Measuring the Impact of industry 4.0 technologies and Organization Learning on Creating Value-Based Digital Transformation in Tourism

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Abstract:

Industry 4.0 Technologies and digitalization have irrevocably changed our world business, industry, and society. Globally, the Influence of the industry 4.0 was recognized in all industries, including service industries such as tourism and hospitality. This study seeks to measure the impact of tourism 4.0 and organization learning on creating Value-Based Digital Transformation in the tourism industry. In order to address this issue, this study uses quantitative research approach. Administrated questionnaires have been distributed online through google form. 422 tourists filled in the questionnaire. Structural Equation Modeling (SEM) combines multiple regression with Confirmatory Factor Analysis (CFA) to examine the causal relationships between variables using Amos 25 software package. The study's findings revealed that Organizational Learning and tourism 4.0 technologies (the internet, the big data, the chatbot, virtual reality, and augmented reality) have a positive impact on Value-based Digital Transformation in the tourism industry. This study contributes by adding knowledge to how the tourism industry can use various technologies to improve performance of the tourism industry.

Key words: Organization learning, industry 4.0, Value-based Digital Transformation, tourism industry.

1. Introduction

Advanced technological developments that are emerging currently in the market have been affecting the lives of people, societies, and businesses of various fields more rapidly than in the past. The industry 4.0 this term appeared for the first time in 2011 during the famous Hannover Fair, as a kind of project in the high-tech strategy of the German Industry (Devezas et al., 2017). Industry 4.0 reshaped the competition, changing the established industries, especially in tourism industry (Peceny *et al.,* 2019).

Peceny et al. (2019) discussed Tourism 4.0, a new tourism paradigm that emerged to expose how advanced technology and various digital innovations modified the entire tourism sector. It was clarified that advanced and digital technologies (such as Internet of Things, Big Data, Chained Disabilities, Artificial Intelligence, Virtual Reality and Augmented Reality) can be applied to tourism sector. Papathanassis (2017, p.212) used the term Tourism 4.0 in relation to digital transformation and intelligent automation in tourism, explaining: *"Tourism 4.0-related technologies such as cloud computing, mobile internet, robotics, AI, autonomous vehicles and even 3D-printing"*. Technologies related to the industry 4.0 are mentioned by research as having considerable impact on the skill requirements and on the composition of the global tourism workforce (Papathanassis, 2017).

Peterson (2018) examined Industry 4.0 issues in the service sector and the situations in the hospitality industry; they found that the challenges of Industry 4.0 require continuous

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innovation and learning, depending on people and the capabilities of the business. Therefore, appropriate management approaches play a vital role in the development of dynamic capabilities and in an effective learning and innovation environment. Accordingly, this study seeks to examine and develop a framework that can support innovation and the learning environment in an organization found in the tourism industry. Studies clarified that successful digital transformation starts from digital leadership that has a clear digital vision supported by a modern learning organization to achieve a sustainable and agile business model (Devezas et al., 2017).

Digitalization and the industry 4.0 have been studied many times in existing literature (Devezas et al., 2017); nevertheless, there is limited research that focuses on the industry 4.0 in organizations related to tourism and how effective business models should be developed accordingly (Peceny et al., 2019). Thus, this research seeks to add empirical evidence to the literature, focusing on two main pillars: industry 4.0 technologies and organizational learning in tourism industry. This study is applied to the tourism industry (on various tourism organization that engages in the provision, promotion, sale and purchase of tourism products) to achieve the highest productivity and ensure operation sustainability. This study seeks to measure the impact of tourism 4.0 and organization learning on creating Value-Based Digital Transformation in the tourism industry.

2. Literature Review

Advanced progression in the field of digital media, communication, robotics, transportation, etc. is called the 4th Industrial Revolution or Industry 4.0 in the industrial sector. These technologies have changed how businesses operate in the market; these technologies have created great transformations in the services sectors; these technologies have deemed a necessity in the business model in order for any business to be able to sustain itself in the market, even in businesses in the tourism industry (Devezas et al., 2017; Peceny et al., 2019). Industry 4.0 has also led to changes in the transformation of the tourism sector and is likely to occur in future processes.

2.1 The Concept of Industry 4.0

Industry 4.0 is the term that describes the current movement toward a highly connected and automated system in which human, machines, and resources are integrated into an ecosystem (Guzmán et al., 2020). While Calıs□ et al. (2021) identified Industry 4.0 as a collective concept that expresses the use of the internet in the industrial sector and the digitalization of production, thus affecting all value chains of businesses. The main characteristic of Industry 4.0 is the linkage of real objects and people with information-processing and virtual objects to establish an intelligent and agile ecosystem through a variety of technological solutions. This includes industrial automation, computerization, digitization, and internet of things, big data, data analytics, artificial intelligence, simulation, embedded systems, cloud systems, additive manufacturing, and virtualization technologies (Ustundag and Cevikcan, 2018).

When it comes to using industry 4.0 in an organization, this requires organization to be accepting and wanting to learn how to conduct digital transformation; digital transformation is

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considered a strong stimulus that provides businesses with various opportunities in the market so it is at the center of business strategies (Overton et al., 2017). Vial (2019) defined digital transformation as a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies. Digital transformation has been applied in various aspects related to the tourism industry, making industry 4.0 a common practice in the field and a means to encourage the rate of tourism in the country (Peceny et al., 2019).

2.2 The Concept of Tourism 4.0

According to Manjari (2018), the industry 4.0, which is used in tourism, is known as Tourism 4.0, is a new stage of tourism development. A different practice is not compared to E-tourism and M-tourism. According to Korz□e (2019), tourism using electronic and advanced technology, tourism 4.0, examples are hotel reservation, flight or car service; m-tourism. This digitalization of tourism establishment include the usage of internet to offer various services to aid tourism related services. Manjari (2018) explains that tourism 4.0 shows wider aspects and includes both the concept of e-tourism and m-tourism as it is considered as a current trend of big data processing collected from a vast number of travelers to create a personalized travelling experience. According to Hunter et al. (2015), tourism 4.0 is a phenomenon that emerged due to information technology applied to enhance the tourism experience. According to Gretzel et al. (2015), smart tourism and tourism 4.0 allow tourism destinations and providers of tourism products to connect with tourists on forms of information communication technologies and other cutting-edge technologies that allow massive amounts of data to be transformed into a value proposition.

The internet is a significant tourism 4.0 tool that aids providers of tourism services. The internet is significant to tourism as it provides two major benefits: it provides cost reduction: there can be fewer intermediaries than before, processes are streamlined and tourist companies can save time and expenses; and it aids in the marketing practices since the Internet allows geographical barriers to disappear; companies can easily enter foreign markets and reach more tourists (Brain, 2017).

Big data is the next significant tourism 4.0 tool. Big data in tourism allows for real-time information about tourists, their movements, their preferences, their buying decisions, their aspirations etc. Big data are collected from different sources, such as social media, on tourist portals, with robots and chat bots etc. This data are useful to business in the industry as it collects actual tourist actions that are implemented (the data is not obtained by surveys), making the information reliable and detailed and including segmentation capacity. This information can be useful in improving the efficiency of customer service (Manjari, 2018; McCraken, 2018).

A visible manifestation of AI in tourism and hospitality at present are chat bots; it are virtual assistants that hold a natural language conversation with human through bots and chap apps (for example, Amazon's Alexa or iPhone Siri) (Brain, 2017). They can play an important role in customer-centric businesses like tourism, carrying out basic requests for information.

According to Korz□e (2019), Dutch airlines KLM first used bots and chat apps to send their passengers boarding passes and flight information via Facebook Messenger, WeChat, Viber and other chat apps.

Virtual reality (VR) plays a significant role in tourism 4.0. Tourists like to make a virtual journey to the existing places from the touch and 360- degree holidays videos. In addition, theme parks are also seeking to open virtually (Virtual Reality Theme Park), highlighting virtual destinations (e.g. kadu National Park, Great Barrier Reef, Hamilton Island). The concept of VR is to replace the real-world environment (Fes, 2018; Manjari, 2018). Augmented reality (AR) technology is updating travelers experience by making the planning journey more interactive and simpler. It aids travelers to book a hotel, access information, navigating around the destination, translating written or spoken signs or conversations, etc. through an app on mobile devices (Augment, 2016).

Bu□chi et al. (2020) stated that Industry 4.0 provides enabling technologies to help companies in the tourism industry to achieve more significant opportunities following improved efficiency and increased production capacity. According to Peceny et al. (2019), Industry 4.0 capabilities help tourism companies dramatically reduce the time between tourists planning their trips, knowing about an event occurring, and appropriate response and decision-making.

Digital transformation is accelerated by innovative technologies that fundamentally change the business models and how work is done. This study explores the industry 4.0 dominant enabling technologies that accelerate the digital transformation, leading to value-based digital transformation in the tourism industry.

2.3 Organization Learning

In order to apply various technologies, the tourism company must seek to constantly learn about the market trends and the impact of digitalization and advanced technology in the market (Fes, 2018; Manjari, 2018). Kane et al. (2018) argue that digitally maturing companies are more likely to create an environment that enables studying, acquiring, and absorbing innovation through organizational learning. Learning organization can adapt to an ambiguous, rapidly changing, and unexpected environment by investing in experimentation and figuring out what works for the field and business (Bu□chi et al., 2020).

Organizational learning is viewed as a process-based approach that aims to build an agile learning organization that focuses on keeping resources, capabilities, and environment aligned by emphasizing adoption, development, reconfiguration, transformation, and renewal (Ruel et al., 2020). Organizational learning refers to the organization's knowledge gaining and practice to acquire constantly new market awareness, experiences, business practices, and information familiarity; knowledge needed to create an attractive touristic and/ or digital presence that encourages visitors to travel to the destination (Kane et al., 2018).

2.4 The Development of the Proposed Research Model

This study seeks to assess the impact of tourism 4.0 tools (the internet, the Big data, chatbots, virtual reality, and Augmented reality) and organization learning regarding digitalization on creating Value-Based Digital Transformation in the tourism industry. Based on the literature review, two main hypotheses emerged H1: there is a positive significant relationship between organizational learning and Value-Based Digital Transformation in the tourism industry; H2: there is a positive significant relation between tourism 4.0 tools and Value-Based Digital Transformation in the tourism industry. Hypothesis two consist of five sub-hypotheses: (H2.1) the internet (H2.2) big data (H2.3) chat bots (H2.4) virtual reality and (H2.5) augmented reality has a positive significant impact on Value-Based Digital Transformation in the tourism industry.

3. Research Methodology

This quantitative research following a deductive approach; the data collection is used to evaluate the research hypotheses developed from previous studies and literature reviews. The researcher examines to what extent organizational learning and tourism 4.0 technologies affect the value-based digital transformation in the tourism industry. In this study, the research investigation followed Sekaran and Bougie (2016) deductive sequential steps. The data collection is through administrated questionnaires, which is created through google form and the link is placed on various tourism social media pages. The questionnaires contained several scales that assess the variables that were adopted from past studies. The questionnaire went through a pilot test to confirm the questions validity and reliability before actual data collection. The total number of participants that filled out the questionnaire so to be analyzed were 422 participants. These participants were sampled through non-probability sampling (conveniently). The Amos 25 software package was used to perform the Structural equation modeling (SEM) that combines multiple regression with Confirmatory Factor Analysis (CFA) to examine the causal relationships between the variables in the hypotheses.

4. Data Analysis and Research Findings

The participants of this study came from different socio-demographic background. They were potential tourists that enjoy travel and used digital platforms and communication to aid in the decision-making to travel to a specific area or used digital platforms and communication during their travels.

Based on the analysis, when it comes to the measurement model (made up of thirty-seven observed Items that measure the latent variables in the study), the level of internal consistency for each construct was acceptable, with the standardized loading ranging from 0.613 to 0.922, exceeding the minimum hurdle of 0.50 at the alpha level of 0.05.

Composite reliability (CR) is used to measure overall reliability: the reliability of a construct in the measurement model. The variable, organization learning, had a reliability alpha of 0.878; The variable, the internet, had a reliability analysis of 0.918; The variable, big data, had a reliability analysis of 0.929; the variable, chatbot, had a reliability analysis of 0.938; the variable, augmented reality, had a reliability analysis of 0.879; the variable, virtual reality, had

a reliability analysis of 0.767; the variable, value based digital transformation, had a reliability analysis of 0.824.

The model fit indices like the comparative fit index (CFI), Tucker Lewis index (TLI), Degrees of Freedom (DF), Chi- Square/ Degrees of Freedom ($\chi2$/DF), Chi-Square ($\chi2$), and Root Mean Square of Error Approximation (RMSEA) were chosen to evaluate the model fit (Thakkar 2020). Table 1 indicates that the measurement models provide good support for the factor structure determined through the CFA.

Table 1: Goodness of Fit (GOF) Measures

Goodness of Fit Measures	Name of index	Level of acceptance Hair et al. (2019)	Model Result
Chi-Square	$\chi2$	▯ 0.05	1124.321
Degrees of Freedom	DF	≥ 0	585
Chi-Square/ Degrees of Freedom	$\chi2$/DF	≤ 3	1.922
Comparative Fit Index	CFI	$\geq .90$	.956
Tucker Lewis Index	TLI	$\geq .90$	.950
Root Mean Square Error of Approximation	RMSEA	<.08	.047

The structural model results using the AMOS software show that DF was 620 (it should be more than 0), $\chi2$/DF has a value of 2.667, which is less than 3.0 (it should be less than or equal to 3.0). The RMSEA was .063 (it should be less than 0.08). The TLI index was .915, which is close to 1.0 (a value of 1.0 indicates perfect fit). The CFI was .921. All indices are close to a value of 1.0 in the structural model, indicating that the structural model provides good support for the factor structure determined through the structural model. Based on the path analysis of the SEM, shown in table 2, all the hypotheses are supported.

Table 2: Hypothesis Testing Path analysis

Hypothesis Path			Beta (β) Value	Critical Ratio	P-Value
Organization learning	←	Value-Based Digital Transformation	0.958	1.978	***
Technology 4.0 the internet	←	Value-Based Digital Transformation	0.988	3.425	***
Technology 4.0 the big data	←	Value-Based Digital Transformation	0.968	4.661	***
Technology 4.0 the chatbot	←	Value-Based Digital Transformation	0.914	4.461	***
Technology 4.0 the virtual reality	←	Value-Based Digital Transformation	0.926	4.321	***
Technology 4.0 the augmented reality	←	Value-Based Digital Transformation	0.930	4.331	***

According to the Squared Multiple Correlations (R2), it was equivalent to 0.929, which means that the estimated structural model corroborated the two hypotheses, as Organizational Learning and tourism 4.0 (the internet, Big data, chat bots, virtual reality, and Augmented reality) technologies constructs explained 92.9 % of Value-based digital transformation Level variance.

5. Discussion and Conclusion

The aim of tourism 4.0 is to reduce the negative effects of tourism, to see the effects of the use of technology in the tourism sector and to develop cooperation models in partners. This concept reflects the trend of applying the tools and concepts of Industry 4.0 to the tourism sector, in order to create a personalized travelling experience and a more sustainable tourism. The impact of the fourth industrial revolution in tourism, resulting in the creation of more personalized traveling experience, based on a variety of modern high-tech computer technologies. Currently, Tourism 4.0 faces several challenges. This includes its dependency on the readiness level of the target group in terms of skills, processes, trust and interest. These issues commonly arise in the marketing and the development of the business model in the industry related to the new concepts, but need to be overcome before the new paradigm can become a success. Thus, this study sought to measure the impact of tourism 4.0 and organization learning on creating value-based digital transformation in the tourism industry.

This research aims to fill the gap of the high failure rate of digital transformation theoretically and practically. The study formulated a value-added digital transformation model based on organizational learning and tourism 4.0 technologies (the internet, Big data, chat bots, virtual reality, and Augmented reality). The research highlighted the essential tourism 4.0 tools that promote digital transformation among the tourism industry so to manage and direct this digital transformation process. The research recommends five technologies that significantly affect the industry. These technologies proven in this study to be significant and positive in impact. Furthermore, the study emphasizes that the supportive, experimental, and transparent learning organization accelerates the transformation process.

This study results showed that the internet, Big data, chat bots, virtual reality, and augmented reality technologies constructs significantly impact Value-based digital transformation level in the tourism industry. These findings are supportive of existing literature. Past study show, that digital transformation has been applied in various aspects related to the tourism industry, making industry 4.0 a common practice in the field and a means to encourage the rate of tourism in the country (Peceny et al., 2019). Bu☐chi et al. (2020) stated that this Industry 4.0 provides enabling technologies to help companies in the tourism industry to achieve more significant opportunities following improved efficiency and increased production capacity. According to Peceny et al. (2019), Industry 4.0 capabilities help tourism companies dramatically reduce the time between tourists planning their trips, knowing about an event occurring, and appropriate response and decision-making.

This study contributed academically. Despite the importance of tourism and its impact on the economy and how many researches sought to improve the industry. This study enriches academia with a new structural model representing the main pillars of digital transformation success for the tourism 4.0. This model formulates an overall perspective, evaluating the impact of close integration between organizational learning and tourism 4.0 technologies, which are considered in this study as the main pillars of the organization's digital transformation success. This model explains 92.9 % of the digital transformation success.

This study contributed practically. The main practical contribution of this study is identifying the main pillars that contribute together to ensure the digital transformation success in the tourism industry. These pillars successfully implement industry 4.0 technologies to achieve value-added digital transformation. This research has contributed practically to exploring organizational learning practices that support the organization and facilitate the digital transformation process. Furthermore, this study contributes to the tourism industry by highlighting the industry 4.0 technologies that accelerate the digital transformation.

Tourism 4.0 is term for the trend of using advance technology to improve business performance, the growing use of big data, artificial intelligence, cloud computing, and other high-tech computer technologies to generate demand and improve services for consumers across different industries. Therefore, this study recommends that the companies that operate in the tourism industry, use these assessed technologies so to create personalized travel experiences from the early stages of the booking journey to the post-trip. The companies that operate in the tourism industry should invest in cultural transition by transitioning to a new learning organization that supports the digital transformation process and facilitates it. They should invest in Industry 4.0 technologies that have a significant impact on the business performance and ensure the value-added from digital transformation such as reduced costs, minimized waste, maximum efficiency, high speed, and enhanced quality.

This study has certain limitations. The first limitation is that the study is applied to tourists in the Egyptian context. The perceptions might vary significantly between different countries and diverse cultures. Future researches may consider this limitation and examine the model in a global context to enhance generalizability. Another limitation is that the research hypothetically examined only two critical factors that significantly affect digital transformation success. Further research is recommended to incorporate additional variables into this research model to generate deeper insights. Furthermore, future research may examine other moderating variables' effects to enrich the model; or examine other industry 4.0 technologies. Future studies may focus on organizations via investigating corporates in case study analysis. This approach may provide a deeper understanding of how an organization can manage the challenges of digital transformation and achieve a successful transition to industry 4.0. This study is a cross sectional study; future studies can conduct a longitudinal study to assess the before and after experience with 4.0.

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قياس تأثير تقنيات الصناعة ٤٫٠ والتعلم التنظيمي على خلق التحول الرقمي القائم على القيمة في السياحة

ملخص البحث باللغة العربية

إن التقنيات ورقمنه الصناعة ٤٫٠ قامت بتغيير شكل الاعمال والصناعة والمجتمعات في العالم. وعلى الصعيد العالمي، لوحظ تأثير الصناعة ٤٫٠ على جميع الصناعات، بما في ذلك صناعة الخدمات مثل السياحة والضيافة. تسعى هذه الدراسة إلى قياس تأثير تقنيات السياحة ٤٫٠ والتعلم التنظيمي علي خلق التحول الرقمي القائم على القيمة في صناعة السياحة. ولمعالجة هذه القضية، استخدمت هذه الدراسة منهجية البحث الكمي. وقد تم توزيع الاستبيانات المدارة عبر شبكة الإنترنت من خلال نموذج جوجل. وقد قام عدد ٤٢٢ سائحا بملء الاستبيانات، بالإضافة الي استخدام نمذجة المعادلات الهيكلية(SEM) والتي تجمع بين الانحدار المتعدد والتحليل العاملي التأكيدي (CFA) لفحص العلاقات السببية بين المتغيرات باستخدام حزمة برامج Amos 25. وتكشف نتائج الدراسة أن تقنيات التعلم التنظيمي والسياحة ٤٫٠ (الإنترنت، والبيانات الضخمة، وروبوت الدردشة، والواقع الافتراضي، والواقع المعزز) أن لها تأثير إيجابي على التحول الرقمي القائم على القيمة في صناعة السياحة.

الكلمات الدالة: التعلم التنظيمي، الصناعة ٤٫٠، التحول الرقمي القائم على القيمة، صناعة السياحة.