Research Paper

A conceptual framework of the service delivery system design for hospitality firms in the (post-)viral world: The role of service robots

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ARTICLE INFO	ABSTRACT
	This study aims to develop a conceptual framework of the service delivery system design for hospitality firms in the (post-)viral world. Several theoretical approaches such as resource-based view, value chain analysis, stakeholder theory, PESTEL analysis, positioning strategy, and service delivery system design were adopted. The paper identified three service delivery system designs (robotic, human-based, and mixed) and analyses their requirements, advantages, disadvantages, and potential target markets. According to the suggested model, hospitality firms need first to explore the expectations of tourists. Then comes the analysis phase (based on a holistic perspective, and consisting of RBV, Value chain, Stakeholder, and PESTEL analyses), which helps hospitality firms to identify how they should differentiate and position themselves in the market. Following, companies decide on what kind of service delivery system they should offer to their target customers, and position themselves in the market according to the chosen system.

1. Introduction

1.1. Rationale

COVID-19 is a major disruptor of the tourism and hospitality industries (Gössling et al., 2020). The fear of the virus forced governments to undertake various actions to slow its spread. Borders were closed, airplanes were grounded, hotels, restaurants, conference and convention venues, and other hospitality companies had to close their premises, compulsory quarantine measures were imposed on populations, physical distancing was introduced as a recommended social behaviour of people (Nicola et al., 2020). As a result of tourists' fear of the virus and governments' actions to curb it tourism demand plummeted (Dube et al., 2020) and many companies had to fire their employees due to the lack of financial resources to pay salaries (Hanson, 2020), while others went into default.

At the same time, the COVID-19 pandemic creates many opportunities for hospitality companies to innovate to survive and remain competitive on the market. Hotels, restaurants, venues, museums, airports, airlines, cruise lines have to rewrite their health and safety protocols to decrease the probability of spreading the virus. Masks, transparent anti-virus helmets, and rubber gloves may become standard equipment for hospitality employees with direct contact with customers (Sigala, 2020). Some hotels have adopted robots for the disinfection of rooms with ultraviolet light (Rosen, 2020). After resuming operations, hotels, restaurants, and venues had to work with decreased capacity to assure physical distancing among customers. Therefore, while the core service of hospitality companies does not change, the *way* the service is delivered to the tourists is changing. Due to the pandemic, hospitality companies' service delivery systems may undergo a major transformation to incorporate physical distancing as an integral part of the hospitality service.

Prior research has already recognised the strategic role of information and communication technologies (Buhalis, 1998; Benckendorff et al., 2019; Neuhofer et al., 2014), including automation (Ivanov and Webster, 2019a; Tussyadiah, 2020), for hospitality companies' marketing communications, distribution strategies, supply chain management, experiences design, creating and sustaining competitive advantage, etc. However, the current COVID-19 pandemic may assign additional roles to technologies, especially robots, in the strategic management of hospitality companies (Gretzel et al., 2020; Ivanov et al., 2020; Sigala, 2020). The pandemic forced health authorities to impose physical distancing as a way to slow down the spread of the virus (Li et al., 2020a, b) because the virus spreads easier than previous

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pandemics due to its less distinguishable symptoms and longer incubation period (Chinazzi et al., 2020). The pandemic is changing the behaviour of tourists – they become more sensitive towards the health and safety standards of firms and destinations (Wen et al., 2020). Therefore, hospitality firms need to develop the right service delivery system design which meets both the customers' expectations and fits the firm's resources and capabilities. This would make it easier for hospitality firms to position and differentiate themselves in the market and target their potential customers. In this respect, robots may be a beneficial tool to ensure a high level of physical distance during and after the pandemic (Seyitoğlu and Ivanov, 2020). When people do not have physical closeness and keep distance, the risk of being infected decreases, hence through robots, hospitality companies may provide a service that is safe to the health of both tourists and employees. Additionally, in the (post-)viral era, the use of service robots may be widespread as people would be more concerned about their safety and security when receiving services from hospitality firms (Zeng et al., 2020). Therefore, service robots may gain a strategic significance for the service delivery systems of hospitality firms.

1.2. Aim

In light of the above discussion, this paper aims to develop a conceptual framework of the service delivery system design for hospitality firms in the (post-)viral world. Specifically, it aims to: *a)* identify and analyse the physically distant service delivery designs in hospitality firms in the (post-)viral world; *b)* analyse the role of customer expectations, company's resources, activities, stakeholders, positioning strategy, and external macroenvironment in the service delivery system design; *c)* develop a strategic model of service delivery system design in hospitality firms in the (post-)viral world; and *d)* elaborate on the role of robots in service delivery system in hospitality firms in the (post-)viral world.

To achieve the aim, the rest of the paper is organised as follows. The next section provides a focused literature review on the strategic management frameworks (resource-based view, value chain, stakeholder theory, PESTEL), differentiation as a positioning strategy, service delivery system design, and service robots in hospitality. Section 3 develops and elaborates on the conceptual framework of the service delivery system design in hospitality firms in the (post-)viral world: Section 4 discusses the theoretical, managerial and policy implications, paper's contribution and limitations, outlines directions for future research, and concludes the paper.

2. Literature review

2.1. Strategic management frameworks

2.1.1. Resource-based view

The resource-based view (RBV) looks at the firm as a *bundle of resources* that are the source of its sustainable competitive advantage (Barney, 1991; Grant, 1991). Resources can be physical (e.g. buildings, equipment), financial, human, and intangible (e.g. trademarks, image) (Ivanova and Ivanov, 2015). They need to be valuable, rare, inimitable, and non-substitutable to provide a competitive advantage for the firm (Barney and Arikan, 2001). While physical and financial resources are easy to copy by competitors, human and intangible resources are more difficult to imitate and, hence, can serve as a stronger source of competitive advantage. The resources are *static* and they are made *dynamic* by the organisational capabilities, knowledge, and learning in order to create value for the consumers (Ivanova and Ivanov, 2015). The tacit knowledge (i.e. organisational routines, the experience and unwritten knowledge of employees) and codified knowledge (i.e. written service operations manuals) help the company utilise its resources (Brown et al., 2003). The RBV has been adopted and discussed in numerous studies (Barney, 2001; Barney et al., 2001; Evans, 2016; Lee

and King, 2006; Wernerfelt, 1995), including in the hospitality (Alonso et al., 2018; Evans, 2016; Lee and King, 2006; Massukado-Nakatani and Teixeira, 2009; Peters et al., 2011).

2.1.2. Value chain framework

The value chain framework looks at a company as a *bundle of activities*. A company's competitive advantage stems from how well (effectively and efficiently) it performs its primary and support activities (Porter, 1985). The primary activities relate directly to the production of the product (inbound logistics, operations, distribution, marketing and sales, and after-sale service), while the support activities (firm infrastructure, human resource management, technological development, and procurement) are more transversal and facilitate the primary activities. The value chain framework is complementing the RBV theory because it shows a different source of competitive advantage (a company's activities that mobilise the resources). In recent years, the concept of 'value chain' has been extended to largely overlap with the concept of 'supply chain' (Hjalager et al., 2016; Mitchell, 2012; Thomas-Francois et al., 2017). However, in this paper, we shall use the value chain framework in its original definition by Porter, applied for analysis of a company's activities, not for analysis of the whole supply chain in hospitality.

2.1.3. Stakeholders theory

The stakeholder theory (Freeman, 2004, 2010) looks at the firm as a *bundle of relationships*. The stakeholder approach suggests that a firm or an enterprise cannot survive without the involvement of stakeholders (Li et al., 2020a, b); thus, the interests of stakeholders need to be identified and understood (Nguyen et al., 2019). The competitive advantage of a firm is based on the network of relationships a firm has with various internal and external stakeholders (customers, employees, managers, suppliers, distributors, local community, public authorities, financial institutions, media, etc), who often have conflicting goals. The firm is perceived not only as a profit-maximising entity but as a socially engaged entity that considers the interest of its stakeholders (Jurgens et al., 2010). Therefore, the evaluation of stakeholder perspectives can be beneficial for tourism planning (Yang et al., 2009).

2.1.4. PESTEL analysis

PESTEL is a widely used framework for the analysis of the external environment of a company. It focuses on the developments in the political, economic, social-demographic, technological, ecological, and legal factors that shape the macroenvironmental context in which a company operates (Morrison, 2018). These factors provide opportunities that managers can utilise or create threats for which they must be prepared to face.

Within hospitality, the above four strategic management frameworks (RBV, value chain framework, stakeholder theory, and the PESTEL analysis) were adopted by Ivanova and Ivanov (2015) who developed an integrative framework of hotel chains. The authors showed that these strategic management frameworks can be successfully combined to provide a holistic perspective of hospitality companies.

2.2. Positioning strategy: differentiation

Positioning is one of the most important elements of strategic management that is providing long term advantages for firms to be successful in the market (Rodríguez-Molina et al., 2019). It is defined as "performing different activities from rivals' or performing similar activities in different ways" (Porter, 1996: 62). The positioning strategy is based on determining the competitors and offering a unique feature(s) to attract potential customers. In this respect, uniqueness is a significant component of positioning strategy (Rodríguez-Molina et al., 2019). As a basic element of positioning approach, differentiation relates to the development of products and services containing unique attributes that provide better value for customers compared to rivals' (Porter, 1985;

Banker et al., 2014). The main aim of product or service differentiation is to build up a position that is seen as unique and creates a sense of value for potential customers (Shoemaker et al., 2007). While a firm adopting a differentiation strategy expects customers to pay higher prices for differentiated features of a product, customers want to experience a service or product that meets their expectations (Porter, 1980). For a successful differentiation strategy, research and development (R&D) and advertising are considered as basic requirements (Porter, 1980; Barney and Hesterley, 2006) because while promotion contributes to the firm's value, R&D leads to innovation and uniqueness (Gao and Hafsi, 2019).

The positioning strategy has been applied by various studies in hospitality and tourism in terms of competitiveness, image and branding (Crompton et al., 1992; Botha et al., 1999; Kozak and Rimmington, 1999; Andreu et al., 2000; Uysal et al., 2000; Gallarza et al., 2002; Chen and Uysal, 2002; Claveria and Poluzzi, 2017; Evren and Kozak, 2018; Rodríguez-Molina et al., 2019). Since there is a harsh competition among hospitality firms and destinations, positioning has become a significant part of their marketing strategies (Rojas-Mendez and Hine, 2017). For an effective positioning strategy, the differentiated features which distinguish one destination or hospitality firm from others would need to be important and attractive product attributes (Crompton et al., 1992) that bring value to the customers such as overall customer experience, hotel location, a unique service delivery system (e.g. the use of service robots), décor, hotel/restaurant theme/design, or else. Botha et al. (1999) point out that instead of developing marketing plans based on managers' beliefs, it would be more beneficial to identify the key product attributes for customers and strengthen them; hence, a firm must consider customer expectations first. However, these differentiated attributes need to be promoted in proper ways to gain successful positioning in the market (Rodríguez-Molina et al., 2019).

2.3. Service delivery system design

The service delivery system is one of the components of the service strategy triad in addition to the target market and the service concept (Roth and Menor, 2003). It shows *how* the company delivers its value proposition to its target customers (Hazée et al., 2020; Ponsignon et al., 2011). Roth and Menor (2003) posit that the architecture of a service delivery system consists of three strategic design choices: structural, infrastructural, and integration. The structural choices relate to the physical components of the system (facilities and their layout, the used technologies and equipment, capacity management), and the service process interfaces (e.g. front-of-house face-to-face or technology-mediated interactions, or back-of-house operations) that define the touchpoints in the customer journey (Lemon and Verhoef, 2016). The infrastructural choices refer to the role of human resources in the service delivery system and include people, policies, practices, processes, and performance systems. The integration choices relate to the external integration of the service delivery system of the company with the suppliers and the customers, the internal integration between structural and infrastructural choices and of the functional areas within the company, and the adaptive mechanisms such as intellectual capital, system knowledge, and learning (Roth and Menor, 2003: 151-153). The design of a service delivery system will influence upon a company's servicescape (Bitner, 1992) by providing the physical space in which the service takes place (structural choices), by defining the service processes and internal procedure (infrastructural choices) and the system knowledge and learning (integration choices) that guide employees' behaviour. In that sense, the service delivery system needs to be an integral part of the experience design process (Fesenmaier and Xiang, 2017; Oh et al., 2007; Pine and Gilmore, 2011) to deliver value to the customers (Patrício et al., 2011). Furthermore, the proper design of a service delivery system contributes to the environmental and social sustainability of a company's operations without hurting its economic performance (Jaaron and Backhouse, 2019).

From an operations management perspective, the use of technology in the design of service delivery system in hospitality influences many of the characteristics of the system – its service interface, capacity, flexibility, costs, the role of the customer, degree of customer contact. Most importantly, the use of technology allows hospitality companies to transform their face-to-face front-of-house operations into a technology-mediated interface. The use of automation technologies (e.g. chatbots, robots, kiosks, etc.) moves the transformation even further by automating the interactions between the company and the tourists in technology-delivered services (Ivanov & Webster, 2019). This allows hospitality companies to create novel experiences for tourists (Neuhofer et al., 2014), but on the other hand, the use of technology decreases the degree of contact between tourists and employees in the service delivery system. Additionally, customers' participation in the service delivery leads to co-creation of value (Cabiddu et al., 2013; Tregua et al., 2020) and the use of technology further increases that role of customers and transforms them into prosumers (Ivanov, 2019). Furthermore, technology increases the capacity and productivity of hospitality companies and allows them to serve more tourists with the same number of human employees, thus decreasing the costs to serve customers (Ivanov and Webster, 2018). However, technology may decrease the flexibility of the service delivery system thus creating potential service failure problems and frustrations for both tourists and employees (Dabholkar and Spaid, 2012).

2.4. Service robots in hospitality

Companies from various service industries (Belanche et al., 2020; Wirtz et al., 2018; Xiao and Kumar, 2019), including hospitality (Ivanov and Webster, 2019a; Ivanov et al., 2019; Murphy et al., 2017; Tuomi et al., 2020; Tussyadiah, 2020), have started to use robots to cut costs, create experiences, differentiate from competitors, gain and sustain a competitive advantage, improve quality, etc. (Chan and Tung, 2019; Ivanov and Webster, 2018; Naumov, 2019; Tung and Au, 2018; Tung and Law, 2017). Hospitality firms use robots for the provision of information, preparing and serving food and drinks, entertaining guests, moving items, etc. (Ivanov et al., 2017). For instance, there is a growing investment in restaurant robotics in the UK (Dobberstein, 2019). In Japan, several hotels have decided to benefit from robots instead of human staff for the frontline services (Tuomi et al., 2020). Besides, the service robots may learn from previous interactions with guests and employees to optimise their future actions and behaviours (Belanche et al., 2020; Rosete et al., 2020). For example, considering the hospitality industry, a service robot that serves customers in a hotel should not only constantly analyse and react to its environment to avoid deficiencies but it should also be aware of the presence and emotions of customers and employees. In this aspect, a fully functional anthropomorphic robot can determine emotions and have an interactive relation with humans (Chi et al., 2020).

Customers generally have positive attitudes towards robots in a tourism and hospitality context (Ivanov et al., 2018), trust them (Park, 2020), accept to use them (de Kervenoael et al., 2020; Lin et al., 2019; Lu et al., 2019), but prefer to pay less for robot-delivered hospitality services compared to human-delivered services (Webster and Ivanov, 2020). However, the intentions to use depend on whether tourists perceive specific tasks as suitable for robotisation or not (Ivanov and Webster, 2019b).

From an operation perspective, robots can be used for simple, dirty, dull, dangerous, repetitive, routine tasks, not for complex services such as serving VIP guests and handling complaints (Lee et al., 2020). The literature shows that robots are beneficial in terms of increasing efficiency and reducing labour costs (Rodriguez-Lizundia et al., 2015). Moreover, as the cost of using robotics decreased, firms may want to benefit from the use of robotics to gain a competitive advantage in the market (Bowen and Morosan, 2018). However, in hospitality service robots may not replace human employees to provide guest satisfaction

(Choi et al., 2019) because customers may expect to meet human workers for personalised and hospitable service (e.g., eye contact, warm welcomes, the sincerity of heart, comfort, and authentic smiles) (Ariffin and Maghzi, 2012). In this respect, some restaurants and hotels have removed the robots from their services not only due to service failures and technical difficulties (Drexler and Lapré, 2019), but also due to the very nature of hospitality and tourism industry as well, which is based on the interpersonal interactions between customers and service providers (Lu et al., 2019).

The current COVID-19 pandemic created a new reality for hospitality companies. They need to focus more on health safety of tourists and employees, and on physical distancing which robots could successfully provide (Seyitoğlu and Ivanov, 2020). Furthermore, the pandemic depleted the financial resources of hospitality companies, forcing their managers to look for ways to cut costs. While the inevitable short-term decision of many hospitality firms was to fire employees as a way to cut costs and remain liquid, in the long-term the COVID-19 pandemic may

serve as a driver of automation and robotisation because, from an accounting and finance perspective, the robots allow companies to decrease their fixed labour costs and the cash outflows (Ivanov et al., 2020). Therefore, the adoption of service robots is expected to increase due to the pandemic (Zeng et al., 2020), leading to transformations in the service delivery systems of hospitality companies.

3. A strategic model of service delivery system design for the hospitality industry in the (post)viral world

3.1. Conceptual framework

Fig. 1 presents the conceptual framework of the service delivery system design in the hospitality industry for the (post-)viral world. Companies need first to explore and learn the expectations of tourists (the demand). Then comes the analysis phase (based on a holistic perspective, and consisting of RBV, Value chain, Stakeholder, and
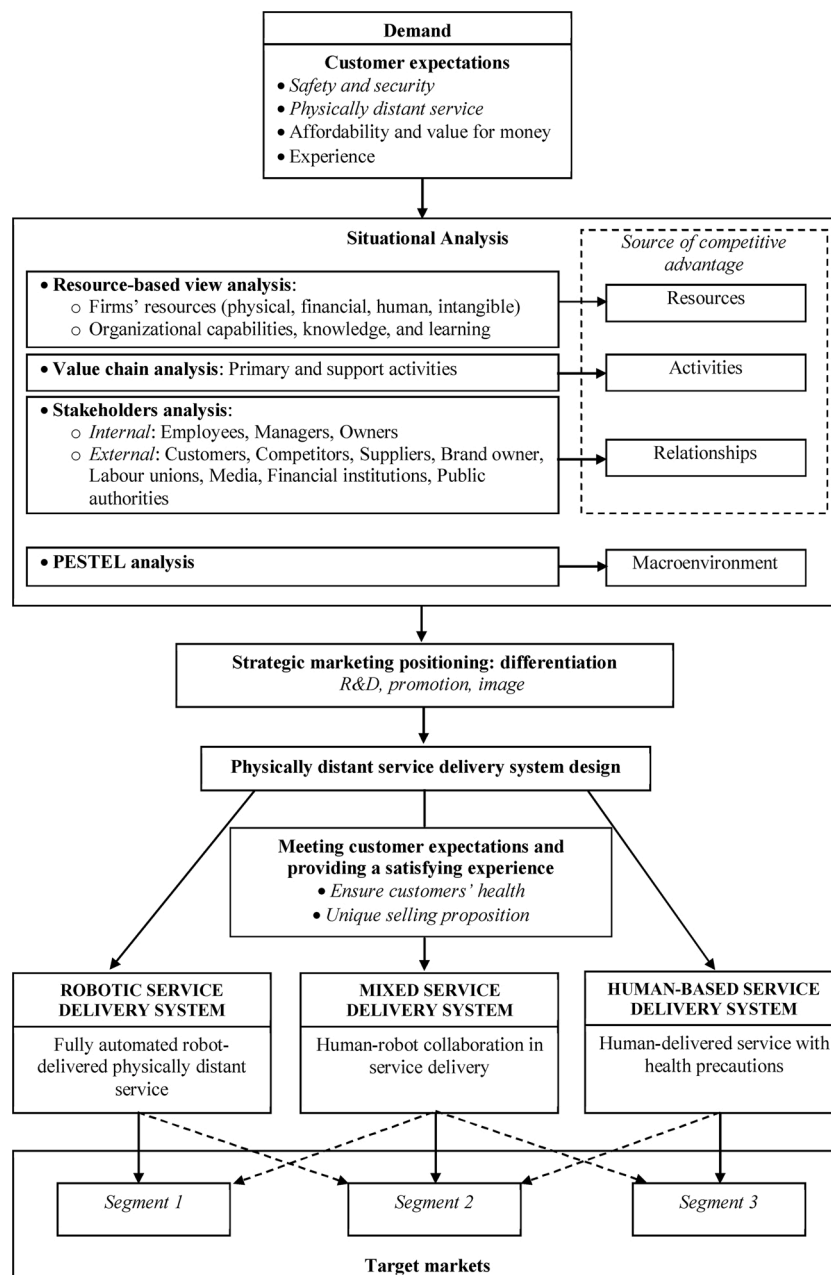

Fig. 1. Conceptual framework of the service delivery system design for hospitality firms in the (post-)viral world.

PESTEL analyses), which helps hospitality firms to identify their *current* resources, activities, and relationships, and what *new* resources, activities and relationships they need for an effective and efficient service delivery system. Further, the analysis delves into the macro-environmental factors that shape company's external environment. The analysis phase informs companies how they should differentiate and position themselves in the market. Following, companies decide on what kind of service delivery system they should offer to their target customers (robotic service, mixed service, or human-based service), and position themselves in the market according to the chosen system. Whichever service delivery system is chosen, hospitality firms must consider and meet the expectations of their target markets.

3.2. Demand: customer expectation

Understanding the customer perspective is essential for the success of a positioning strategy (Blankson and Kalafatis, 2004). When a positioning strategy is based on customer perceptions, firms are likely to be successful and could sustain their effectiveness for a longer time (Saqib, 2019). Brooksbank (1994) stated that if positioning strategies only focus on organisations' perspective they may not be successful as it does not consider the customers' perspective. In this respect, considering the demand side first is compulsory for hospitality firms to understand and meet customers' expectations to succeed in the market.

Recently, health and safety issues have taken more attention because of the COVID-19 virus. Since the virus rapidly infects people and an effective way to prevent from the virus is the physical distance (Li et al., 2020a, b), customers are likely to put greater emphasis on safety and security in the (post-)viral world (Wen et al., 2020). Thus, hospitality firms should first ensure customers' health by providing a physically distant service. We define a physically distant service is a service in which the physical contact between the service provider and the customer is eliminated. The actual service may be provided by a robot, chatbot, kiosk, or another automation technology, or by a human employee with the necessary sanitary precautions (e.g. wearing a mask, gloves, or even helmet). As a second, affordable price and value for money are significant issues that customers expect from hospitality service suppliers (Seyitoğlu, 2020; Brochado et al., 2015). Affordable price may not be the only element to satisfy the customers; they also expect value for their money which is a key factor affecting positive word-of-mouth (Seyitoğlu et al., 2020).

Customers' expectations about their experience with the hospitality service (Chen and Chen, 2010; Sugathan and Ranjan, 2019) is another significant issue that must be considered by hospitality companies when designing their service delivery system (e.g. whether they would like to be served by robots, by human employees, or both). Hospitality experience can be affected by various factors that are mostly based on the attitude and behaviour of service staff such as being patient, welcoming guests, kindness, genuineness, creating a comfortable atmosphere (Brotherton and Wood, 2008; Solnet et al., 2019). All these human-based elements are related to hospitableness (Tasci and Semrad, 2016). However, hospitality experience may be influenced by other factors such as the hospitality facilities, the technology, service procedures, etc. Considering the technological progress, service robots have the potential to enrich the hospitality experience (Van Doorn et al., 2017). For instance, the results of a recent study show that robots' perceived intelligence and anthropomorphism positively affect the hospitality experience (Qiu et al., 2020). On one hand, the adoption of technology may contribute to the efficiency of service processes, but on the other hand, there is still a need to meet the expectations of customers in terms of hospitableness (Solnet et al., 2019). Thus, regardless whether a hospitality firm decides to deliver its services by robots, by human employees or both, it should provide a satisfying and memorable customer experience (Le et al., 2019) that would create positive post-purchase behaviour (Seyitoğlu, 2020).

3.3. Situational analysis

After understanding customer expectations, hospitality firms need to analyse their situation to better position themselves in the market in terms of providing the right service to the right customers. Managers need to analyse their external macroenvironment (PESTEL analysis), the resources (physical, financial, human, intangible) and organisational capabilities, knowledge, and learning in their companies (RBV analysis), evaluate the effectiveness and efficiency of their primary and support activities (Value chain analysis), and identify the key stakeholders (Stakeholders analysis). Each of the four strategic frameworks provides a partial and one-sided perspective of the company. While, the RBV looks at *what* companies *have* or *have access to* (resources), and the value chain framework – what companies *do* and *how* they do it, the stakeholder theory focuses on *whom* the companies *work with*. This means, that even if companies do not have valuable, rare, inimitable, and non-substitutable resources (RBV), or do not use them effectively and efficiently in their primary and support activities (value chain framework), the company will be able to survive due to the strong relationships it has with various stakeholders (Ivanova and Ivanov, 2015). Moreover, PESTEL analysis would help to analyse the related issues of the external macroenvironment of a company. Since each framework has a different perspective and use, the strategic analysis needs to incorporate them all to combine a more holistic perspective of a company's strategic position in terms of resources, activities, and relationships with stakeholders within a specific macroenvironment.

The above-mentioned approaches would be beneficial for hospitality firms to decide what kind of service delivery system is suitable to meet the expectations of potential customers, whether they have the resources to provide such a system (RBV), how they need to reorganise the activities in the company to address the expectations of the tourists (Value chain framework), which stakeholders they need to involve in the process and how the service delivery system design would affect them (Stakeholders analysis). All these frameworks together would enable firms to analyse their situation and thus firms would be certain about how to provide safe and secure physically distant service system to their customers in the (post-)viral world. For example, a decision to design a service delivery system based on service robots would need to assure that robots guarantee the life and health of tourists and employees, that the company has the financial resources to buy/lease service robots and provides training to human employees how to effectively and efficiently use the robots (RBV), that firm's facilities are robot-friendly and allow the robots to fulfil their tasks (Ivanov and Webster, 2017) (structural choices), that the front-of-house and back-of-house processes are well organised (value chain framework; infrastructural choices), that the company has a contract with robot manufacturers/suppliers for maintaining the robots (stakeholder analysis; integration choice), and that the legal health and safety regulations are met (PESTEL analysis). Hospitality firms may choose one of the suggested designs according to their situational analysis.

3.4. Strategic marketing positioning: differentiation

Service delivery systems in the (post-)viral world must ensure customers' health and safety and to show that firms can deliver their value proposition to their target customers. As tourists would be more concerned about their health and safety in the (post-)viral world (Jiang and Wen, 2020), companies need to provide a physically distant service as an efficient way of keeping customers safe. In the (post-)viral world, providing a service delivery system based on physical distancing may be helpful to create a unique selling proposition, and generate a positive company image that would help to attract the attention of target customers. At the same time, hospitality companies need to provide a valuable and satisfying experience to tourists too. Therefore, their unique selling proposition has to be more elaborate and go beyond customers' health safety, but consider their experience as well. For any

service delivery system in the suggested framework, there is a need of R&D, promotion, branding, and creation of an image, that help hospitality firms to position themselves with their unique services, differentiate from their competitors and persuade customers to buy their services (Miller and Henthorne, 2007; Niu and Wang, 2016; Tarman et al., 2019).

3.5. Physically distant service delivery system design in the (post-)viral world

The conceptual framework (Fig. 1) shows three different physically distant service delivery systems. A robotic service delivery system provides a fully automated robot-delivered physically distant service, a 'mixed' service delivery system is based on human-robot collaboration in service delivery, while a human-based system provides human-delivered service with health precautions. Table 1 elaborates on the requirements, advantages, disadvantages, and the target market segments of each system.

3.5.1. Robotic service delivery system

A firm applying a robotic service delivery system in the market will provide a fully automated robot-delivered physically distant service to its customers. Such robotic service delivery system has been already introduced by Henn na hotels in Japan. This system requires implementing service robots for all front-of-house operations (e.g. information provision, room service delivery, robotic waiters/hosts/bartenders/baristas, etc.) and some back-of-house operations (e.g. cleaning, disinfection, cooking, storage) that can be a safety bridge between service employees and tourists as there will be no human touch and people must be physically distant from each other (Seyitoğlu and Ivanov, 2020). Thus, a robotic service delivery system can prevent customers from infections and keep them safe. The service robots require maintenance (in-house or outsourced) and need to be disinfected after serving each guest. The robots can be complemented by other technological solutions such as chatbots or self-service kiosks for some tasks (e.g. check-in/out) for which using a robot is not economically feasible (Ivanov and Webster, 2019a). Of course, the introduction of service robots in a hospitality company requires adaptation of employees and customers, because both sides (employees and customers) need to learn how to the use of robots and get accustomed to being in a high-tech service environment. In this aspect, while some training of employees will make their adaptation easier, customers should also be informed about the details of service technology tools that the firm uses. The advantages of robotic service delivery system in the (post-)viral world relate to the lack of physical human contact, low risk of virus transmission, but creating novel and enjoyable experience without worrying about being infected as well. On the other hand, a robotic service delivery system is less flexible than a human-based service delivery system. Customers might be frustrated by the lack of human employees in the service process and the lack of social interaction with them, which may force hospitality companies to decrease the use of robots. For example, in January 2019 Henn na hotel in Nagasaki, Japan, announced that it stopped using half of its robots because they caused problems to guests and created more work for the employees (Shead, 2019). The target market segment for a robotic service delivery system is likely to be tourists with high security and health concerns, and those highly motivated towards robotic/advanced technology.

3.5.2. Human-based service delivery system

On the other extreme, hospitality firms may choose to design a service delivery system based on human-delivered service with health precautions. This system is convenient for the target market segments such as tourists with lower or moderate security and health concerns, tourists seeking social interaction, and tourists relying on human employees. A human-based service delivery system is relying on human employees in all aspects of front-of-house operations, but (some of)

Table 1

Physically Distant Service Delivery System Designs in the (Post-)Viral World.

	Service Delivery System Designs		
	Robotic Service Delivery System	*Mixed Service Delivery System*	*Human-based Service Delivery System*
Based on	Fully automated robot-delivered physically distant service	Human-robot collaboration in service delivery	Human-delivered service with health precautions
Requirements	• implementing service robots for all front-of-house operations • robot maintenance (in-house or outsourced) • disinfection of the robot after serving each guest • adaptation of employees • adaptation of customers	• implementing service robots for some front-of-house operations • robot maintenance (in-house or outsourced) • disinfection of the robot after serving each guest • personal care and attention (wearing masks, not being close to customers, using disposable materials, disinfectant use, distance sitting design etc.) for some tasks which require social skills and emotional intelligence • adaptation of employees • adaptation of customers	• relying on human employees in all aspects of front-of-house operations • back-of-house operations may be automated • highly sensitive health precautions (wearing masks, not being close to customers, using disposable materials, disinfectant use, distance sitting design etc.) by firm and employees • adaptation of employees • adaptation of customers
Advantages	• no human touch • low risk of virus transmission • enjoyable experience without worrying about being infected • novel experience	• no human touch for some tasks • social interaction with human employees • novel experience	• social interaction with human employees
Disadvantages	• inflexible service delivery system • customers might be frustrated by the lack of human employees • no social interaction with human employees	• medium risk level of transmission of the virus • enjoying the experience to some degree due to worrying of being infected by the human staff	• higher risk level of transmission of the virus • human touch for all tasks • not enjoying the experience due to worrying of being infected by the human staff
Target Tourist Segments	• Tourists with high security and health concerns • Tourists who are highly motivated towards robotic/advanced technology	• Tourists with lower or moderate security and health concerns • Tourist relying on human employees to some degree • Tourists who are not motivated to high-tech service but concern about their health	• Tourists with lower or moderate security and health concerns • Tourist seeking for social interaction • Tourists relying on human employees

back-of-house operations may be automated. However, highly sensitive health precautions (wearing masks, not being close to customers, using disposable materials and disinfectant, distance sitting design, etc.) by firm and employees are necessary to provide a safer service to tourists (Sigala, 2020). As the last, this system also requires the adaptation of employees and customers, because they need to learn and adhere to the health and safety protocols. This service delivery system for a physically distant service is easiest to organise because it is based on the currently existing service delivery systems of nearly all hospitality companies in the world.

3.5.3. Mixed service delivery system

A mixed service delivery system, based on human-robot collaboration in the service delivery, combines the robotic and the human-based service delivery systems. It requires implementing service robots for some front-of-house operations to provide both safety and social contacts for tourists. For example, a robot can be used for room service delivery, such as in Best Western Premier Sofia Airport hotel (https://www.hotelpremiersofia.com/). The target market segments may include tourists with lower or moderate security and health concerns, tourists relying on human employees to some degree, and the tourists who are not motivated to high-tech service but concern about their health. Since service robots will be used for the mixed service delivery system maintenance (in-house or outsourced), the disinfection of the robots after serving each guest is included in the requirements for the system. Moreover, as this system also includes human employees in the service, personal care and attention such as wearing masks, not being close to customers, using disposable materials and disinfectant, distance sitting design, etc., is needed to ensure tourists' health. As all the suggested systems, mixed service delivery system also requires the adaptation of employees and customers to be efficient. The system has some advantages such as no human touch for some tasks, social interaction with human employees, and novel experience (created by the service robots). Its disadvantages include medium risk level of infection, while customers may not fully enjoy the experience because of worries about being infected by human employees.

4. Discussion and conclusion

4.1. Contribution

This paper contributes to the body of knowledge by developing a conceptual framework of physically distant service delivery system design in the hospitality industry for the (post-)viral world. In doing so, the paper steps on several theoretical approaches such as resource-based view, value chain analysis, stakeholder theory, PESTEL analysis, positioning strategy, and service delivery system design. The paper identifies three service delivery system designs (robotic, human-based, and mixed) and analyses their requirements, advantages, disadvantages, and potential target markets. In doing so, the paper reconfirms the strategic role of (automation) technologies for hospitality companies (Buhalis, 1998; Benckendorff et al., 2019; Gretzel et al., 2020; Ivanov and Webster, 2019a; Neuhofer et al., 2014; Sigala, 2020; Tussyadiah, 2020).

4.2. Theoretical implications

From a theoretical perspective, the conceptual model developed in the paper shows the relationships between the various strategic frameworks for situational analysis (RBV, value chain, stakeholder theory, PESTEL), marketing positioning (differentiation), and service delivery system design. The model stresses that a physically distant service delivery system may well address tourists' expectations for a safe hospitality service in the (post-)viral world. The design of the service delivery system has to consider the company's resources (RBV), activities (value chain), stakeholders (stakeholder theory), and the external macro-environment (PESTEL) because they put limitations on the feasibility of

the designs. For example, if a hotel does not have sufficient financial resources (it is small, low category), its facilities are not robot-inclusive (e.g. small floors, door steps that hinder robot's navigation) and require significant investment to upgrade, or its customers have negative attitudes towards robots, a robotic service delivery system design may be inappropriate and not economically feasible (Ivanov and Webster, 2018). For such a property, a human-based physically distant service delivery system is more relevant and affordable. In that sense, the conceptual model emphasises that although the actual service delivery process in hospitality companies takes place at operational level, the design of the service delivery system is a strategic decision that needs to consider various issues.

At the same time, once implemented, the design of the service delivery system would influence on company's facilities (structural choices in the system design) and activities (value chain framework; infrastructural choices), the knowledge and skills required by employees and customers (RBV; adaptive mechanisms in integration choices), the relationships with suppliers and labour unions (stakeholder theory), etc. For newly established properties, the design of the service delivery system will be facilitated by the absence of significant sunk costs for promotion, lack of existing facilities that need investments to be redesigned in line with the new service delivery system, or staff that have to be retrained to unlearn old practices and learn new procedures and protocols. Newly established properties will not have these hindrances, they have greater flexibility, and can design a physically distant service delivery system from scratch without the need to adapt elements of an existing service delivery system. For example, the design of a new hotel can consider in advance the use of service robots for cleaning floors, disinfection, room service delivery, cleaning swimming pools, cutting grass, luggage carrying and storage, preparing and delivering food/drinks, etc., and include larger floors, wider corridors, sensors on walls, special surface materials for the pool to facilitate the effective and efficient use of robots in the hotel. In that context, new entrants/start-ups in the hospitality industry that offer physically distant services might be more competitive than incumbent firms in regard to the design of the service delivery system, although they would lack financial resources, market knowledge, and an established network of customers, distributors and suppliers that would hinder their competitiveness (Castro and Ferreira, 2019).

4.3. Managerial implications

From a managerial perspective, the combination of using human employees and service robots simultaneously allows a hospitality company to utilise the strengths of human employees and robots while offsetting their disadvantages. In that sense, the mixed system seems very suitable for the hospitality industry in the (post-)viral world, because it provides a physically distant service without sacrificing social interactions between tourists and human employees. However, if the target market segment is the tourists with high security and health concerns, and tourists who are highly motivated towards robotic/advanced technology, a robotic service delivery system would be most suitable. Therefore, hospitality firms must (re)design their service delivery systems and position themselves in the market in accordance with their target tourists' profiles. Both designs are more suitable to provide a physically distant service to tourists via benefiting service robots, because, personal precautions may not be enough to eliminate the risk of infection in the human-based service delivery system due to the lack of the technological shield between the human employees and tourists provided by service robots (Seyitoğlu and Ivanov, 2020).

The hospitality managers need to have a realistic assessment of their resources, activities and relationships with stakeholders. This refers not only to their current resources, activities and relationships, but also how the design of the service delivery system would impact upon them. Managers must evaluate what new resources their companies need to obtain, which current resources may become underutilised or obsolete,

how will the service process be reorganised, what new skills employees need to have, and so on. If they overestimate their current resources, underestimate the resources they need to have or the service process changes that the (re)design of the service delivery system would require, the implementation of the service delivery system may be challenging or even a failure. Additionally, if they choose to use robots in the service delivery, managers have to make sure that their companies will not become dependent on one supplier and avoid the vendor lock-in effect (Farrell and Klemperer, 2007), e.g. by renting instead of buying the robots.

Furthermore, the design of the service delivery system is an intangible resource that can be a source of competitive advantage. In the (post-)viral world, many hospitality companies may provide a physically distant service as a way to address customers' expectations. In that case, a physically distant service alone may not be a significant differentiator for the hospitality companies that offer it, but the *way* the physically distant service is delivered can be a differentiator. Therefore, the hospitality companies should not limit their unique selling proposition in the (post-)viral tourism to health safety, but incorporate customer experience as well. In that context, service robots can help hospitality companies design memorable experiences (Tung and Au, 2018) that add value for and attract customers. In short, the unique selling proposition should outgrow 'safety' to become 'safety + experience'. Additionally, hospitality companies will have to make hygiene a visible part of the product. Cleaning the hospitality facilities may need to become a theatrical performance to mitigate tourists' health concerns, and service robots (e.g. for cleaning floors and disinfection) may be the main actors in the spectacle. For example, hospitality companies may post videos with their cleaning robots in action, schedule some of the sessions for cleaning of the common areas of the hotel / restaurant/airport, etc., at parts of the day when the cleaning robots will be seen by the guests, allow guests to make selfies with the robots, etc.

4.4. Policy implications

From a policy perspective, a physically distant hospitality service delivery system raises the question of its legal regulation that goes beyond the temporary use of masks, protection helmets, extensive disinfection, etc., during a viral pandemic. In fact, some requirements (e. g. disinfection protocols) may need to be made permanent and an integral part of the tourism and hospitality legislation as preventive measures against future viral outbreaks. Moreover, legislators would need to provide legal regulations regarding the liabilities for damages caused *by* robots. While a robot is an asset for a hospitality company and damages on it can be treated damages on property, that is not the case for damages caused by a robot, because a service robot takes autonomous decisions. The need for such legal regulation had already been recognised in Article 49 of the *European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL))*European Parliament, 2017*European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL))*.

Furthermore, while the conceptual framework in the paper was developed for hospitality companies, it can be useful for destination management organisations (DMOs) as well. The introduction of a physically distant service delivery system in hospitality companies may improve the image not only of the companies but of the destination as well because it matches the expectations of the target markets but it needs to contribute to the consistency of the destination tourist product (Sedmak and Kocipe, 2017). DMOs may contribute to the strategic marketing positioning of hospitality companies that have physically distant service delivery systems by popularising their good practices and success stories on travel fairs, social media, newsletters, etc. (Morrison, 2018). This would increase the market visibility of these companies and will support their marketing efforts. DMOs may also provide relevant market analyses regarding tourists' expectations, and facilitate the

contacts between service robot suppliers and hospitality companies.

4.5. Limitations and future research directions

The paper is not without limitations. First, this is a conceptual study not based on empirical findings. Second, the theoretical foundations of the present study include the resource-based view, value chain analysis, stakeholder analysis, PESTEL analysis, and positioning strategy. Thus, the limitations of these theoretical frameworks *per se* present limitations of the conceptual model in this paper as well. Third, the conceptual framework considers only service robots in the service delivery system design, while other automation technologies (e.g. chatbots, self-service kiosks) are not included because they go beyond the scope of the paper. Future research may step on the suggested model and analyse the strategic role of robots in the service delivery systems of specific companies to provide a reality check of the model. In particular, future research may be oriented to provide empirical support to the proposed framework in relation to specific hospitality service encounters and contexts of robot use given the variety of hospitality services and the range of application of service robots in the industry. Additionally, research may expand the model to incorporate all types of technologies and elaborate on their specific roles in a physically distant service delivery system. Furthermore, research can shed light on tourists' actual preferences towards the 'human employees-robots' ratio in the front-of-house operations of hospitality companies they patronise. Finally, future research may analyse tourists' willingness to pay for robot-delivered services.

Declaration of Competing Interest

The authors report no declarations of interest.

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