0.62	0.63	0.66	0.64	0.72	0.53	0.69	0.59	0.67	0.61	0.68	0.77	1.00										
DMTECH4	0.63	0.61	0.62	0.70	0.68	0.71	0.52	0.71	0.60	0.72	0.59	0.69	0.75	0.82	1.00									
DMTECH5	0.49	0.54	0.52	0.54	0.53	0.60	0.55	0.58	0.48	0.61	0.52	0.54	0.62	0.63	0.67	1.00								
DMTECH6	0.60	0.58	0.62	0.66	0.67	0.71	0.52	0.72	0.63	0.71	0.55	0.62	0.68	0.76	0.79	0.69	1.00							
DMIN1	0.58	0.57	0.61	0.65	0.65	0.68	0.49	0.70	0.61	0.67	0.52	0.66	0.64	0.70	0.77	0.63	0.84	1.00						
DMIN2	0.53	0.54	0.59	0.62	0.63	0.67	0.43	0.65	0.59	0.65	0.51	0.63	0.59	0.64	0.70	0.60	0.75	0.80	1.00					
DMIN3	0.52	0.52	0.65	0.62	0.64	0.64	0.46	0.65	0.66	0.66	0.51	0.58	0.60	0.65	0.69	0.60	0.71	0.72	0.81	1.00				
DMIN4	0.50	0.57	0.54	0.56	0.58	0.63	0.55	0.67	0.56	0.65	0.53	0.61	0.62	0.64	0.66	0.70	0.70	0.68	0.70	0.69	1.00			
DMIN5	0.57	0.62	0.63	0.65	0.67	0.71	0.54	0.72	0.61	0.69	0.54	0.62	0.67	0.72	0.74	0.70	0.76	0.76	0.76	0.77	0.82	1.00		
DIGSOL1	0.32	0.31	0.31	0.30	0.27	0.33	0.35	0.29	0.27	0.34	0.16	0.28	0.30	0.32	0.35	0.31	0.34	0.34	0.26	0.25	0.32	0.34		
DIGSOL2	0.37	0.36	0.35	0.35	0.35	0.36	0.35	0.36	0.28	0.33	0.22	0.33	0.34	0.35	0.36	0.37	0.36	0.37	0.30	0.31	0.33	0.39		
DIGSOL3	0.46	0.42	0.39	0.43	0.43	0.45	0.33	0.41	0.36	0.41	0.29	0.41	0.40	0.48	0.48	0.35	0.46	0.44	0.35	0.34	0.31	0.38		
DIGSOL4	0.36	0.38	0.31	0.38	0.37	0.38	0.27	0.36	0.29	0.34	0.28	0.36	0.40	0.40	0.40	0.32	0.38	0.37	0.29	0.27	0.28	0.33		
DIGSOL5	0.31	0.32	0.27	0.34	0.31	0.36	0.26	0.36	0.27	0.32	0.29	0.37	0.34	0.35	0.38	0.30	0.40	0.41	0.37	0.33	0.34	0.35		
DIGSOL6	0.30	0.33	0.30	0.33	0.35	0.37	0.27	0.39	0.29	0.36	0.23	0.36	0.32	0.38	0.40	0.32	0.39	0.37	0.32	0.35	0.36	0.39		
DIGSOL7	0.33	0.34	0.37	0.40	0.41	0.40	0.33	0.42	0.40	0.45	0.31	0.36	0.39	0.42	0.45	0.37	0.46	0.42	0.36	0.39	0.37	0.44		
DIGSOL8	0.28	0.28	0.25	0.33	0.31	0.31	0.21	0.33	0.24	0.27	0.20	0.30	0.27	0.30	0.31	0.21	0.32	0.36	0.28	0.30	0.25	0.31		
GOV1	0.03	0.06	-0.03	0.10	0.07	0.02	0.07	0.04	0.02	0.05	0.02	0.05	0.05	0.02	0.00	0.09	0.03	0.00	-0.02	-0.03	0.08	0.04		
GOV2	0.20	0.28	0.09	0.23	0.21	0.19	0.20	0.23	0.15	0.20	0.11	0.22	0.18	0.14	0.21	0.21	0.20	0.21	0.17	0.13	0.24	0.20		
GOV3	0.00	0.03	-0.08	0.00	-0.01	0.03	-0.04	0.02	-0.02	-0.01	-0.01	0.09	-0.02	0.01	0.00	0.03	0.02	0.01	0.09	-0.03	0.06	0.04		

Table E-2. Correlation matrices of reflective and formative constructs

	DMC1	DMC2	DMC3	DMC4	DMC5	DMC6	DMC7	DMOR1	DMOR2	DMOR3	DMOR4	DMTEC H1	DMTEC H2	DMTEC H3	DMTEC H4	DMTEC H5	DMTEC H6	DMIN1	DMIN2	DMIN3	DMIN4	DMIN5
FIN1	0.20	0.16	0.21	0.21	0.21	0.20	0.17	0.25	0.18	0.21	0.19	0.30	0.23	0.26	0.21	0.11	0.21	0.23	0.17	0.20	0.10	0.20
FIN2	0.23	0.18	0.26	0.26	0.28	0.23	0.15	0.25	0.20	0.23	0.19	0.31	0.20	0.26	0.24	0.17	0.21	0.25	0.21	0.25	0.15	0.25
FIN3	0.18	0.14	0.23	0.20	0.22	0.17	0.15	0.22	0.18	0.19	0.21	0.28	0.21	0.23	0.21	0.13	0.19	0.22	0.17	0.22	0.12	0.21

Table E-3. Correlation matrices of reflective and formative constructs

	DIGSOL 1	DIGSOL 2	DIGSOL 3	DIGSOL 4	DIGSOL 5	DIGSOL 6	DIGSOL 7	DIGSOL 8	GOV1	GOV2	GOV3	FIN1	FIN2	FIN3
DIGSOL1	1.00													
DIGSOL2	0.62	1.00												
DIGSOL3	0.39	0.50	1.00											
DIGSOL4	0.32	0.37	0.61	1.00										
DIGSOL5	0.22	0.30	0.40	0.42	1.00									
DIGSOL6	0.30	0.33	0.42	0.39	0.45	1.00								
DIGSOL7	0.29	0.31	0.48	0.40	0.41	0.63	1.00							
DIGSOL8	0.15	0.18	0.28	0.30	0.45	0.37	0.37	1.00						
GOV1	0.06	0.07	0.07	0.11	-0.02	0.07	0.07	0.03	1.00					
GOV2	0.16	0.15	0.25	0.26	0.17	0.21	0.17	0.19	0.48	1.00				
GOV3	0.02	-0.05	0.04	0.01	0.01	0.07	0.03	0.06	0.40	0.34	1.00			
FIN1	0.17	0.22	0.21	0.20	0.10	0.12	0.14	0.16	-0.03	-0.07	-0.01	1.00		
FIN2	0.11	0.24	0.24	0.23	0.15	0.18	0.21	0.15	-0.02	-0.02	-0.05	0.69	1.00	
FIN3	0.11	0.23	0.20	0.22	0.10	0.13	0.17	0.15	-0.05	-0.09	-0.04	0.79	0.75	1.00

Table E-4. Factor and Cross Loadings

	Culture	Organization	Technology	Insights	Technology Solutions	Environment	Financial Resources
DMC1	0.84	0.62	0.65	0.60	0.51	0.17	0.22
DMC2	0.84	0.65	0.67	0.63	0.51	0.25	0.18
DMC3	0.83	0.72	0.68	0.68	0.48	0.06	0.26
DMC4	0.88	0.71	0.73	0.70	0.54	0.21	0.25
DMC5	0.88	0.73	0.72	0.71	0.52	0.19	0.26
DMC6	0.88	0.76	0.77	0.74	0.55	0.17	0.22
DMC7	0.66	0.64	0.60	0.55	0.44	0.17	0.17
DMOR1	0.79	0.86	0.77	0.76	0.54	0.20	0.26
DMOR2	0.69	0.85	0.66	0.68	0.45	0.13	0.21
DMOR3	0.75	0.91	0.78	0.74	0.53	0.18	0.23
DMOR4	0.57	0.77	0.67	0.58	0.37	0.09	0.21
DMTECH1	0.64	0.70	0.81	0.69	0.51	0.20	0.33
DMTECH2	0.71	0.75	0.87	0.70	0.51	0.15	0.23
DMTECH3	0.76	0.75	0.90	0.75	0.56	0.12	0.28
DMTECH4	0.77	0.78	0.91	0.80	0.58	0.17	0.24
DMTECH5	0.65	0.65	0.80	0.72	0.47	0.20	0.15
DMTECH6	0.75	0.77	0.88	0.84	0.58	0.17	0.22
DMIN1	0.73	0.74	0.82	0.89	0.57	0.17	0.26
DMIN2	0.69	0.71	0.76	0.91	0.47	0.14	0.20
DMIN3	0.70	0.73	0.74	0.89	0.47	0.09	0.25
DMIN4	0.68	0.71	0.76	0.87	0.46	0.22	0.13
DMIN5	0.76	0.76	0.81	0.92	0.54	0.17	0.24
DIGSOL1	0.38	0.32	0.37	0.34	0.59	0.15	0.14
DIGSOL2	0.43	0.36	0.41	0.38	0.68	0.13	0.25
DIGSOL3	0.50	0.44	0.50	0.41	0.80	0.22	0.24
DIGSOL4	0.42	0.38	0.44	0.34	0.71	0.24	0.24
DIGSOL5	0.37	0.37	0.41	0.40	0.63	0.13	0.13
DIGSOL6	0.39	0.38	0.42	0.40	0.67	0.20	0.16
DIGSOL7	0.44	0.47	0.47	0.44	0.75	0.16	0.19
DIGSOL8	0.34	0.31	0.33	0.33	0.57	0.17	0.17
GOV1	0.06	0.04	0.05	0.02	0.09	0.69	-0.04

Appendix D

GOV2	0.24	0.21	0.22	0.21	0.29	0.97	-0.07
GOV3	-0.01	0.00	0.02	0.04	0.03	0.47	-0.04
FIN1	0.24	0.25	0.25	0.20	0.25	-0.07	0.90
FIN2	0.28	0.26	0.27	0.25	0.29	-0.03	0.90
FIN3	0.22	0.23	0.24	0.21	0.26	-0.08	0.93