ARE CUSTOMERS READY TO BE SMART? DESIGNING SMART HOTEL EXPERIENCES

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Abstract

Purpose – Even if it is often accepted that smart hotels are built on networks of technological devices, there is currently no consensus among researchers as to what level of technology is required to define a smart hotel. Based on the above-mentioned assumption that smart hotels are built on a network of technological devices, this paper aims to understand how smart hotels can be conceptualised based on customer preferences.
Methodology/Design/Approach – To achieve this goal, the paper conceptualises smart hotels as a service network in which the customer comes into contact with a variety of technological and traditional touchpoints on site. This conceptualisation allows the researcher to observe customer preferences at different touchpoints and identify the technologies that are central to the development of the customer experience.
Findings – The results show that the ideal customer journey includes both traditional and technological touchpoints and that artificial intelligence is of central importance for the development of the smart hotel concept.
Originality of the research – The methodological approach taken in this paper enables researchers and practitioners to easily visualise and identify important patterns in the customer journey, facilitating the task of identifying the most relevant touchpoints in complex service networks, such as smart hotels.
Keywords smart hotel, internet of things, customer journey, service delivery network, technology, hospitality

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INTRODUCTION

Over the years, the internet of things (IoT) has attracted the interests of tourism and hospitality researchers. Some of the most cited papers regarding the applications of the internet of things in this field show that the internet of things can increase the interconnection between the hospitality industry and stakeholders (Buhalis & Leung, 2018), impact the customer experience (Femenia-Serra et al., 2019a; Pencarelli, 2020), and foster nowness and co-creation (Buhalis & Sinarta, 2019; Pencarelli, 2020). At the basis of this technological advancement there is a variety of interconnected smart objects with different computing capacity (e.g. sensors) that rely on the internet to communicate between each other's (Buhalis & Amaranggana, 2013). The fast exchange of information between these small objects allows for the creations of smart rooms, building management systems, real time information sharing across devices, and advertising technologies that rely on geolocation (Buhalis et al., 2019; Buhalis & Amaranggana, 2013; Nadkarni et al., 2020). As a result, the introduction of IoT in hospitality is often seen as part of a wider strategical approach, leading to the creation of smart hotels, which are a "network technical systems that improve the comfort and feel-good quality, security and energy efficiency in a hotel" (Borkmann, 2020, p.5). IoT technologies are therefore expected to impact three different areas of hospitality management: guest experience, operational efficiency and sustainability (Nadkarni et al., 2020; Casais & Ferreira, 2023). IoT technologies are therefore expected to impact three different areas of hospitality management: guest experience, operational efficiency and sustainability (Nadkarni et al., 2020). Among these areas, guest experiences has until now received a minor attention, probably because the internet of things is often viewed as a "working technology" (Hsu & Lin, 2018). As a consequence IoT adoption has mostly been studied from the perspective of firms and governments, while fewer studies have focused on customers (Gao & Bai, 2014). Nonetheless, the IoT can be used to improve customer experience by aligning preferences and expectations, thanks to a better customization of the service (Femenia-Serra et al., 2019b). In the field of hospitality, such technologies can improve the integration between products and services, leading to the creation of seamless experiences (Gretzel et al., 2015; Lim et al., 2018). They can furthermore reduce the unfamiliarity of the destination, and mould the physical environment around customers, thus accruing the sense of homeyness of the hotel (Buhalis et al., 2019; Nolich et al., 2019). Moreover, IoT technologies can be used to increase guests' psychological safety through social distancing, in a context where memories of the COVID-19 pandemics are still vivid (Chen et al., 2021; Li et al., 2022). However, given the huge variety of existing IoT technologies, it is becoming increasingly difficult for researchers to map the existing IoT technologies and understanding their implications for customer experiences (Nadkarni et al., 2020; Pappas et al., 2021). An example of such problem is well represented by the definition of smart hotel. In smart hotels, different technologies work together to create a unique hotel concept (Jaremen et al., 2016; Kim & Han, 2020). For this reason, researchers often argue that smart-hotel models do not rely on a single technology, and there is no consensus about the level of technological adoption required to define a smart hotel (Kim & Han, 2020).To understand and approach smart hotels it is thus necessary to assume that the impact of technological advancement on the hotel experience does not depend on individual technology, but on specific configurations of technologies. Thus, in order to develop positive customer experience, it is important to investigate how costumers differ in their attitudes and preferences (Lemon & Verhoef, 2016).

However, to date, limited research is available about how internet of things technologies can be combined to create better consumer experiences.

Therefore, the present paper aims to identify which combinations of internet of things technologies are preferred by different types of customers. In specific the paper aims to answer the following research questions:

1. How do customers differ in their attitude towards new technologies?
2. How do these differences impact customer preferences for smart hotel technologies?
3. How could the preferences for different technologies be combined together to create different smart hotel experiences?

To explore this idea the present research conceptualizes smart hotels as a Service Delivery Network, in which each customer interacts with a variety of small technologies.

The paper will therefore proceed as follow: first the existing applications of IoT in the context of hospitality will be mapped to identify the main touchpoints characterizing the guest experience. Later, based on a survey of 869 respondents, potential hotel customers will be clustered based on their preferences, and "ideal smart hotel experiences" will be explored by mean of a network analysis.

1. LITERATURE REVIEW

1.1. Experiences and hospitality

Successfully designing, managing and staging experiences is of paramount importance in the hospitality industry, since experiences can contribute to the creation of a long-lasting competitive advantage (Gilmore & Pine, 2002; Veerakumaran et al., 2017). Assuming an experiential perspective is thus considered essential to ensure a competitive advantage (González-Torres et al., 2021). In fact, experiences allow for a higher differentiation if compared to services, since they are complex blend of many individual elements that come together in order to involve the individual customer at an emotional, physical, intellectual or spiritual level (Addis & Holbrook, 2001; Gilmore & Pine, 2002; Lemon & Verhoef, 2016). Experiences also leave the customers with unforgettable memories, that contribute to increase loyalty and positive word of mouth (Jani & Han, 2015). For these reasons, experiences have been extensively studied in the context of hospitality, where the single elements influencing the cognitive and emotional aspects of the evaluation of the hotel service have been disentangled following the idea that the environmental stimuli can influence customers emotions and behavior (Chang, 2016). The hotel environment, or experiencescape, has been thus untangled to identify its different dimensions. Five major dimensions of the experiencescape have been therefore identified: the physical, social, natural, socially symbolic dimensions, and technological dimensions (Bitner, 1992; Kandampully et al., 2018; Rosenbaum & Massiah, 2011). Among them two dimensions have been proven to be of extreme relevance in the field of hospitality, the human and the physical dimensions (Ariffin et al., 2013; Ariffin & Maghzi, 2012; Brunner-Sperdin & Peters, 2009). The human dimension usually comprises the empathy and expertise of the employees, the hospitableness and hosting behavior of the staff, and the interactions with other guests (Ariffin & Maghzi, 2012). On the opposite the physical dimension includes the interior and exterior design, the hotel upkeep, the lighting effects, the color effects, the sounds, and the smell (Ariffin et al., 2013; Brunner-Sperdin & Peters, 2009; Walls, 2013). In the case of smart hotels, however, we can expect that also the technological dimension plays a relevant role in influencing the customer experiences, because it partially substitutes human interaction, and in some cases mediates the interaction between the customer and the physical environment (Kandampully et al., 2018). Indeed, physical and technological hotel attributes influence customers' evaluation of the experience and willingness to stay in smart hotels (Chang et al., 2022; Kim & Han, 2020; Liu et al., 2022; Yang et al., 2021) Moreover, in the case of smart hotels, stimuli pertaining to the human, physical and technological dimensions are likely to be perceived as groups of information belonging to a same hotel experiences, since the environmental stimuli belonging to the five dimensions of the experiencescape are often perceived as groups of information (Lin, 2004). In this sense the different points of interaction between the customer and the firm (touchpoints) can be perceived as blend together in customer mind, this because they are delivered in close succession (Tax et al., 2013).

1.2. The customer journey

From a temporal perspective, the different encounters between the service environment and the customers can be conceptualized in marketing as a customer journey implying a variety of stages and points of contact (touchpoints) between the customer and the firm (Becker & Jaakkola, 2020). The customer journey can be then represented through the process of customer journey mapping, which consists in identifying the most relevant touchpoints and organizing them in a temporal order. Customer journey mapping helps companies visualizing all the touchpoints that contribute to customer experience, thus providing an important tool for the introduction of service innovations (Rosenbaum et al., 2017).

In customer journey mapping, the customer experience is often divided between the pre-purchase, the purchase and post-purchase stage each one encompassing a variety of touchpoints (Halvorsrud et al., 2016; Lemon & Verhoef, 2016). In the case of hospitality services, however, this distinction is less informative than in other contexts, and consequently, the division between pre-trip, onsite and post-trip experience is more often adopted (Hu & Olivieri, 2021; Neuhofer et al., 2013). The pre-trip and the post-trip experiences are characterized by a variety of human, static and interactive touchpoints, that constitute a complex and diversified ecosystem, and include blogs, review sites, and OTA. Also, onsite experiences present a blend of digital and physical aspects, whose interactions vary depending on the characteristics of the tourist and the service provider (Hu & Olivieri, 2021). Onsite physical touchpoints include the pickup of the customer, the reception, the room allocation, the room services, the breakfast and the dining services, and the check-out (Erinle & Bharathi, 2013; Hu & Olivieri, 2021; Neuhofer et al., 2013; Rojas et al., 2021). Interactive touchpoints may include hotel apps, interactive TV screens or digital bracelets (Hu & Olivieri, 2021), but also robots, in-room climate and lightening control, automatic check-in and keyless entry (Kansakar et al., 2019).

1.3. Internet of things and hospitality experiences

Interactive touchpoints are expected to become more and more integrated in the experiencescape in the future, thanks also to the internet of things. With the internet of things, contexts aware physical objects, such as radio frequency identification (RFID), tag, sensors, actuators, and mobile devices, are connected to the internet and interact between each other (Berger et al., 2021), thus creating always responsive services, able to account for the customer's context (Gretzel et al., 2015). This technological advancement is supported by a variety of enabling technologies, the most relevant being artificial intelligence, RFID, wearable, smartphones, and apps (Atzori et al., 2010; Buhalis et al., 2019).

As reported by Copeland (2022) and Tussyadiah (2020), artificial intelligence is defined by the Encyclopedia Britannica as "the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings". AIs can be classified under three typologies, depending on their level of environmental interaction and self-awareness: they can be reactive machine, limited memory, theory of mind, and self-aware. The latter two are far from being implemented, and they are able to understand that people and creatures have thoughts and emotions that affect their own behavior. The former two are currently in use, and can work in collaboration with smart objects allowing the implementation of in-room voice control (e.g. Alexa or Siri) or self-check-in. The main difference between them is defined by the ability to rely on past events before engaging in present actions (Buhalis et al., 2019; Hintze, 2016).

RFID are small devices enabled with near field communication, that can sense, store, and transmit environmental data (Lee et al., 2017). RFID are used to track goods and control security, for example with the use of e-passports, while ensuring a seamless experience. They can also be used to send information to smartphones, for example in museum and shopping centers (Öztayşi et al., 2009).

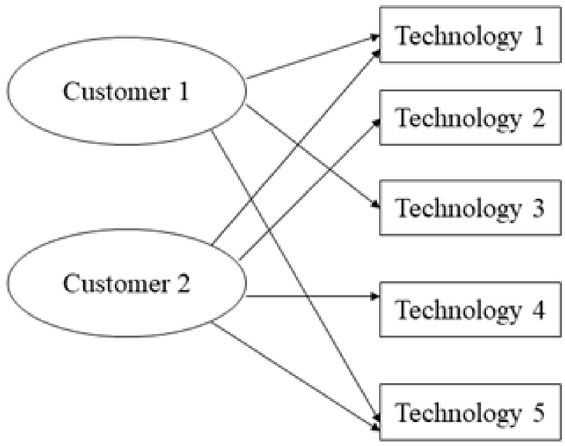
Smartphones host a range of apps. Besides functioning in collaboration with RFID, smartphones can also be integrated with wearable, such as smart bands and smartwatch. The functioning of the internet of things is furthermore made possible by the existence of a fast internet connection combined with cloud computing. In fact, 5G and fiber connection allows large volumes of data to be transferred at high speed across mobile networks, thus providing the infrastructure required by IoT to exchange real-time data (Buhalis et al., 2019; Ji & Wang, 2016). Cloud computing is a model for on-demand access to a shared pool of configurable resources, that provides the necessary power to process the huge data stream produced by devices and humans in real time (Lee & Lee, 2015). This combination of small responsive objects and enhanced interconnection allows for the introduction of new customer touchpoints, such as automated hotel rooms, new smart room services, automated check-in and check-out, and location based smartphone interactions (Sharma & Gupta, 2021). Some examples of technologies allowing the introduction of these new touchpoints include, thermostats embedded with temperature, humidity and air quality sensors, smart lock technologies that allow the customer to access the room without key, proximity sensors providing location based information, minibars that automatically track consumption, voice control and building management systems (Eskerod et al., 2019; Nadkarni et al., 2020; Pelet et al., 2019). These technologies can be leveraged to improve customer experience, while contributing to the development of a more sustainable hospitality offer. From the perspective of environmental sustainability, IoT can be used to increase the energy efficiency of hotel structures (Casais & Ferreira, 2023; Nadkarni et al., 2020). From the perspective of social sustainability, the adoption of IoT technologies in hospitality is an opportunity to develop more accessible services for people with disabilities (Casais & Ferreira, 2023).

1.4. Smart hotels as a network of physical and digital touchpoints

In the case of IoT technologies, the presence of multiple actors and high level of technological complexity generate a network of services, that can be hardly described by adopting a dyadic service encounter perspective (Larivière et al., 2017). In dyadic conceptualizations of the service encounter the customer is assumed to assess the service in isolation, based on its relationship with the service provider. This approach, however, presents some critical limitations with respect to its ability to describe costumer experience in the case of fragmented service deliveries, where the customer journey is characterized by a variety of encounters, often involving different service providers. Service delivery network approaches (SDN) aim at releasing this limitation of the dyadic approach, by conceptualizing the customer journey as an ego centric network in which the customer and the others service providers are nodes, and the encounter with the customer is represented by the presence of ties (Tax et al., 2013).

Based on the service delivery network perspective, it is argued in this paper that smart hotels can be represented as a network of technologies embedded in hospitality services. Smart hotels are indeed described in the literature as hotel structures relying a variety of interconnected technologies, that can contribute to the creation of a seamless customer experience (Kim & Han, 2020; Stankov et al., 2019; Yang et al., 2021). They can therefore be considered as complex systems of physical and digital touchpoints, that go beyond the dyadic interaction between the customer and the single technology. Drawing on the literature on service delivery networks, the customer journey in smart hotels can be then represented as an ego network of technological and traditional services that have the guest at their centre and different physical and digital touchpoints as nodes, as in Figure 1.

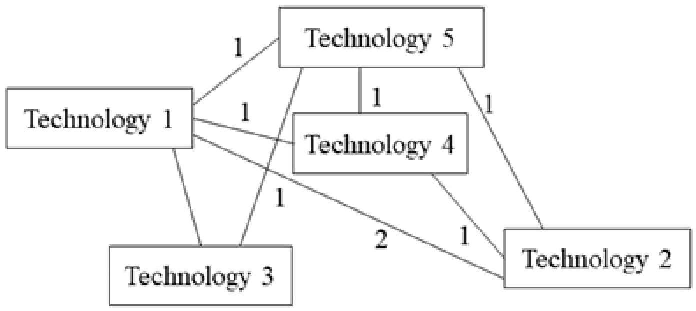
Figure 1: **Representation of Multiple Customer Journeys as an Ego Network**



Note: elaboration of the authors based on Tax et al. (2013)

When multiple customers journeys are considered, the network can be represented as a bipartite network with a group of nodes representing the customer and a group of nodes representing the physical and digital touchpoints (see Figure 2).

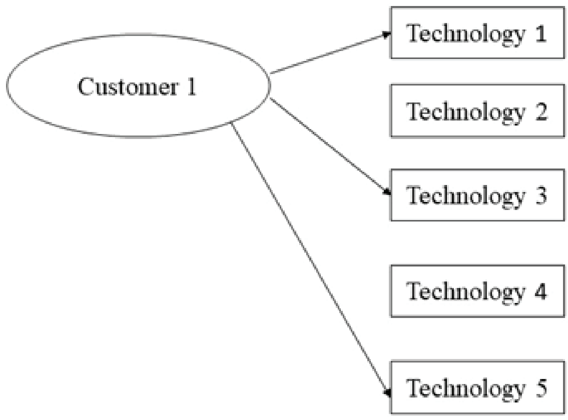
Figure 2: **Representation of Multiple Customer Journeys as a Bipartite Network**



Note: elaboration of the authors based on Tax et al. (2013)

Another alternative consists in representing the network as a weighted network in which the nodes represent the physical and digital touchpoints, the weights of the edges the number of customers who have chosen the same path across the different touchpoints (see Figure 3). In the present study, smart hotels are approached as a weighted network.

Figure 3: **Representation of multiple customer journeys as a weighted network**



Note: elaboration of the authors based on Tax et al. (2013)

2.MATERIALS AND METHODS

2.1. Data collection

As mentioned in the introduction of the paper this work aims to explore how customers differ in their attitude towards new technologies; how these differences impact customer preferences for smart hotel technologies; and how the preferences for different technologies combine together to create different smart hotel experiences. To answer these questions a primary data collection was conducted. Data were collected as part of a larger study in October 2021 through a computer-assisted web questionnaire submitted to a panel of Italian consumers. The questionnaire was distributed through Qualtrics (Provo, UT, USA, version 2021, https://www.qualtrics.com) in collaboration with a private data collector specialized in market research, and the respondent were selected using a quota sampling based on age, gender, and area of origin. The areas of origin were determined using the division between north-east, north-west, center, south and islands. The criteria for the selection of the sample were determined to ensure that different groups of the Italian population were represented. Moreover, age and gender are among the demographic factors that influence customer relationship with technology (Kim et al., 2021). The survey consisted in three parts (i) demographic data, (ii) background questions, regarding vacation habits and (iii) a series of attitudinal questions, including preferences. A total of 1107 questionnaire were distributed, among these 1000 questionnaires were collected, among them 141 were discarded due to the presence of uncomplete information.

The average age of the respondents was 50.24 years (SDage= 17.07). Of these, 48.2% respondents were male and 51.78% were female. The respondents displayed different levels of education: 9.55% of the respondents had a middle school or elementary school diploma, 58.57% had a high school diploma, 26.48% a bachelor’s degree and 5.4% a master’s degree or higher. They also came from different areas of Italy, 44.76% came from the northern part of Italy, 22.20% from the center, and 33.03% from the south.

Following the previously developed theoretical framework, respondents were asked to express their preferences towards the use of internet of things devices at different points of the customer experiences. The different points of the customer experiences considered in the present study were determined based on the literature on the customer journey in hospitality services, most precisely the reception, the room access, the room services, the breakfast and the dining services, and the check-out were identified on relevant touchpoints of the hotel experience (Erinle & Bharathi, 2013; Hu & Olivieri, 2021; Neuhofer et al., 2013; Rojas et al., 2021).

For each touchpoint different technological and traditional solutions were identified as reported in Table 1, and customers were asked to report their favorite solution at each touchpoint.

Table 1: **Technological and Traditional Solutions Identified at Different Touchpoints**

Touchpoint	Technology	References
Check-in	Smart check-in; staff; Smart check-in or staff depending on the time	Sharma and Gupta (2021)
Room access	Smartphone; Key; Facial recognition; Digital print	Boo and Chua (2022); Kim et al. (2008)
In-room control	Voice; switch; tablet	Buhalis and Moldavska (2021); Kim (2016)
In room facilities	Tv and Wi-Fi; AI (Alexa, Siri); no technology; Immersive shower; widespread audio	Buhalis and Moldavska, (2021); Sherry (2013); Tuominen & Ascenção, (2016)
Dining services	Robot; QR code and staff; staff; robot and staff	Odekerken-Schröder et al., (2022); Yasami et al., (2022)
Information	Guide; staff; AI in room; App or web	Buhalis and Moldavska (2021)

2.2. Data analysis

The data collected in the customer survey were first used to cluster potential tourists based on their attitude toward technology. Later a network analysis comprising a graphical representation of the network and the use of descriptive measures (e.g. degree centrality and strength) was used to identify the most popular technologies for each cluster.

Among the measures of centrality, degree centrality and strength were computed to understand the structure of the network. Degree centrality is a measure of “popularity” that consists in a simple count of the total number of connections linked to a vertex (Hansen et al., 2010). In fact, degree centrality indicates the number of edges (α) that connect a vertex i with other vertices j,

$$s_i = \sum_j a_{ij}$$

Strength or weighted degree is a generalization of degree centrality, useful to describe the structure of weighted networks Strength or weighted degree is the sum of the weights (w) of all the edges ij connected to a node i (Amano et al., 2018; Kolaczyk & Csárdi, 2014),

$$s_i = \sum_j w_{ij}$$

In the present case the strength of each vertex was considered, given that the collected information about customer preferences was organized in a weighted network.

3. RESULTS

3.1. Cluster analysis

A non-hierarchical (k-mean) cluster analysis was used because it suited the dimensions of the dataset (n>200). In the k-mean cluster analysis respondents are assigned to clusters based on the smallest distance between the respondent and the centroid. K-mean clustering requires to choose the number of clusters in advance (Steinley, 2006). Following the technique proposed by (Brida et al., 2010; Gon et al., 2016; Pérez & Nadal, 2005), a stepwise approach was adopted starting from five to two clusters. Taking into account the complexity of the results interpretation and, making sure that each cluster has a representative number of members it was decided to take the three-partition clustering. Table 2 represents the percentage of representativeness for each cluster.

Table 2: **Percentage of Sample within each Cluster for Different Numbers of Clusters**

Number of clusters	5	4	3	2
	%	%	%	%
Cluster				
A	17.03	41.66	34.87	52.70
B	15.77	22.21	44.19	47.30
C	19.33	21.98	20.94	.
D	33.83	14.15	.	.
E	14.04	.	.	.

An analysis of the final clusters centers was made. This allowed us to examine the answers given within each cluster. Table 3 represents the main characteristics of each cluster, with respect to the perception of technology in holiday and in everyday life. The first and the second clusters represent the larger clusters and comprise respectively the tech-savvy tourists and the non-technological tourists. The first group is technologically competent and enjoys interacting with technology both on vacation and in everyday life. The second group struggles with the use of technology in everyday life and tends to avoid technological solutions while on vacation.

The third cluster comprises the disconnected tourists. This cluster comprises those tourists who are confident users in everyday life but feel the need to disconnect while on vacation.

Table 3: **Cluster Classification Based on Clusters' Average Values, Scale from 1 to 7, where 1= disagree and 7=agree**

	1-tech-savvy tourist	2-non technological tourist	3-disconnected tourist
Technology increases hotel comfort	5.75	4.10	5.83
To discover the destination, I would ask the hotel staff rather than using Apps	3.95	4.80	5.36
I prefer robotic and automatic hotel systems over staff	3.31	2.28	4.81
I want to disconnect on vacation	3.82	5.06	5.17
New technologies on vacation are important to prevent COVID-19	4.95	3.72	5.53
Trying new technologies is fun	5.94	3.93	5.69

	1-tech-savvy tourist	2-non technological tourist	3-disconnected tourist
I am passionate about technology	5.63	3.19	5.38
I am always curious to try new technologies	5.74	3.25	5.59
If new technologies are hard to use, I easily give up	2.34	3.96	5.29
I am a reference point for the use of technology for friends and family	4.94	2.72	5.08
New technologies (app, videocalls) can help fighting COVID-19	5.08	3.63	5.55

Table 4 shows the demographic characteristics of each cluster. The first cluster, tech savvy tourists (34.87% of the total sample), is composed predominantly by male consumers, the average age of this cluster is around 47 years. Customers in this cluster tend to have a higher level of education compared to the second cluster, non-technological tourists. The second cluster, non-technological tourists (44.19% of the total sample), is composed predominantly by females, the age average of this group is around 53 years old. Customers in this cluster tend to have lower levels of education compared to the first cluster, tech-savvy tourists, and the third cluster, disconnected tourists, generally they hold a high school diploma or a lower level of education. The third cluster, disconnected tourists (20.94% of the total sample), is composed predominantly by male consumers, the average age of this cluster is 48 years old. People belonging to this cluster tend to have a higher level of education compared to the second cluster, non-technological tourist. Moreover, following Pérez and Nadal (2005) and Brida et al. (2010) an analysis was made of the different clusters, to detect any significant differences between the cluster's groups (see Table 4). The chi-squared test was used since the variables considered were categorical. The chi-squared test showed that gender [$\chi2$ (2, 869) = 7.78, p = 0.020], age [$\chi2$ (4, 869) = 35.46, p<0.001], and education [$\chi2$ (2, 869) = 15.36, p < 0.001], significantly vary across clusters.

Table 4: **Socio–Demographic Characteristics of the Three Clusters (Percentage Values)**

	1-tech-savvy tourist	2-non technological tourist	3-disconnected tourist	p-value
	%	%	%	
Level of education				***
High school diploma or lower	63.70	75.00	60.99	
Higher than high school diploma	36.30	25.00	39.01	
Age				***
<40	33.99	22.40	33.52	
40-60	40.92	34.64	39.01	
>60	25.08	42.97	27.47	
Gender				**
Women	46.86	57.03	48.90	
Man	53.14	42.97	51.10	

Note*:* Significance of the Chi-square test was reported. All test results are not significant unless indicated otherwise:
***Significant at p ≤ 0.01, **Significant at p ≤ 0.05, *Significant at p ≤ 0.1.

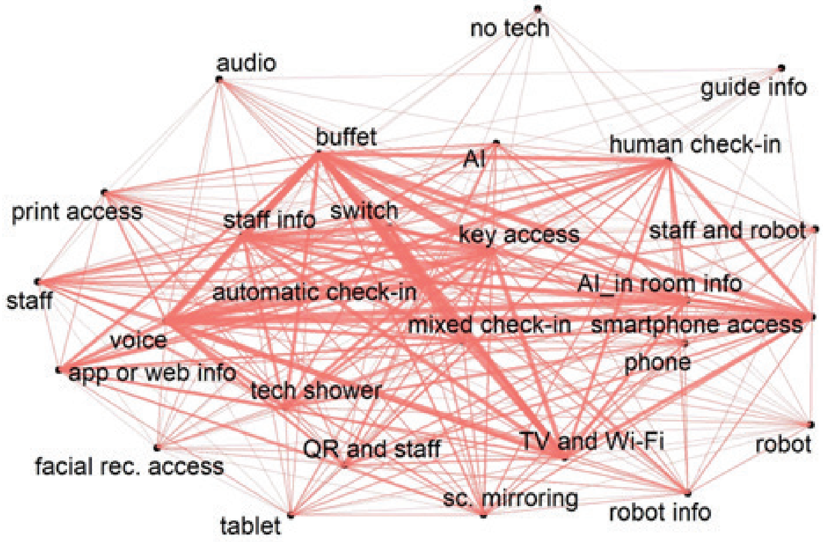
3.2. Network analysis

The visualization of the graph representing customer preferences shows the most selected customer journeys and the preferred technologies of each cluster. A graph representing customer preference was generated for each cluster (view Figures 4, 5, 6). Moreover, degree centrality and strength were computed for every technological and traditional touchpoint (view Table 5). The degree centrality and strength of every technological and traditional touchpoint were taken as a reference to determine which were the most popular touchpoints for each cluster of tourists. A summary of the most popular touchpoints for each cluster is reported in the next paragraphs. Figures 4,5, and 6 were generated in R by using the Graphopt layout algorithm in the ggplot package. This methodology allows the generation of a bidimensional map, which tends to plot vertices together based on the strength of their associations, so the more central services are plotted together in the middle of the figure (Funkhouser et al., 2021). It is also particularly suited for complex graphs (Højsgaard, 2012).

3.2.1. Tech-savvy tourists

Of the three possible check-in options (human, mixed, automatic), the tech savvy tourists tend to prefer automatic check-in, they want to access their room with a traditional key, and they want to have TV and Wi-Fi in their room. Their favorite room control-system is voice control. They prefer a buffet breakfast. They are willing to receive recommendations about the destination from the staff.

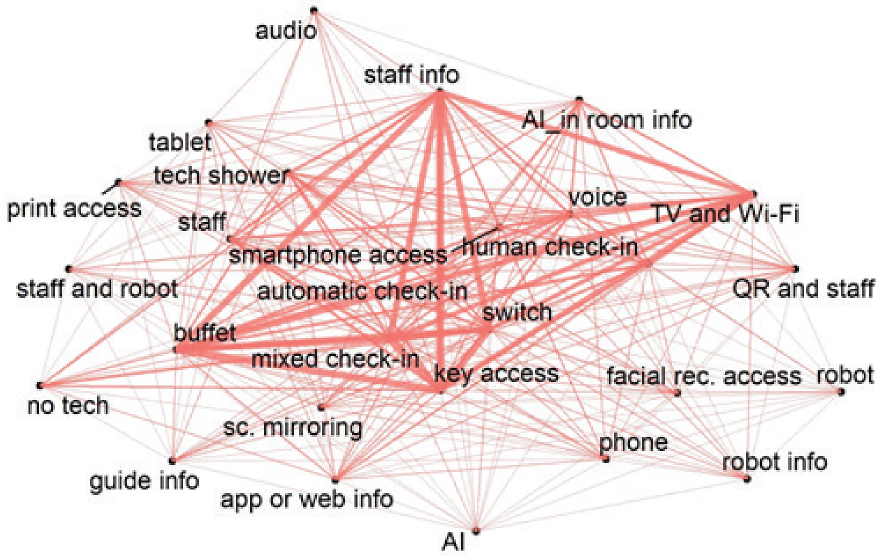
Figure 4: **Representation of the Customer Journey as a Network of Technological and Non-technological Services for Tech-savvy Tourists**



3.2.2. The non-technological tourists

The non-technological tourists tend to prefer mixed-check-in. They do not necessarily care about in-room technology, but they expect to have TV and Wi-Fi. Their favorite way to control the room is by using switches. They prefer a buffet breakfast and are looking for staff recommendations about the destination.

Figure 5: **Representation of the Customer Journey as a Network of Technological and Non-technological Services for Non-Technological tourists**



3.2.3. The disconnected tourist

The disconnected tourists tend to accept different modes of check-in, including human, automatic, and mixed. Disconnected tourists are willing to access their room both with their smartphone or with the key. When it comes to in-room technology they prefer to have TV and Wi-Fi. They would like to be able to control their room with switch or voice control. For their breakfast they prefer a buffet and they are looking to receive recommendations for visiting the destination either from an artificial intelligence or from the hotel staff.

Figure 6: **Representation of the Customer Journey as a Network of Technological and Non-technological Services for Disconnected Tourists**

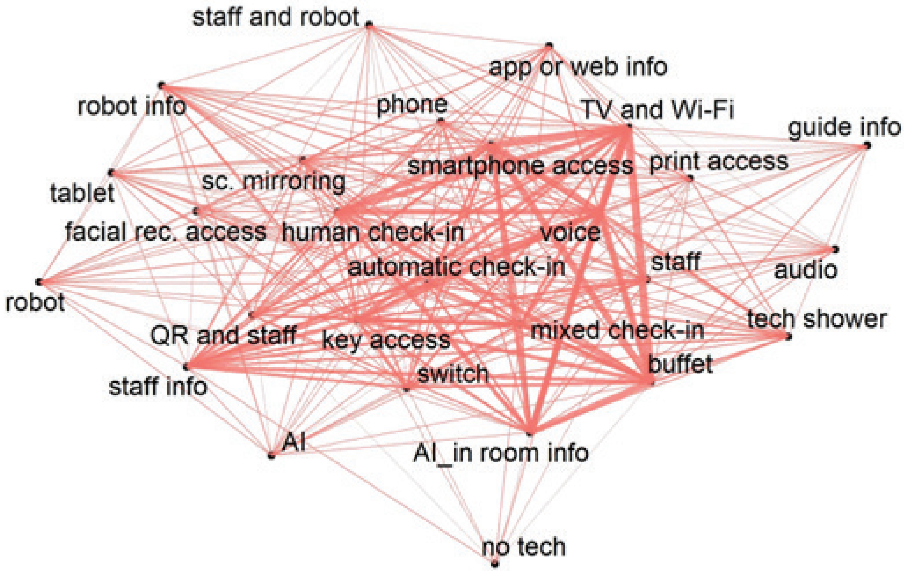


Table 5: **Degree Centrality and Strength for each Touchpoint Divided by Cluster**

	1-tech-savvy tourist		2-non technological tourist		3-disconnected tourist	
	Degree centrality	Strength	Degree centrality	Strength	Degree centrality	Strength
Check-in						
human check-in	26	623	25	581	25	483
mixed check-in	24	630	26	1484	26	406
automatic check-in	26	868	26	623	25	385
Room access						
smartphone access	25	840	25	588	24	581
key access	25	1015	25	1855	25	511
facial rec. access	22	77	23	105	23	77
print access	22	189	20	140	22	105
In-room control						
TV and Wi-Fi	22	952	23	1484	23	693
sc. mirroring	22	301	23	182	21	182
AI	22	210	21	49	19	63
no tech	12	21	18	252	11	28
Immers. shower	23	574	22	637	22	238
audio	18	63	15	84	20	70
In room facilities						
voice	23	1190	24	889	25	735
switch	24	616	25	1456	24	280
phone	22	189	22	196	24	161
tablet	22	126	22	147	22	98
Dining services						
buffet	24	1323	24	1750	24	686
QR and staff	22	357	21	217	22	224
staff	22	308	24	616	24	203
robot	19	56	18	42	20	84
staff and robot	20	77	21	63	19	77

	1-tech-savvy tourist		2-non technological tourist		3-disconnected tourist	
	Degree centrality	Strength	Degree centrality	Strength	Degree centrality	Strength
Information						
AI_in room info	24	623	23	413	23	483
robot info	21	189	19	70	23	161
staff info	24	868	23	1827	24	455
app or web info	22	427	23	273	22	119
guide info	12	14	21	105	18	56

5. DISCUSSION

Previous literature on smart hotels has mostly focused on customer acceptance without considering how hotel technologies can be combined together to create valuable smart hotel experiences for different groups of customers (Chang et al., 2022; Kim & Han, 2020; Liu et al., 2022; Yang et al., 2021). The present research results give a more detailed perspective on how different attitudes towards technology shape customers preferences, and how this can translate in different ideal guests' experiences.

The results showed that customers differ in their attitude towards technology, since three clusters were identified based on the data collected: I) the tech-savvy tourists, II) the non-technological tourists, and III) the disconnected tourists. Individuals in the first cluster, tech-savvy tourists, are technologically competent and enjoy interacting with technology both on vacation and in everyday life. The second cluster, non-technological tourists, struggle with the use of technology in everyday life and tends to avoid technological solutions while on vacation. The third cluster comprises individuals who are confident users in everyday life but feel the need to disconnect while on vacation. They are mostly unwilling to put effort in technological interactions.

Until now the literature has mostly made a distinction between tech-savvy and non-technological tourists. However, the present findings shows that technology literate tourists can be divided in two subgroups: one that enjoys using technology also in holiday and one that seeks disconnection. These results support and expand the findings of Femenia-Serra et al., (2019b), who observe that technology literate tourists are not always willing to adopt technological solution while on vacation. With this regard, the desire of certain groups of people to disconnect while on vacation has been previously observed (Dickinson et al., 2016; Egger et al., 2020), but it has not been theorized in relation to customer ability to interact with technology. Moreover, our results put this distinction in relation to tourists' preferences for smart hotel technologies.

With this respect, our results show that tourist attitude towards technology influence the ideal smart hotel experience of customers. In fact, each cluster presented different preferences with respect to the use of technology in smart hotels, so that different concepts of smart hotel emerge for each cluster. The first cluster is characterized by a preference for automated check-in and the use of in-room voice control. Also, tourists belonging to the first cluster display a more varied preference for in-room technology if compared to the other clusters. On the opposite, the interest of the second cluster for technology is limited to mixed check-in, and the use of in room WI-FI and television. Finally, customers in the third cluster, disconnected tourists, prefer to access their room with their key or smartphone, control their room with their voice or with switches, and relay on in-room AI or the hotel personnel to gather information about the destination.

These results confirm the importance of the hotel environment in shaping the customer experience, and in determining the adoption of smart hotels (Kandampully et al., 2023; Kim & Han, 2020). Moreover, it shows that different customer attitudes can be associated with the preference for different characteristics of smart hotels. In fact, the ideal smart hotels for tech-savvy tourist are characterized by large use of technology. Thus, it can be conceptualized as a space where the tourist can experiment and interact with a variety of new technological solutions. This concept is close to the idea of smart hotel developed by Henn Na. The ideal smart hotel for non-technological tourists reflects the conceptualization of smart hotel proposed by Stankov et al. (2019), who advocate for the introduction of calm technologies in hospitality service. In fact, calm technologies are technologies that are activated only when the customer needs to interact with them and do not require customers total attention or whose presence remain in the background (Stankov et al., 2019). Finally, non-technological tourists require limited technological interaction. This group of corresponds to what has been observed by Eskerod et al. (2019), who report that in some cases tourists' concern for IT only goes so far that the Wi-Fi connections should be fast. Non-technological tourists may also struggle to keep up with new technological innovations, keeping their needs in mind is important to create accessible, and therefore socially sustainable, smart hotel experiences (Casais & Ferreira, 2023).

6. CONCLUSIONS

In conclusion, the present paper aimed at understanding which combinations of internet of things technologies are preferred by different types of customers, and how this influences their ideal smart hotel experience. This study integrated a definition of smart hotel based on the combined use of different technologies with a service delivery network approach. The results allowed us to better explore customer preferences with respect to the use of internet of thing technology.

From a theoretical perspective the present work presents three major contributions. Firstly, it identifies a group of technologies that are relevant for the development of the smart hotel concept, thus identifying a group of technologies on which the research on smart hotels could focus. Secondly, these results provide useful guidelines for the development of the smart hotel concept. Indeed, the results identify three distinct groups of customers, I) the tech-savvy tourists, II) the non-technological tourists, and III) the disconnected tourists, each one displaying a different type of ideal smart hotel experience. The tech savvy tourists are interested in exploring and trying new technologies, the non-technological tourist want to limit their technological interactions to TV and wi-fi, and the disconnected tourists are interested in comfortable but invisible technologies.

Overall, this research provides useful information also for practitioners. These include: i) a more in-depths knowledge about the groups of technologies that are of higher interest for different groups of customers ii) guidelines on how to create valuable smart hotel experiences for different groups of customers.

The paper also presents some limitations. The research has been conducted only on an Italian sample, as a result it does not account for cultural differences. This aspect could be relevant, especially when considering that in some countries, smart hotels, such as Henn Na and FlyZoo, are more common than in Italy. Further research is therefore needed to understand if cultural differences influence customers' preferences for smart hotel technologies. Another important limitation of this research is that it did not consider the contribution of smart hotels to sustainable development. One reason for this limitation is that the present paper aimed at understanding which combinations of technologies better suit different groups of guests. Nonetheless, smart hotels can provide an important contribution to a sustainable development of the hospitality industry, notably through the introduction of more accessible services and the creation of energy-efficient buildings (Casais & Ferreira, 2023; Nadkarni et al., 2020). Future studies should look at how the sustainable use of smart hotel technologies influences the perception of this type of hotels.

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