International Journal of Contemporary Tourism Research

REFLECTIONS OF INDUSTRY 4.0 TO MANAGEMENT OF SERVICE ENTERPRISES: SMART HOTELS

Research Article

Emre BİLGİN SARI*

ABSTRACT

Service enterprises cannot avoid the necessity to follow useful quests under the weight of competition conditions, although the operation of them is challenging due to the basic characteristics of the service. The development of technology also helps to outperform usage areas for information technology service enterprises, which affect the operations of production enterprises in the beginning. Today's technologies, which are gathered under the title of Industry 4.0, find application areas in both manufacturing and service enterprises with their business models. In this study, the effects of the Industry 4.0 studies on the management of service enterprises are investigated. In the case described in a smart hotel example, information on changing guest hospitality conditions and follow-up dimensions are given.

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* Ph.D., Res. Asst., Dokuz Eylul University, Faculty of Economics and Administrative Sciences, emre.bilgin@deu.edu.tr, orcid.org/0000-0001-5110-1918

INTRODUCTION

With the development of technology, almost every field is subject to change. These changes greatly affect people's daily lives, replacing old habits with new ones. In the developing world of information technology, the extent and scope of competition among businesses continues to expand with this effect. In this challenging competitive environment, the most basic tenet of the location of businesses is determined by the information age capture ratings. In this case, the establishment of a solid information and technology infrastructure is important for businesses.

Information and communication technology has become a critical tool for the development of service businesses as everywhere. Service consumers often share their experiences with the effect of progressing science, use of multimedia-enabled devices, and digital / mobile marketing campaigns. For this reason, consumers are now more experienced and have an opportunity to play an active role in comparing their experiences with others and to evaluate their preferences accordingly (Neuhofer, et al. 2014: 341). The ability to track this change in the management of service enterprises is related to a complete understanding of information technologies. Developments, under the Industry 4.0 and offering a digital business model, are housed in systematic arrangements that can be used by service businesses to create road maps as well as industrial enterprises.

This study focuses on the contribution of Industry 4.0 studies to the pursuit of technological developments in the management of service businesses. The organization of study is beginning the answer of "What is Industry 4.0? What does it involve? Where did it come from?" questions and then "How does Industry 4.0 affect service operations?" question is answered. One of the most specific features of the smart hotel example given as a case study is to show the intertwining with technology. The technological support that started with service design continues until the planning of reuniting after service consumption.

INDUSTRY 4.0

The rapidly evolving digital transformation among developed economies is now referred as "Industry 4.0" and dramatically changes existing business models. Industry 4.0 is a collective term that includes many modern automation systems, data exchanges and production technologies (Oztemel and Gursev, 2018: 6). It deals with the digital transformation experienced in technology and transforms existing business models with this transformation. This change in business models is called the Fourth Industrial Revolution. Industry 4.0 means the fourth industrial revolution, with industrial internet integration (Götz and Jankowska, 2017: 1633).

Industrial revolutions firstly start with the innovation of steam machine in 1712. It appeared with mechanical production systems using water and steam power. Second Industrial Revolution is about mass production with the use of electricity. In scientific management, as Taylor proposed, products that were divided into pieces and moved on moving bands with electricity use enabled mass production. Third Industrial Revolution is using Automation of Production Processes. After the 1970s a digital revolution began to be lived. With this digital revolution, the use of electronics and the development of IT (Information Technology) has made the production even more automated. And finally, Fourth has come. Industry 4.0 was first used as a term in the Hannover Fair, Germany in 2011 (Jeschke,et al. 2017: 9) However, the steps taken towards Autonomous Machines and Virtual Environments are based on earlier dates. The Internet of things was defined in 2000 with the widespread use of internet networks. However, this is referred as Industry 4.0 in Germany in 2011, and then followed by the Davos Summit and World Economic Forum in 2016. In many sources, the manufacturing leadership of the Far East, with its cheap labor advantage, to be managed.

Industry 4.0 can be described as the proliferation of technological developments (from artificial intelligence to renewable energy) in industries. Moreover, in this case, it brings to mind many questions waiting to be answered like "What are the defining characteristics of Industry 4.0", "When the industry 4.0 industrial revolution is completed?", "What will the future production processes look like?". Understanding the Industry 4.0 in depth will also increase the predictions for the future.

With Industry 4.0, the world is starting a new industrial revolution. The power and impact of emerging technologies is further enhanced by the ever-widening data communication and expanding information network. Undoubtedly, this new era will have the effect of changing business life, service life of products, service areas, business models, machine security and even socio-economic standards with the using of technologies. Industry 4.0 is a term that combines concepts like cyber - physical systems, internet of things (Wollschlaeger, et al. 2017:17). Pioneering technologies can be listed in the following way (Lasi, et al. 2014: 239 – 240; Zezulka,et al. 2016: 9; Hermann et al, 2016: 3929 – 3930; Lu, Y. 2017:4):

- 3D Printing
- Artificial Intelligence
- Big Data
- Biotechnology / Genetics and Agricultural Innovation
- Block chain / Bitcoin
- Desalination and Improved Waste Management
- E-Commerce
- Fintech
- Internet of Things (IoT)
- Nanotechnology
- Renewable Energy
- Robotics
- Shared Economies
- Smart Cities
- Virtual / Augmented Reality

Industrial production requirements change day by day. It's getting harder to meet customer expectations. There is an increasing demand for products that meet these expectations. This also means more competition for companies and necessity for more economical manufacturing. In order to adapt to the new conditions, investments in systems engineering, manufacturing IT and business systems are needed more than ever. In this process companies have no choice but to create new means of production that will make their lives easier. With Industry 4.0, some of the innovations that can make a difference in life are (Lom, et al. 2016:1; Dang, et al. 2018: 855; Sanin, et al. 2018:3):

- Hazard control: Ensure safety and security when transporting hazardous materials

- Smart container: To improve the quality of the packaging used in food transportation
- Predictive maintenance: Recognizing the machine through the sensor to prevent possible damage and improve productivity
- Lift maintenance: Provide economical and easy repair with remote vehicles.
- Updating devices: Update devices with priced devices, especially when those devices are strategically away.
- Smart cities: Using communication technologies and networks to manage traffic flows, water flows, air quality and security in cities

The literature studies integrated with the place of industry 4.0 have started to attract attention to the service sector. Smart work and digitalization are also in the service businesses. Every customer is different and it is the duty of businesses to offer customized service (Shamim, et al. 2017:2). Industry 4.0 and technological achievements will help in this regard.

TECHNOLOGY IN SERVICE MANAGEMENT

One of the most basic features that distinguish the information age from the industrial age is that the presence and efficiency of the service enterprises have increased in the information age. Although they have different features in terms of service operations, production of service and presentation to consumers, technological developments affect as much as production enterprises.

In the language of economy service is an asset. However, because of their intangibility, output cannot be measured physically (Oral and Yüksel, 2007: 8). Nevertheless, it can be explained as the situation where the activity of the individual is in the benefit of another individual; time, place, form, and mental benefits are directed. (Friedman, 2007: 552). In the US and other industrialized countries that make up more than 80% of economic activity, there are many examples such as transportation, retail, sales, health, education, consulting, outsourcing, entertainment, accommodation and much more when traditional service operations are considered (Spohrer and Maglio, 2008: 244). According to this view, service, also known as co-creation of value, forms the basis of all economic

exchange (Vargo and Lusch, 2004:7). The key to effective service lies in the arrangement of talents among multiple actors or stakeholders, thus creating the most value (Maglio et al., 2009: 402). The most prominent feature of contemporary service enterprises is the more intense use of technological developments.

Service systems are the creation of mutual benefit with the exchange of people, information, organization and technology. (Maglio et al., 2009: 405). The concept of value creation is related to the way in which service systems organize and utilize the capabilities of its members (Breidbach and Maglio, 2015: 3 – 5). Technological developments and innovations are challenging to redefine the roles of system components. Because technology transforms into a source of interaction on human, knowledge and organization. In service systems, the role of human relations, a key role, is based on relationships with information technologies (Maglio et al., 2015:4).

Tourism hotel business is one of the best known examples of service sector. The effects of the necessary transformation in technology on service enterprises will also have an impact on the hospitality industry. The explanations on this subject are the subject of a separate sub-title.

Use Of Technology In Tourism – Hotel Enterprises

Recent developments, seen as one of the paradoxical trends in the hospitality industry, are the applications for the substitution of technology for human contact. Until recently, hospitality has been altered by technology by removing the interaction in tourism activities based on interaction between the host and the customer. With the development of Information Technology, guests can check out many hotels on their smart phones, take a digital key and go to their rooms, they can do all this without touching anyone.

The use of robots in accommodation businesses is also a matter of concern to researchers. Rodriguez-Lizundia et al., in their study of 2015, examined how people entered into interaction with robots. When robots are created with features that will be in eye-contact like a human, it has been seen that humans have increased their willingness to interact with the robot and discover its functionality (Rodriguez-Lizundia et al. 2015:84). Ivanov, Webster and Berezina, in their study of 2017, also talked about the service automation in the tourism sector and the first use of robots in service as a service sector. In addition to self-service kiosks and mobile applications, there are many examples of them in the hotel kitchen, restaurant, meetings, congress, car rental offices, airports, travel agencies, museums etc. (Ivanov, Webster, Berezina, 2017:1-19). This is the clearest example of leaving human function in technology in hospitality enterprises. With the development of robot technology, guests' suitcases can be carried by robot pageboys, and again, orders given by mobile devices can be prepared and presented by robot waiters. And guests do not have to tip for all that.

Cheung, et. Al in their study of 2017) stated that the use of robot and avatar robot for disabled people will facilitate daily life and facilitate travel in tourism (Cheung, et. al, 2017: 229). Nieto et al. stated that social robots would facilitate communication between tourism enterprises, tourists and intermediaries, and expressed that they would solve foreign language problem (Nieto, et. al., 2014: 21-22).

In addition to the hardware technology, to mention briefly the new trends shaping the travel and tourism processes, the guests share the hotel pool, the photos and videos about the sea through social media accounts, they give the scores to hotels and restaurants, and they write travel memories the blogs. In study of Bowen and Whalen (2017) about tourism; these trends are; technology, big data, social media and online communities, and a shared economy. While big data, social media, online communities, and shared economy are treated as separate areas, these trends converge under its roof, as advances in technology have emerged as a result. Dubey (2016) mentioned about the effects of new technologies on tourism and stated that digital technologies, web-based applications such as social media, internet and cloud technologies have changed the preferences and experiences of tourists (Dubey, 2017:65-69).

Smart tourism is also other side of researches about this subject. Gretzel et. al. (2015) defined smart tourism, shed light on current smart tourism trends, and then demonstrate their technological and commercial fundamentals. Their research continues about the expectations and disadvantages of smart tourism. Soava (2015: 101-116)

mentioned about the applications of digital generation in tourism and electronic tourism, in addition., from smart tourism applications, virtual reality, 3D printers, e-agency definition, digital smart travel friend, semantic tourism travel search and planning. mentions artificial intelligence-assisted virtual applications that allow you to experiment with smart watches and holographic images before taking the tour package. When businesses are assessed to be able to reach satisfied customers, which are the main output of service businesses, it seems that business boundaries do not exist. Just as smart hotel application in this regard will be transferred with the facilities offered to the guests of Case Study Smart Hotel.

SMART HOTEL CASE

The company, overviewed in the application of smart hotel management, is the six-star hotel project of international hotel chain in Turkey. With its magnificent bay, the hotel gives the impression that it is a deluxe hotel from the outside, besides the facilities that it actually offers are based on much more technological. In order to offer unique guest experiences, an operator who wants to work on an infrastructure needs information about the guests who are traveling around the hotel, such as which areas they spend time in, where they wait, and what intervals they have. Some questions about hotel management are:

- How many guests use the tennis courts as a sport activity? Are they popular then fitness center?
- How many guests use the spa for sauna? Do they prefer the massage rooms? Which days they are crowded than other days?
- How much time did guests spend their time at the restaurant? How many guests spent over an hour at the lobby bar last Tuesday?
- How many guests want to rent a car from hotel? Are they using hotel transformation vehicles?

To answer these types of question a network project has applied to the company shown in the Figure 1. In this project basically three topics are discussed; Guest Insight – Engagement – Actionable Results. These are explained as;

Figure 1. Smart Hotel Project

Guest Insight: Facebook Login via system Wi-Fi provides information on the demographic features and appreciation of the guests. Location-based data is used and analyzed by the project to gather information for guests' tastes and preferences. It is used to determine the changing trends in the preferences of the guests over time and to provide more efficient management by directing the personnel to the busy areas. While comparing metrics network tagging is maintained inside the hotel,

Engagement: A secure connection is established with Facebook login via system Wi-Fi provides and mobile offers are developed on time via this system where guests can share their experiences simultaneously. Guest experience is monitored using the system Wi-Fi with Facebook. "Like" and check-in operations seamlessly by encouraging increased brand awareness. Integration with third-party applications to ensure location awareness.

Actionable Results: Data-based decisions are made to increase guest loyalty and attract new customers. Analysis data is used to increase the most effective connection traffic in the location. Repeated visits are provided to ensure guest loyalty, to better serve the level of service and to increase revenues. New customers are created through relevant, event-based interaction.

The artificial intelligence main system has been developed for the establishment of a system infrastructure that accommodates the features desired by the operator. Other intelligent systems that are required to carry out hotel activities match this main system.

Hotel Information Management Systems; from the reception to the camera systems, from wireless access points to room TV systems, from energy management systems to workstations, as much work as every guest can associate with mobile phones has an artificial intelligence main system. Equipment that the hotel has and that is shared with guests; "In-Wall Touch Screens", "Desktop Touch Screens", "Management Units" and "Wireless Switches" and access to mobile device applications is provided.

On the mentioned touch screens, color, logo change can be provided in accordance with the guest's personal taste. In addition, these screens provide different language options and ease of use in current areas. With the help of these screens, guests can access social media accounts. Mobile devices can be reflected on these screens again.

Artificial Intelligence Main System and Sub-Systems;

- Searching and analyzing customer's social accounts, sharing of appropriate campaigns and events with customers
- Gathering the location and information on the landmarks and Wireless Access Points to share location-appropriate activities and campaigns
- Access to social activity areas according to the services received through the face recognition system
- Retention of order and payment system information
- Conditioning digital TV broadcasts - Creation of demand orders according to customer needs
- Improvement of energy efficiency in unused areas according to customer density
- Preparation of pre-orders according to the requirements of the procurement process by keeping the stocks of the hotels
- Campaign for instant old customers by analyzing according to hotel density and future density.

These main systems and sub systems are listed in details below:

- **Reception**
- ✓ Retrieving customer records
- ✓ Installing Mobile App
- ✓ Transferring data to the data center

- **Mobile Phone**
- ✓ Ordering on Mobile App
- ✓ Receiving payment via Mobile App
- ✓ Receiving location information via Mobile App
- ✓ Presenting location related campaign contents via Mobile App
- ✓ Providing video link to customer services via Mobile App
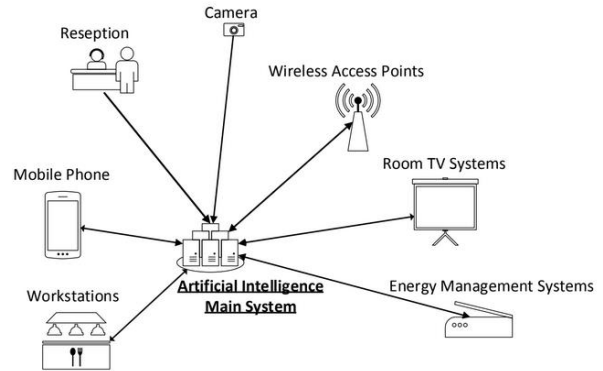- ✓ Sharing social content

Figure 2. Artificial Intelligence Main System and Sub-Systems

- **Workstations**
- ✓ Customer orders coming from mobile apps fall on the screen
- ✓ Hotel management's daily business plans for staff falling on the screens
- ✓ Staff performance values reflected on the screens
- ✓ Room TV Systems
- ✓ To meet with the customer's name on the TV screens
- ✓ Turn the TV's blood according to the customer's nationality
- ✓ Create the movie packages according to the age group
- ✓ Create the demand on the TV screen (Kitchen, Cleaning, etc.)
- **Camera**
- ✓ Making face records of the guests and transferring them to the data center
- ✓ Control of customers from face recognition system, creation of location information and measurement of satisfaction levels
- ✓ Detection of non-customers and transfer of location information to security units

- ✓ Opening of room doors with facial recognition system
- **Wireless Access Points**
- ✓ Providing access to the Internet through Mobile App
- ✓ Creating location information for guests
- **Room TV Systems**
- ✓ TV in the room to meet with the customer's name
- ✓ TV screen on demand (kitchen, cleaning, etc.)
- **Energy Management Systems**
- ✓ Energy Management Systems
- ✓ Conducting central energy management
- ✓ Management of lighting systems
- ✓ Management of Air Conditioning Systems
- ✓ Management of cleaning systems

When check in is done, "Full" room status is active. The full room condition allows the room temperature to be set to an ideal level when guests go to the rooms. When the guests open the room door, the "Welcome" scenario takes over. So, opening lights and curtains, begin playing music and a personalized welcome screen is shown on the TV.

With the use of a personalized screen reflected on the television and the provision of a mobile connection, having a phone that acts as a remote control for many areas; guests can program a "Good Morning" scenario that opens them gently, instead of an alarm or telephone voice. Examples such as personalized experience in Hotel support to offer unique and luxurious accommodation. Control over TV with mobile phone, room service is ordered and invoiced automatically and besides all these features, the system infrastructure is energy friendly. The sensors sense the presence of guests and turn on and off the lights and adjust the thermostats to prevent energy consumption. In addition, the one-touch "Green" button provides easy access to the guest's eco-friendly program.

CONCLUSION

The smart hotel project is a multi-faceted project with many operations in connection with the content of Industry 4.0. The output of the project with technological orientations can be summarized in four themes. The first one is attractive. The number of guests and passengers who spend time at a particular location can be monitored simultaneously and can determine the busiest hours

of work and determine how guests can be redirected to the hotel. The second theme is the engagement. The length of time that guests spend in a particular place and the length of the guest stay to maximize guest services and sales. The third is loyalty. It is essential that the number of guests is repeated for the first time. Improve the customer experience for repeating guests through targeted offers. And the last one is Versatility. As the location analysis is compared at multiple network locations, identify variations in guest behavior at different sites. All these metrics provide central visibility and control over all networks from a single web-based clipboard.

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