VALUE FOR HOTEL GUESTS WITH INTERNET OF THINGS

Discovering the types of new, innovative solutions that can improve the customer journey

Topi Hukkanen

International Business
Bachelor's Thesis
Supervisor: Mikko Pynnönen
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ABSTRACT OF
BACHELOR'S THESIS

Author: Topi Hukkanen

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Supervisor: Mikko Pynnönen

Objectives
The first objective of the study was to determine the most predominant type of customer value that Internet of Things (IoT) solutions generate in hotels. The second regarded discovering the stages of the stay that would benefit the most significantly from improvements that use the technology. The results could aid hotel firms in their decision-making related to IoT investments.

Summary
IoT has been gaining popularity in the hotel industry as an emerging technology. However, its perceived value among guests has not been researched exhaustively. Based on readings conducted, it was proposed that social value is the most prevalent dimension, and that the arrival and departure stages would benefit from enhancements. The study utilized a consumer survey to gather data, the purpose of which was to investigate the attitudes towards features of IoT applications and find underlying value trends.

Conclusions
The analysis conducted on the responses suggested that the most prevalent type of value is actually economic value, with convenience and speed as the most important attributes. The transition stages of the trip, as proposed, were the parts of the customer journey where IoT would provide the most considerable value to guests. The results thus imply that hotels should focus on improving the processes that take place before and after the customer stays in the room. The developments should strive to generate significant economic value to the customer.

Key words: IoT, Internet of Things, value, hotel, customer, service, convenience, speed

Language: English

Grade:

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1. INTRODUCTION

1.1. Background

The hotel industry is constantly becoming more digitalized, and consumers are considering these technological advancements to be a standard (Beldona et al, 2018). Firms of the sector have to maintain their position at the earlier stages of the guest technology adoption curve in order to prevent obsolescence and generate significant value to their visitors (ibid). This however is not a surprising phenomenon, when the number of 2,5 billion smartphone users globally in 2018 (Statista, 2019) is taken into account for instance. Everything is smarter now.

Companies within the industry apply a range of different technologies and solutions to their functions. The variety ranges from artificial intelligence-powered applications to big data analytics and beyond. One of the technologies that has gained substantial exposure in various contexts is Internet of Things (IoT). This network-based concept consists of smart, connected devices, and the key characteristics of the solutions can be divided into resource-saving and value-generating groups (see Hilton, 2018; Porter & Heppelmann, 2014; Porter & Heppelmann, 2015).

A major strength of IoT solutions is the interconnectivity with consumer devices, which ‘aims at improving the quality of people’s life by saving time and money’ (Palattella et al, 2016). This is what hotels are also attempting to leverage, as suggested by PwC (2017): 80 percent of the respondents stated that their hospitality firm is investing substantially in IoT.

Questions do however remain. Because of the novelty of the applications in question, research regarding the value that guests perceive in IoT has been limited. This may pose issues to smaller firms willing to stay up to date with their technology offering, as they may not have the means to study the matter and invest in complex and expensive solutions. Therefore, the purpose of this paper is to map the value that IoT provides to hotel guests in a service environment. This initiative will assist hotel firms in making purchases that their

customers will perceive significant value in. The guests will experience an enhanced, digitally powered journey.

1.2. Research problems

Hotels are globally investing in IoT-based solutions to improve the experience of their customers in multiple ways. Ecosystems that involve the technology require large investments from a company, which may result in them having to choose between the improvable functions in the hotel. In other words, hotel enterprises often lack resources to enhance numerous aspects in the customer experience with developed technology, because of which they have to make specific purchasing decisions.

Due to this, it is to be determined where IoT has the most significant impact on the experience of the customer. The customer journey consists of multiple different stages, which each can be enhanced with the technology. There is no extensive knowledge however on which of the stages of the trip would customers perceive value in smart, connected devices.

Literature suggests different types of perceived value, known as customer value dimensions. The dimensions can be associated with specific IoT applications, meaning that each solution provides one or multiple types of perceived value to the customer. Thus, it should be investigated which types stand out the most in this setting. Proceedings in the area will help companies decide what values they should consider when making their initial investments.

1.3. Research questions

The following research questions are formed based on the problems and their background:

- At what stages of the trip do IoT solutions provide the most significant value to the customer?
- What is the most significant type of value that customers experience in IoT solutions?

1.4. Research objectives

The research objectives for this paper are:

- To determine the predominant perceived value dimensions that are present during the stay.
- To investigate which stages of the stay would be most significantly improved with IoT solutions using a value perspective.

2. LITERATURE REVIEW

2.1. Introduction

The main purpose of this literature review is to build a foundation for further research on the types of values that consumers perceive when using different Internet of Things (IoT) solutions provided by hotel firms. In order to acquire critical knowledge related to the researchable topic, literature revolving around several topics such as service components in the industry, and the nature of IoT within the sector will be assessed in an organized manner.

Various studies conducted on the consumer values and benefits are in a key role in this paper, as there will be a conceptual framework formulated based on them to concretize the research process and syndicate the various topics present.

2.2. IoT and its characteristics

The International Telecommunication Union (2012) proposes a standardized definition for IoT, emphasizing the interconnectivity of physical and virtual entities using available information and communication technologies.

However, the definition of IoT appears to be disputed with multiple different descriptions of the concept available in literature (Atzori et al, 2016; Wortmann & Flüchter, 2015). Atzori et al (2010, Figure 1) consider there to be alternative vision-based definitions in literature that can be divided into three main themes. The first one emphasizes the word ‘things’, focusing on the objects that can be connected into the network. The second one underlines the word ‘internet’, revolving around the specific technologies applied to IoT. The third school stresses the semantics for IoT, centering their definition on the data acquisition and storage that can be achieved using the network.

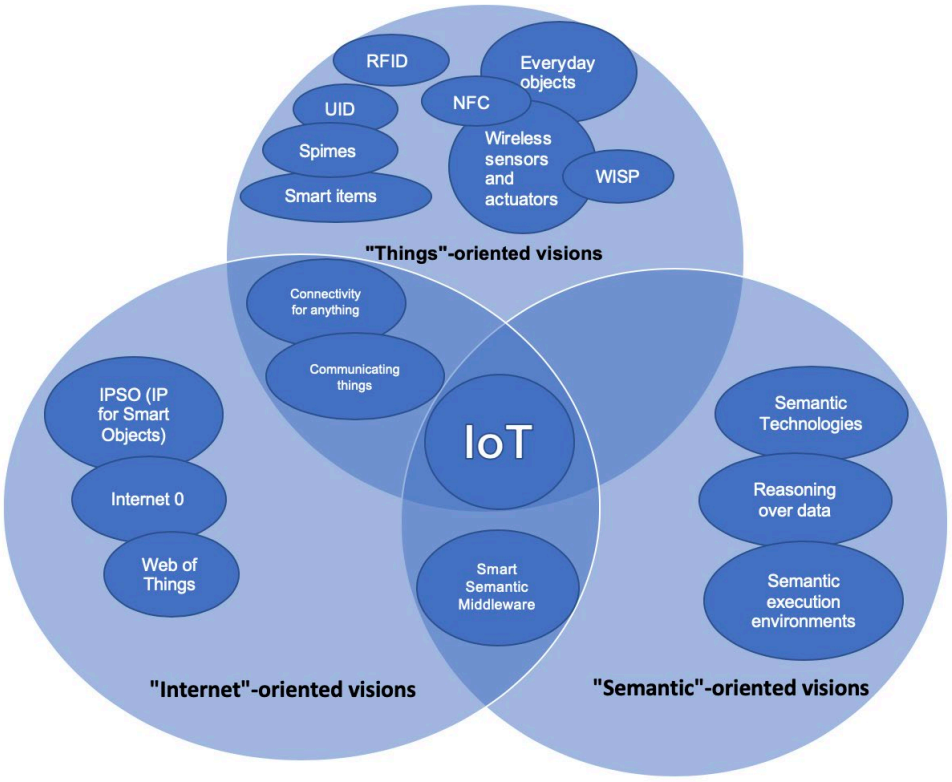

Figure 1: The different visions of IoT: a paradigm (Atzori, 2010).

Porter and Heppelmann (2014) on the other hand raise the issue of term ‘internet of things’ being redundant given how it might make it more difficult to understand the concept of connecting physical and digital objects, and constantly evolving solutions. They propose the term ‘smart, connected products’ instead to avoid this type of ambiguity. The dispersion of the common term cannot be denied though, as a Google Scholar search produces more than 3 million results with the keyword ‘internet of things’, which is why the concept will be referred to as ‘IoT’ in this paper for the sake of clarity.

Taking the variety of different visions into account, it could be beneficial to look into IoT from the perspective that suits the area that is being studied. What is to be investigated in this literature review is what type of an approach would be compatible with the research topic in hand: IoT from the service business point of view.

2.2.1. Industrial IoT (iIoT)

There is a set of features that distinguish industrial IoT (iIoT) and consumer IoT (cIoT) from each other (Nguyen & Simkin, 2017; Porter & Heppelmann, 2015; Palattella et al, 2016). The key element in iIoT is the automation, as companies combine Information Technology and Operational Technology to improve different aspects of their processes such as services and manufacturing (Palattella et al, 2016). The businesses employing IoT have large capabilities in enhancing data-based decision-making (Kaur & Sood, 2015; Tien, 2017) but the potential applications of the paradigm need to be evaluated case by case to avoid vulnerabilities that may cause harm in the industrial setting (Boyes et al, 2018).

In hotel business, customer experience improvement is not the sole aspect firms are looking to improve by investing in IoT, as iIoT solutions are used for resource-saving practices in energy management for instance (Hartman et al, 2018; Chen, 2019). This type of efficiency in energy consumption does not only save the environment, but also has a high potential to function as a pulling factor for the increasingly corporate social responsibility (CSR) aware customers (Chen, 2019).

Energy solutions of hotels equipped with IoT may have a multitude holistic benefits perceived by customers. Taking the aforementioned evidence into account, the ROI of IoT applications may be significant in a number of ways. The information provided by Chen (2019) about the increasing weight of environmental performance in customer purchase decision-making is crucial when considering the future of smart buildings and IoT services. Looking from a marketing perspective, these implications could prove to be very potential for service business if consumers consider IoT solutions environmentally friendly and use them as a criterion for their choices regarding accommodation during their trips.

However, one underlying problem still stands and opens doors for future research: the issue with investing on IoT purely for environmental reasons is the lack of evidence regarding the long-term energy savings in living spaces (Hargreaves, 2018), which according to Kyriakos et al (2018) is resulted by the loss of transparency

and communication between IoT software and hardware developers. Therefore, what should be determined in later studies is the extent to which the solutions provide energy resource savings.

2.2.2. Consumer IoT (cIoT) and the emergence of smart homes

As the emphasis of the study in hand is in consumers and their thoughts on IoT, background information of the solutions available for the consumer market is relevant to be assessed.

Contrary to the iIoT, consumer IoT (cIoT) as a concept covers the different smart, connected solutions available for individuals to use in various settings with diverse benefits associated into it (Hoffman & Novak, 2015; Hsu & Lin, 2016; Mani & Chouk, 2018). The attributes in common with all cIoT solutions are considered to be the convenience and saved resources, such as time and money, they provide to the user (Hsu & Lin, 2016; Palattella et al, 2016).

A recent phenomenon in cIoT studies has been the emergence of smart home technologies (SHT) and their implications to consumers (Risteska Stojkoska & Trivodaliev, 2017; Hargreaves et al, 2018; Wilson et al, 2017; Darby, 2018). The concept smart home, just like its main element IoT, has multiple definitions in literature (Darby, 2018). These definitions tend to be divided into two main categories: one class emphasizes ‘smart home’ as a home with smart devices such as automated lights and doors to increase different qualities of living, and the other focuses on the implications smart home technologies have on the building and underlying functions such as energy consumption (ibid).

The increasing interest in smart homes and their general development have their own effect on service businesses. Beldona et al (2018) studied the impacts that technological standards at the home of the customer has on their expectations of the hotel room they are staying in. The results show that hotels, especially those catering customers with more developed devices in their personal use, should adopt

technological advancements early to avoid dissatisfaction. This is because the level of technology has a notable effect on customer experience. Therefore, as mentioned by Beldona et al (2018), the firm should place themselves towards the left end of the Technology Adoption Life Cycle, proposed by Moore (1999, Figure 2).

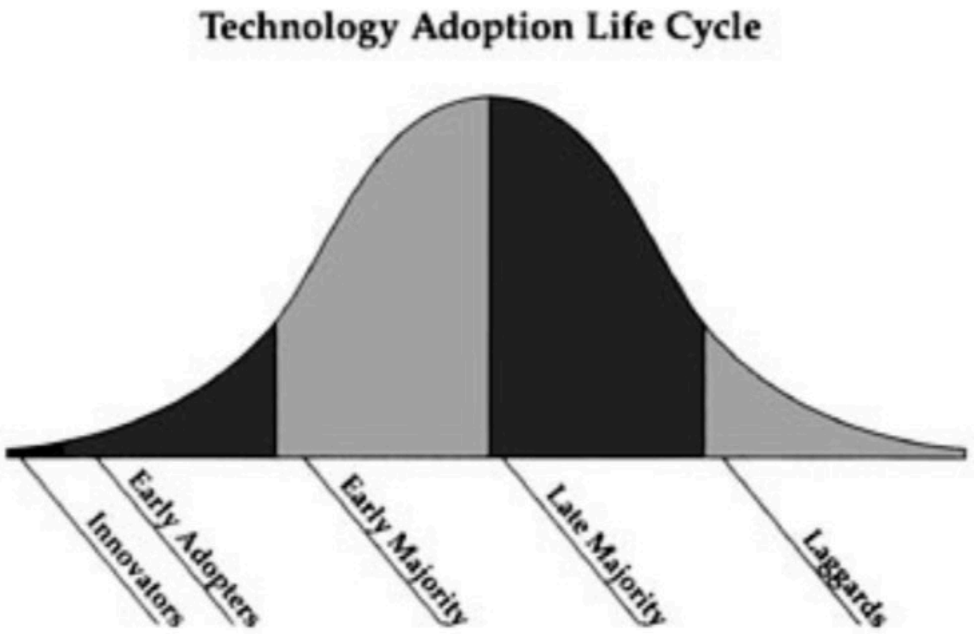

Figure 2: Technology Adoption Life Cycle by Moore (1999).

The study and the cycle provide a strong argument for a hotel to invest in IoT in-room technologies, but what needs to be determined is whether customers spend enough time in their rooms to perceive substantial value generated by solutions that are inside the room. After all, hotels can be considered to be temporary places for living, whereas at the home of the customer different applications can generate value constantly.

2.2.3. Threats of IoT

As discussed, IoT may save energy for companies, and time and money for individuals (Palattella, 2016) but what has to be taken into account when investigating potential implementations is the variety of issues that the paradigm is still considered to suffer from (Alaa et al, 2017; Boyes et al, 2018; Ng & Wakenshaw, 2017; De

Cremer et al, 2017). IoT is considered to require significant consumer demand in order for it to succeed (Palattella, 2016). Therefore, the concerns that potential customers might have regarding it need to be addressed carefully. Some of the notably often mentioned barriers of smart home technologies are costs, data privacy and safety issues, and the lack of suitability for the use of the consumer (GfK, 2016; De Cremer et al, 2017; Hoffman & Novak, 2018; Hargreaves et al, 2018; Risteska Stojkoska & Trivodaliev, 2017; Alaa et al, 2017).

Multiple studies underline the aforementioned issues in the smart home context but how do the problems position in the minds of hotel customers? What should be investigated further by hotel businesses is whether benefits of IoT solutions perceived by guests make up for the negatives present, namely increasing nightly rates, data privacy, and functionality issues.

2.3. Hotels as service platforms

The next step in this literature review is to study the nature of the hotels to fully understand the demands consumers have during the different phases of their trips. The acquired information will provide a basis for research on a service business as an IoT platform. Understanding hotel business is fundamental in order to investigate the types of functions that IoT could improve during the customer journey.

2.3.1. Service quality

Service quality is considered to be one of the key factors to generate customer satisfaction, leading ultimately to customer loyalty and retention (Wu & Ko, 2013; Rungsrisawat, 2016; Yang et al, 2011). Quality must also be adapted to meet the demands of customers (Blesic et al, 2011). Therefore, the important aspect in business is to remember is that customer feedback should be constantly studied and received to stay up-to-date with the trends in service offering such as technology, as proposed by Beldona et al (2018).

Measuring service quality can be a difficult task due to the abstract nature of it. One technique that is being used is the observation of numbers on returning customers, which often is a sign of service quality and customer satisfaction (Blesic, 2011). Alternative way to conduct research on the matter is by looking to the gap between customer expectations and satisfaction: the satisfaction should be more significant than the expectation in this case (Rungsrisawat, 2016).

IoT in hotels does have implications on service quality. As a range of hotel functions are becoming automated and powered by devices connected into the network, the contact between humans decreases. The era of self-service technologies is emerging and what has to be taken into account is how consumers view the change from human interaction to self-service, as stated by Park (2018). At their best, automation can result in convenience and savings but the problems with functionality can cause irritation and ultimately dissatisfaction (see Hargreaves et al, 2018).

2.3.2. Amenities

Hotels invest largely in in-room technologies and other amenities, which are proved to improve customer satisfaction (Cobanoglu et al, 2011; Beldona et al, 2018; Dev et al, 2018). However, some of the amenities can be considered redundant, as suggested by Dev et al (2018) in their study comparing their expected and actual use in hotels. The research shows that guests actually tend to overpredict their use of amenities: a phenomenon which may prove to be problematic for further research on IoT solutions. In this sense, the value perspective makes respondents think more of their needs and benefits, which may decrease the number of errors in the process.

2.4. Perceived value

The creation of superior customer value is considered to be one of the major success factors for businesses (Porter, 1980). Therefore, a company has to take into account different types of values when designing their value proposition. One familiar type, customer value, is defined as the perceived benefits the person gets in return to their purchase of a good or service, but it does not necessarily equal customer satisfaction (Lai, 1995). The meaning of consumer values on the other hand is deeper and does not purely concentrate on the transactional value perceived. Consumer values are a set of inner needs that benefits of a product can satisfy if the person considers the subject to be desirable to fit in them (ibid).

El-Adly (2018, Table 1) examined perceived value dimensions in different contexts and proposed a general model for hotels that examines the relationship between perceived values, customer satisfaction and customer loyalty.

Self-Gratification	Improvement in mood and relaxation, decrease in stress and tension
Aesthetics	Perception of visual elements
Price	Utility in return to the sum paid
Prestige	Status symbolism
Transaction	The excitement derived from a bargain
Hedonic	Fun and enjoyment
Quality	Reliability and superiority in service terms

Table 1: Hotel Perceived Value Dimensions and their descriptions (El-Adly, 2018).

However, a more concise set of dimensions could function better in the context of this study. The limitation with the dimensions of El-Adly (2018) is that they are modified to assess hotels as entities, and it may not be as applicable on specific amenities used in those entities. Holbrook (2006, Table 2) offers a more generic overview of the types of customer value, which could be applied to a product or service of any kind.

Economic value *Self-oriented, extrinsic*	Means to the own objectives of consumers (efficiency, excellence, functionality)
Hedonic value *Self-oriented, intrinsic*	Pleasure in consumption experiences (fun, aesthetics)
Social value *Other-oriented, extrinsic*	Status-enhancement, esteem-evoking possessions
Altruistic value *Other-oriented, intrinsic*	Ethical desirability

Table 2: Typology of Customer Value (Holbrook, 2006).

This summarized typology could prove to be conveniently adaptable to studying the nature of values in IoT-powered service business, as this research attempts to accomplish.

2.5. The potential role of IoT in hotels

The research conducted in this review implies that the different IoT solutions in hotels have not been discussed extensively in academic literature yet. There is a considerable gap in information regarding the types of values IoT can generate to improve the stay of the guest, most likely due to the novelty of the technology in the industry. The findings of the survey conducted by PwC (2017) imply however that up to 80 percent of the participating hotel firms are planning to invest in IoT solutions by 2020.

2.5.1. Instances of IoT applications in hotel premises

IoT solutions are currently mostly implemented by larger hotel chains that can afford to experiment with them in one of their numerous premises. These applications vary by attributes and stages in which they contribute to the stay of the guest.

The Dutch citizenM has implemented a range of IoT-powered services to its hotels. For example, their Amsterdam Schiphol Airport hotel has self-check-in machines in the reception and their rooms are equipped with iPads that can control the surroundings of the guest, including but not limited to the TV, lights, and even curtains (citizenM, n.d.).

Nordic Choice Hotels have massive ideas for implementing IoT or as they call it, combining digital and physical into 'phygital' (eBerry, n.d.). The company is developing a digital, Amazon Alexa-based assistant that would be native for all of the different hotels in their portfolio, with plans to open new facilities without physical receptions (Turula, 2017).

In the US, the global giants Hilton and Marriott have entered the competition together as the pioneers of the scheme (Ting, 2017). Hilton has already launched the concept in a number of their hotels (Hilton, 2018), whereas Marriott according to the most recent news has stayed in the beta testing phase to ensure the seamless experience in their future rooms together with Samsung and Legrand (Marriott, 2017). Hilton names the Connected Room as an important part as their sustainability strategy, which ought to halve their environmental footprint (Hilton, 2018).

The variety of consumer IoT implementations by Hilton in the Connected Room concept could be partially used in the research and mapping process, given that they are already tested in real conditions. The selection of such services is reachable through the smartphone app of Hilton Honors (n.d.) and include:

- Pre-trip room selection and preferences
- Automatic check-in
- Virtual keycard
- Tv remote
- Lights control
- Thermostat control

For the purpose of this study, different IoT applications will be chosen to be assessed. Therefore, Table 3 showcases brief examples of potential benefits the different solutions may have in various stages of the trip, and how they can be positioned in the Holbrook (2006) value dimensions.

	Pre-trip	**Arrival**	**During-trip**	**Departure**	**Post-trip**
Virtual keycard	Awareness of the existence (economic), less plastic objects: sustainable (altruistic)	Convenience when entering the room (economic)	Convenience when entering the room (economic)	Time savings (economic)	
In-room AI assistant (e.g. Amazon Alexa)	Awareness of the existence (economic), prestige of the new innovation (social)	Personalization when entering the room (economic), novelty (hedonic, social)	Convenience: centralized controls for room functions (economic), fun (hedonic), prestige (social)	Convenience in the departure process: e.g. taxi bookings (economic)	Prestige, self-gratification and pleasure (social, hedonic)
Self-check-in and check-out (e.g. machines in the hotel or own mobile)	Awareness of the existence, perceived convenience (economic)	Convenience (economic)		Convenience (economic)	
In-room device for room control (e.g. iPad)	Awareness of the existence generates value (economic)	Novelty (hedonic, social)	Convenience: controls for room functions (economic), fun (hedonic), prestige (social)		Prestige, self-gratification and pleasure (social, hedonic)

Table 3: Hotel IoT applications: potential benefits and types of value (Hukkanen, 2019).

The findings from the table suggest that for example an AI assistant that is compatible with the different functions in the room such as lights, thermostats, TV and the mobile phone of the user (Turula, 2017) could provide a broad range of different values. The variety of benefits can also be considered to be significant, which is why it could potentially be a valuable companion for the guest throughout the trip.

The applications seem to provide the most in terms of economic value but given that households do not have such solutions often, a novelty aspect with social value is involved (Beldona, 2018). Altruistic value is not present in a number of the examples.

2.5.2. Research gap and propositions

As mentioned at the beginning of chapter 4, the subject area lacks academic research at the moment. There is no clear understanding on what types of solutions generate superior perceived value to customers, which would be crucial especially for smaller hotels to know to understand the demands of their potential guests at different stages of their trips. Whether the value is generated before, during, or after the trip, or inside or outside the room are questions that this literature review has provided a basis for.

Following propositions are formed for analysis based on readings in this review:

> *P1: Social value is the most significant type of perceived value for guests.*
> *P2: IoT solutions do not provide superior perceived value during the stay but rather in the transition stages.*

2.6. Conceptual framework

A conceptual framework is formed to clarify the research process and rationalize the use of methods. The framework pictured in Figure 3 is based on the customer value dimensions

proposed by Holbrook (2006), and the customer goes through five stages of the trip, using features of IoT applications assessed in Table 3. During each phase, the guest perceives value in the dimensions symbolized by the ring.

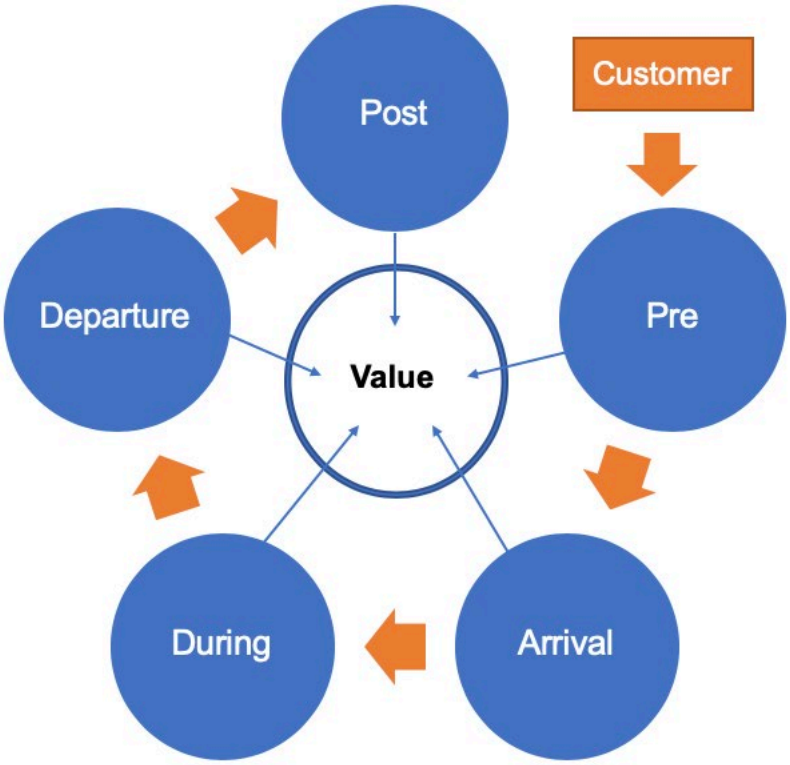

Figure 3: Conceptual framework (Hukkanen, 2019)

3. METHODOLOGY

The study, as described in the exploratory literature review, consists of two levels that are investigated: the stages of the trip, and the value dimensions suggested by Holbrook (2006). As the attention of this study is on the hands-on experience of the hotel guest, the recognized stages for the research were reduced from the original five to three different phases of the journey, pictured in Figure 4. This arrangement maintains the focus in the actual customer interface, while the report still has a great amount of depth.

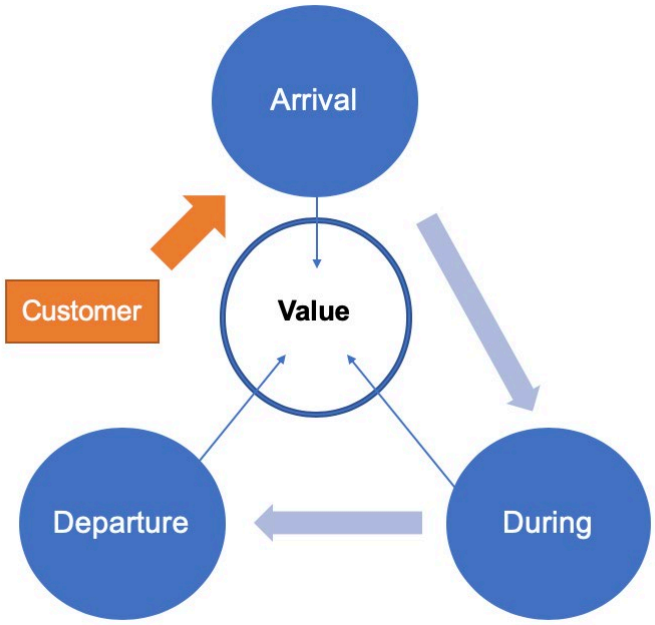

Figure 4: Modified framework for the study (Hukkanen, 2019)

3.1. Survey design

In order to observe the cycle pictured in the modified framework above, a survey was chosen as a source of information. The survey was divided on five pages. The first section was filled with questions regarding the traveler profile of the respondent: frequency of hotel visits, time spent in the hotel room on a daily basis, and hotel type. The next three pages were

structured using two different types of survey items, consisting of 7-point Likert scale statements that measure the different values of the respondents. The second item type that was used was a set of open questions, which would let the consumers elaborate on their thoughts regarding their hotel trips. Each of the pages had four statements and one open question, making the survey design as convenient as possible to the respondent. The last page was for demographic questions, including age, nationality and gender.

3.1.1. Survey statements

The statements were formed using features of IoT applications described in Table 3. Each of the features had a stage of the trip and a value dimension associated to them. The responses to the statements would later in the findings section of this paper indicate what the significant stages and values are.

Value dimension	Stage	Statement
HV	2	I enjoy using voice recognition to control my devices (e.g. Apple Siri, Google Assistant).
EV	3	I prefer having an automated check-out process without human interaction if it saves my time.
SV	3	I like to talk to my friends about my accommodation after the trip.
AV	2	It is important to me that the hotel is using innovative technologies to save energy.
EV	1	It is important to me to have a a fun, interactive check-in process rather than a fast, automated one.
SV	1	New technologies make me feel superior to people with older technologies.
SV	2	I like sharing pictures of a hotel room I am happy with.
AV	3	It is important to me that the hotel benefits from the data I provide during my stay.
EV	2	It is important to me to be able to control the in-room lights and temperature of the room from my hotel bed.
HV	1	It is important that my hotel room is homely when I arrive.
HV	2	It is more fun to order a taxi online than get one by calling.
AV	3	It is important to me that other visitors benefit from the data I provide to the hotel during my stay.

Table 4: The statements in the survey with their associated Holbrook (2006) value dimensions and trip stages (Hukkanen, 2019)

The stages follow the chronological order, beginning from 1, arrival, and ending at 3, departure. The abbreviations in the first column correspond the following value dimensions:

- HV: Hedonic value
- EV: Economic value
- SV: Social value
- AV: Altruistic value

As an example of a combination of these factors in a statement: the first statement observes hedonic value, the enjoyment that a consumer feels in utilizing voice recognition to control their personal devices. This can be directly associated with an Amazon Alexa-powered in-room assistant, which the guest naturally uses in the during-stage.

3.1.2. Open questions

The open questions in Table 5 were written to make the customer reflect on their past hotel experiences and find improvable parts in them. The purpose was also to explore the characteristics that consumers find relevant to be present in their stay.

Question	Options
How would automation and self-service improve your hotel visits?	Free text
What is important for you when you check in to a hotel?	Free text
What are the things that you enjoy about staying in a hotel?	Free text

Table 5: The open questions in the survey (Hukkanen, 2019)

The first question assesses the attitudes and experiences of consumers on occasions in which they do not interact with a human but rather are required to rely on technology during their hotel stay. IoT can be leveraged in self-service check-in solutions for example, as the network can be used to guide the journey of the customer, in a similar way as airports and airlines in collaboration are doing (Sprint Business, 2018).

The second question regards the check-in process. Its purpose is to recognize various trends in consumer preferences. It also reveals attitudes towards automation in the hotel, which may for example be negative in the case the respondent underlines the importance of human interaction.

The third question is a general open item for respondents to reflect on their experiences: what they find the most enjoyable when they stay in a hotel. The

purpose of the item is to expose ideas that consumers appreciate: a value-based approach that can later be linked to IoT solutions.

3.2. Demographics of the study

The survey was distributed to students from various major subjects of Aalto University School of Business through email. Students were chosen as the target group, as they are a part of the clientele that will be predominantly using hotel services in the future, after their graduation. The purposes of the trips will vary from business to leisure.

Also, investigating a more diverse variety of consumers would have necessitated a larger sample from various age groups and nationalities. It would have required a substantially longer analysis process, which could have proven to be too broad for this thesis.

4. ANALYSIS AND FINDINGS

This section of the paper will analyze the results of the survey and provide suggestions based on the data. It will use a three-way approach, first assessing the information from the perspective of the value dimensions, then analyzing the material from the point of view of the different stages, and finally the trends that arose from the open questions of the survey.

The survey received 43 responses, of which 58% or 25 respondents were males, 37% or 16 were females, and 5% or 2 individuals preferred to not specify their gender. The consumers that took part in the survey were primarily from Finland (86%, 37), but there were also 3 from Vietnam and individuals from three other countries. There were no clear differences between nationalities, which is why the factor will be disregarded in this study. The ages did not vary significantly, as all the respondents were within the range of 19 and 24 years, median being 21 years of age.

The frequency of hotel visits among the respondents was distributed mostly between 1-2 times (49%) and 3-5 times (35%). 9% had stayed 6 or more times, and only 3 indicated that they had not been a hotel guest within the last year. Nearly every respondent (96%, 41) answered that they stay in their rooms 2 to 4 hours per day, which suggests that it will not be a factor that affects the analysis.

When the question adapted from Beldona et al. (2018) on the typology of preferred hotels (Figure 5) is observed, it can be seen that the respondents were divided between the three lower-quality places. In the study conducted by Beldona et al, it was concluded that the anticipations of the level of in-room technologies is related to the level of income and the hotel type. According to the research, consumers that are richer in financial terms and stay in lodges of higher quality tend to have higher expectations when it comes to the guest technologies.

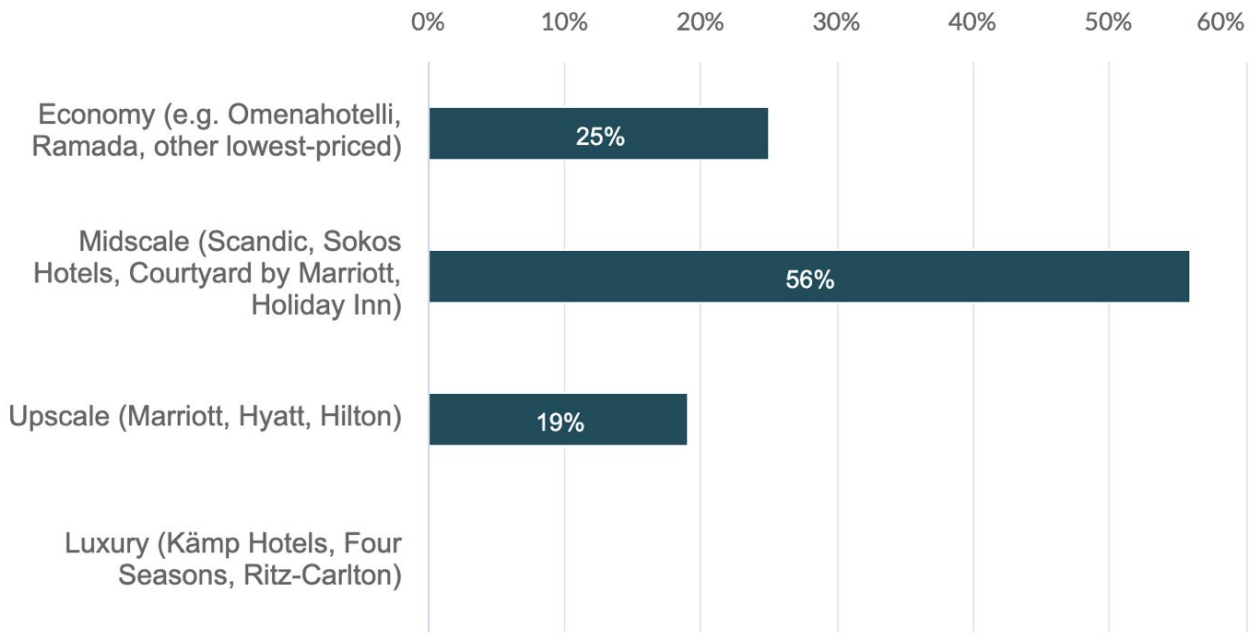

Figure 5: Preferred hotel types of the respondents, adapted from Beldona et al. (2018) (Hukkanen, 2019)

4.1. Value dimensions analysis

This section of the paper will analyze the value dimensions present in the study individually. The main purpose of the part is to investigate to what extent the results support the proposition presented in the literature review:

P1: Social value is the most significant type of perceived value for guests.

The first indicator that is being observed in the analysis is the average total score of the value dimensions. The total score is generated by first taking each single response on a statement and adding the given scores of individual respondents together. Then an average is calculated from the total scores of the statements. For example, if the 43 respondents would all give a score of 5 on a statement, the total score for it would be 5*43=215. The three statements in a value dimensions could have scores of 215, 185, and 200. Their average total score would thus be 200. The scores imply the extent of importance of each value dimension to customers.

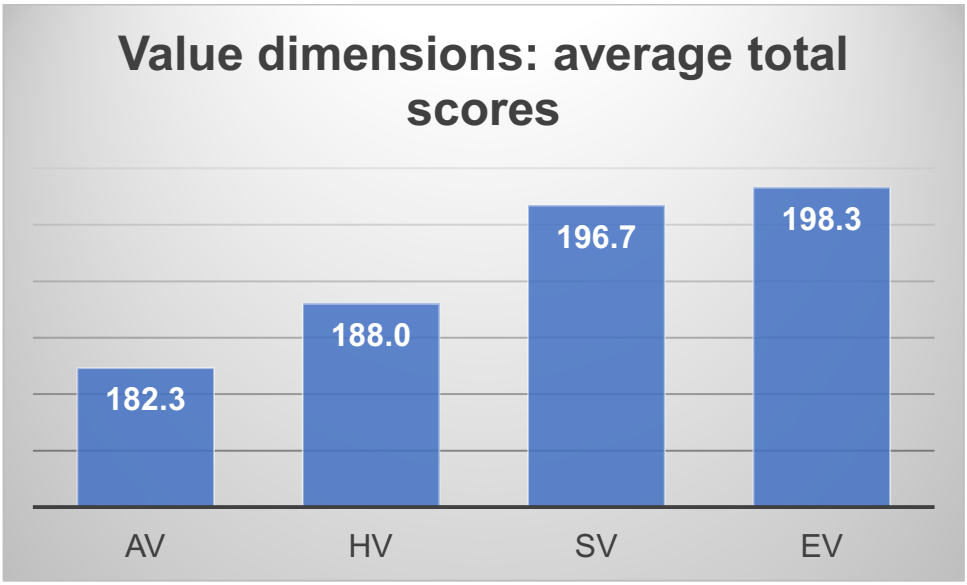

Figure 6: The average scores of value dimensions (Hukkanen, 2019)

Figure 6 shows each of these totals, indicating that in fact economic value has the highest average score out of all the dimensions, followed closely by social value. This measure suggests that the results do not support proposition P1. However, to investigate the phenomenon further, each of the dimensions will next be assessed according to the order shown in the figure above.

4.1.1. Altruistic value

The altruistic value dimension encompasses the different ways a customer views a product or service can contribute to greater good, or how the 'virtue is its own reward' (Holbrook, 2006). In the context of this study, the altruistic value lies in perceived environmental benefits and data acquisition achieved with IoT.

	It is important to me that the hotel is using innovative technologies to save energy.	It is important to me that the hotel management benefits from the data I provide during my stay.	It is important to me that other visitors benefit from the data I provide to the hotel during my stay.	
Total score	215	160	172	**182,3**
Average	5,0	3,7	4,0	
Median	5	3	4	
Standard deviation	1,4	1,5	1,5	

Table 6: Altruistic value statistics (Hukkanen, 2019)

The average score for altruistic value items is the lowest out of all dimensions. As it could be hypothesized, the respondents have appreciated primarily the potential innovative technologies, including IoT, have in contributing to energy savings. With the large emphasis that environmental issues have in media, sustainable tourism has enjoyed increasing popularity among travelers (He et al, 2018), which is also reflected by the results in this study.

The two other statements were compiled to observe the communal effect IoT-generated data and its sharing may have among customers of a company. The result here was also expected, as the consumers considered it more important that their counterparts would benefit from the information rather than the corporate. However, the difference is not large, which indicates that loyalty to a firm can also be an important aspect to the respondents: some want the data to assist the company in developing their processes.

4.1.2. Hedonic value

Hedonic value, according to Holbrook (2006), represents ‘pleasure in consumption experiences.’ This includes for example the enjoyment that a customer feels when

contemplating the appearance of a product, or when they 'have fun' carrying out an action. The statements for this dimension, shown in Table 7, observed the level of pleasure perceived in various actions connected to existing applications of IoT.

	It is important that my hotel room is homely when I arrive.	I enjoy using voice recognition to control my devices (e.g. Apple Siri, Google Assistant).	It is more fun to order a taxi online than get one by calling.	
Total score	237	109	218	**188,0**
Average	5,5	2,5	5,1	
Median	6	2	5	
Standard deviation	1,2	1,6	1,7	

Table 7: Hedonic value statistics (Hukkanen, 2019)

The highest score was achieved by the statement regarding homeliness. Different IoT solutions can potentially be used to create the feeling of being at home (Turula, 2017; Beldona, 2018), which is why the finding may be significant. The total score for the item is the highest in the survey.

AI-based personal assistants have become common in smartphones, and they are currently being introduced to hotel guests in the form of Amazon Alexa, for instance. The respondents of the survey showed clear negativity towards the voice recognition technology. In fact, the score is the lowest for an individual item in the survey. The sample also regarded the option generally considered more convenient for ordering transportation, an online reservation, more preferable.

4.1.3. Social value

The social value dimension entails the sense of prestige customers feel when using a product or a service (Holbrook, 2006). In other words, this dimension assesses how consumers consider their status to be enhanced. The items under this type of value

achieved the second-highest score in the survey, which does not support the initial proposition for value priority among customers. Table 8 indicates the distribution between the statements.

	New technologies make me feel superior to people with older technologies.	I like sharing pictures of a hotel room I am happy with.	I like to talk to my friends about my accommodation after the trip.	
Total score	183	186	221	**196,7**
Average	4,3	4,3	5,1	
Median	4	5	6	
Standard deviation	1,7	1,7	1,3	

Table 8: Social value statistics (Hukkanen, 2019)

The respondents emphasized their tendency to discuss their hotel experiences post-trip: the score for the item is the second-highest in the survey with a low standard deviation. This may be beneficial for IoT in case solutions involving the technology are a part of the discussion after the journey. Customers also like taking photos of the rooms that make them satisfied, which can be considered to contribute significantly to the social value.

The item that assesses the pride that customers feel when using developed technologies also has a considerably high total, which may be a sign of tangible IoT solutions succeeding in attracting the attention of customers. It can be implied that this holds true especially given that the solutions are still in the novelty phase in the hospitality industry.

4.1.4. Economic value

Economic value corresponds extrinsic, self-oriented qualities such as efficiency and excellence (Holbrook, 2006). The respondents placed the most optimism towards it, as the dimension had the highest average score. However, the items had stronger standard deviations than numerous others, which implies that consumers in the population are divided in terms of opinions, as shown in Table 9.

	It is important to me to have a a fun, interactive check-in process rather than a fast, automated one.	It is important to me to be able to control the in-room lights and temperature of the room from my hotel bed.	I prefer having an automated check-out process without human interaction if it saves my time.	
Total score	172	203	220	**198,3**
Average	4,0	4,7	5,1	
Median	4	5	5	
Standard deviation	1,7	1,6	1,8	

Table 9: Economic value statistics (Hukkanen, 2019)

In this case the opinions are related to time-saving, automated processes. The consumers surveyed considered efficient, convenient solutions to be central to them. The debate between those that prefer human interaction and those that appreciate the promptness of self-service does continue given the highest standard deviation in the survey. This phenomenon is present in both, check-in and check-out ends of the spectrum.

The finding regarding the favorability of economic value among respondents does not support proposition P1.

4.2. Stages analysis

After assessing the items from the value perspective, this section includes an overview on the results regarding the different stages of the trip. IoT solutions can enhance the journey at various times, which is why it is relevant to investigate how the outcome aligns with the proposition P2:

P2: IoT solutions do not provide superior perceived value during the stay but rather in the transition stages.

According to the averages, the transition stages, consisting of the phases before and after the actual time of stay have the highest potentials for value-generating IoT, with the arrival stage scoring highest.

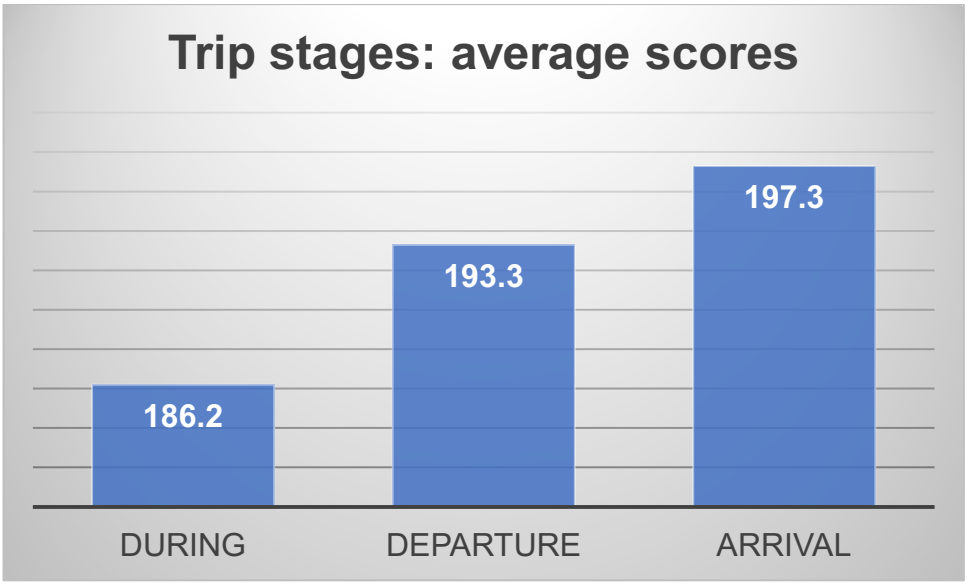

Figure 7: The average scores of trip stages (Hukkanen, 2019)

In order to understand the constructs behind the result, it is relevant to study the customer journey throughout chronologically. This way it can be determined what type of values are involved and to what extent they are actually present in each of the stages.

4.2.1. Arrival to the hotel

The respondents placed a strong emphasis on the first stage of the trip, arrival. This is where companies such as Hilton have achieved what can be considered to be the most innovative impact on customers with IoT solutions (Hilton, 2018). The perceived values of respondents in this stage support the nature of the various features that can be established using the technology. The values of respondents support proposition P2.

	It is important to me to have a a fun, interactive check-in process rather than a fast, automated one.	New technologies make me feel superior to people with older technologies.	It is important that my hotel room is homely when I arrive.	
Total score	172	183	237	**197,3**
Average	4	4,3	5,5	
Median	4	4	6	
Standard deviation	1,7	1,7	1,2	

Table 10: Arrival statistics (Hukkanen, 2019)

4.2.2. During the stay

The during-stage consists of five different items in altruistic, economic, social, and hedonic value dimensions. The scores for individual items range from 109 to 218: the average can be considered to be slightly deflated because of the low score on AI applications.

	It is important to me that the hotel is using innovative technologies to save energy.	It is important to me to be able to control the in-room lights and temperature of the room from my hotel bed.	I like sharing pictures of a hotel room I am happy with.	I enjoy using voice recognition to control my devices (e.g. Apple Siri, Google Assistant).	It is more fun to order a taxi online than get one by calling.	
Total score	215	203	186	109	218	**186,2**
Average	5	4,7	4,3	2,5	5,1	
Median	5	5	5	2	5	
Standard deviation	1,4	1,6	1,7	1,6	1,7	

Table 11: During statistics (Hukkanen, 2019)

4.2.3. Departure from the hotel

For departure, the two highest-rated dimensions score strongest. As mentioned in the altruistic part, the data-related items are not highly rated by the respondents. The results of this stage also support proposition P2, as the values of the respondents align with it.

	It is important to me that the hotel is using innovative technologies to save energy.	It is important to me to be able to control the in-room lights and temperature of the room from my hotel bed.	I like sharing pictures of a hotel room I am happy with.	I enjoy using voice recognition to control my devices (e.g. Apple Siri, Google Assistant).	It is more fun to order a taxi online than get one by calling.	
Total score	215	203	186	109	218	**186,2**
Average	5	4,7	4,3	2,5	5,1	
Median	5	5	5	2	5	
Standard deviation	1,4	1,6	1,7	1,6	1,7	

Table 12: Departure statistics

4.3. Trends analysis

This section of the paper addresses the open questions regarding the preferences of respondents, which were a part of the survey. In order to establish connections to the statements and discover new inclinations among customers, the answers were coded using keywords. The results were organized in a frequency distribution table, Table 13, to investigate the trends further.

	Frequency	Cumulative frequency	Percentage	Cumulative percentage
Bed	7	7	5,7	5,7
Aesthetics	11	18	8,9	14,6
Amenities	12	30	9,8	24,4
Cleanliness	15	45	12,2	36,6
Service quality	19	64	15,4	52,0
Convenience	29	93	23,6	75,6
Speed	30	123	24,4	100,0

Table 13: Trends frequency distribution table (Hukkanen, 2019)

30 respondents out of the total 43 mentioned that the likes of speed, promptness or fast service is important to them. This also strengthens the position of economic value in this study, which has been the most important to the respondents.

Speed was closely followed by another economic value-related trend, convenience, which equals to attributes such as usability and the ease of staying in a hotel. Also, service quality, which can be associated with the ‘quality’ mentioned by Holbrook (2006) did gain attention among the respondents.

Other trends are primarily of hedonic value. There is a clear connection between the items, as for example cleanliness requires service quality and speed, which ultimately leads to convenience generated by the fact that the customer does not have to do the cleaning themselves. What is surprising about the results is the fact that social value does not hold a large role in them. The aesthetics of the room seem to be more of a minor detail to the respondents: a larger emphasis was placed on attributes that assist rather than cause

enjoyment. Only one of the answers explicitly mentioned that luxury amenities are important because of the prestige that they bring to them, and 12 in total said that it is crucial for them that the amenities are of high quality in general. 7 considered the hotel bed to be a luxury of its kind.

4.4. Conclusion of findings

The findings were unexpected in the way how the respondents can be interpreted to be so significantly economic value-oriented. It is to be acknowledged that the results derived solely from the statement items are not fully reliable, but the trends that were present in the open questions provide strong evidence to incline towards this conclusion. The results do not therefore support the proposition *P1: Social value is the most significant type of perceived value for guests.*

The stages were also assessed, and it was remarkable that the respondents did indeed place a larger weight on the actions happening in the stages outside the actual staying part. This indicated that customers do not perceive as much value in the concept of an aesthetic, amenity-filled hotel room, but rather see hotel as a place where the processes are required to work. Therefore, it can be concluded that the findings support the proposition *P2: IoT solutions do not provide superior perceived value during the stay but rather in the transition stages.*

5. DISCUSSION

The results suggest that respondents are currently highly oriented towards convenience, speed, and economic value in general. There are implications that there is a high level of optimism towards the possibilities that smart, connected devices as facilitators can contribute to the experience of individual customers. However, the division between consumers that are ready to rely on self-service and automation, and human interaction is still prevalent in the findings, as suggested previously by Park (2018).

The arising trends align with some of the objectives of cIoT set in literature, which are defined as saving resources and providing convenience to the user of the applications (see Hsu & Lin, 2016; Palattella et al, 2016). Convenience can be seen as an end that is achieved after means match, namely the mentioned speed and service quality. Its pivotal role in creating success for cIoT has been discussed in literature previously (Hargreaves, 2018). This suggests that possible IoT solutions for hotels should first and foremost be convenient to use and provide convenience as an end product.

The feasibility of individual amenities should be reviewed on a regular basis, as also proved by Dev et al (2018). The study showed that some applications of IoT may indeed be redundant for customers: they do not provide significant value to them. In this case, the statement regarding AI-based personal assistants (e.g. Amazon Alexa) gained a low score. This indicates that the respondents do not find the idea of controlling the room functions with AI and IoT viable nor to provide hedonic value. Therefore, it is interesting to follow how solutions of this kind will maintain their popularity growth in the hotel landscape. An example of an early adopter of is Nordic Choice Hotels (Takala, 2017). The attitudes towards such devices should be studied further.

Even though social value did not reach the expected top level of exposure in the responses, it has to be noted that the number is still significant. The study did not have respondents whose preferred hotel type is luxury, which could also affect the perspective on perceived prestige. There is a possibility that social responsibility bias was present, which can often be spotted in surveys (Gittelman et al, 2015). Especially the statement regarding the perceived superiority could have been worded better in order to account for the bias. The

other statements were constructed in the way that they reflect the modern society: consumers enjoy sending photos to their friends and posting them in social media.

There is in fact a possibility that the social value generates from the whole experience rather than from individual factors such as novelty IoT solutions. This can be suggested since the answers to open questions mentioned multiple different attributes that can be associated with social value. It could be that the social value exists throughout the hotel customer journey from pre-trip stage to post-trip. Further research is required to draw conclusions regarding the matter.

What became evident during the analysis was that consumers are still to some extent reluctant about their data being used to develop the processes of a company. One of the strengths that IoT can provide is its data functions, ranging from acquisition to self-maintained analysis (Mani & Chouk, 2018). Therefore, hotel firms could perhaps focus more on conveying what the actual benefits of the network are through marketing. This way the attitude towards the matter could change, and even a sense of community could be generated: customers working together to build a better future experience for themselves.

Another selling point for a company leveraging the energy-saving capabilities of IoT could be the environmental friendliness of the solutions in question. This is exactly what Hilton (2018) stated to pursue by monitoring and minimizing the energy usage of rooms using the technology. With the advent of increasing sustainable tourism, it could be possible to generate excitement around such endeavors. Tourists are after all becoming increasingly aware and interested in matters related to sustainability (He et al, 2018).

The response on the statement about homeliness was the most positive. IoT can in various ways transform a hotel room into a ‘home’, given the prominence of smart home technologies. However, what remains is a level of controversy regarding the actual concept of ‘home’, as it may be subjective. Others consider home to be a place where they enjoy being and become rested, others attribute it to objects, amenities in this context (Beldona, 2018). The finding also emphasizes the importance of a first impression: it is important that the customer is able to settle easily.

The study implies that customers perceive significant value in convenient transitions from one stage to another. Hotels that are making IoT investments should therefore attempt to purchase solutions that contribute to this objective throughout the customer journey.

6. CONCLUSION

6.1. Main findings

The purpose of this study was to discover the types of perceived values that are most prominently present in the hotel customer journey in order to assist hotels in determining suitable IoT solutions to improve it. The objectives for the research were planned accordingly, focusing on the value dimensions and the three different stages of hotel stay from the arrival to departure.

There were two propositions presented, based on the readings conducted in the literature review section. The first one addressed the value dimensions, proposing that social value would be the most significant dimension according to consumers. The findings conversely implied that economic value is perceived to be the most important dimension to respondents, as per the average total scores of each type of value. The open questions in the survey implied that convenience and speed are major attributes that contribute to the economic value. There was optimism towards automation in hotels, but the data suggested that consumers are still divided between self-service and human interaction. There are some limitations to this finding that have to be taken into account, as there is a possibility for a social desirability bias in the responses, which may have deflated the scores given to social value statements.

The second proposition regarded the stages of the trip where IoT could improve the customer journey. The prospect that the readings supported was that customers would perceive the most value in enhancements that would take place in the transition stages, arrival and departure. The statements were initially generated so that they reflect one existing application of IoT in one specific stage. After analyzing the stages, it was concluded that the phases that take place before and after the actual stay are indeed the most crucial when the value perspectives of the respondents are considered. This is mainly because of the inclination that the responses had towards economic value. Convenience and speed are explicitly required to be present in both of the stages.

6.2. Implications for international business

Something that may connect all tourists together globally is the willingness to undergo a seamless hotel experience. Modern hotel firms should therefore review their processes that might have bottlenecks and possibly aid them using applicable technologies. Redundancy however has to be avoided due to the underlying financial and environmental implications.

The value perspective of guests is of utmost importance given for example the increasing demand for personalization. Providing standardized sets of experiences that have been proven to function in the past do not provide the level of perceived value to customers that would be particularly satisfying.

6.3. Limitations

There are limitations that affect the decision-making based on the study. Firstly, the study addressed a minuscule, homogeneous target group, namely students from one university. The respondents were of the same age and primarily originated from Finland. This is why the results cannot be considered to represent a larger population of tourists: data from different demographics is needed to ensure ultimate reliability. The framework may provide a foundation for future research in the industry.

Secondly, the range of IoT applications that functioned as a basis for the statements was rather narrow, and there can be multiple perceptions regarding the types of value each of them generates to the customers. Also, it can be argued that the solutions provide value throughout the customer journey, which contests the framework and the approach that was chosen for the study. The most reliable results could be achieved if the respondents had a hands-on experience with various applications, as the actual values that are present could be verified.

Thirdly, the examination conducted on the quantitative data only relies on a narrow range of methods, which could be further developed using various tools for analysis. This way the

quality and reliability of the data could be ensured. There may be some discrepancies that are caused by the diverse interpretations of respondents, as it could be seen that there was a high standard deviation in multiple items. A 7-point scale can be considered to be too large for a study of this nature, as it allows a larger deviation. A set of interviews could have also functioned in investigating the underlying perceived values and trends.

6.4. Suggestions for further research

Specific IoT solutions could be studied with a modified SERVQUAL method to contribute to the feasibility analysis of technologies further. This could also help in determining what is the value of IoT as an attracting factor for potential customers.

Social value was first considered to be the most significant value present in the different stages of the hotel experience. However, there is a possibility that the value generates throughout the customer journey: a topic area that would benefit from further research.

There was substantial skepticism among the respondents towards voice recognition and artificial intelligence, level of which should be investigated in future studies. This could benefit numerous industries.

The study suggested that convenience and speed are significant attributes for customers in hotels, and it could be determined how those compare in completely different industries.

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APPENDIX A

Bachelor's Thesis survey on smart hotels

This survey functions as a foundation for my Bachelor's Thesis research. The objective of the study is to explore the attitudes of students towards smart solutions in hotel environments. The end result will help hotel firms in moulding their service variety for future needs.

The survey should only take 6 minutes and the responses are completely anonymous.

If you have any questions regarding the survey or the thesis process in general, please contact me through email: topi.hukkanen@aalto.fi

Your input is highly valued!

Best regards,

Topi Hukkanen
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1. How many times have you stayed in a hotel in the past year? *

Valitse

2. On average, how much time do you spend awake in your hotel room per day? *

Valitse

3. Which type of hotel do you visit most often? *

Valitse

Seuraava

Bachelor's Thesis survey on smart hotels

4. Please rate the following statements, 7 being the highest value. *

	1	2	3	4	5	6	7
I enjoy using voice recognition to control my devices (e.g. Apple Siri, Google Assistant).	○	○	○	○	○	○	○
I prefer having an automated check-out process without human interaction if it saves my time.	○	○	○	○	○	○	○
I like to talk to my friends about my accommodation after the trip.	○	○	○	○	○	○	○
It is important to me that the hotel is using innovative technologies to save energy.	○	○	○	○	○	○	○

5. How would automation and self-service improve your hotel visits? *

Edellinen Seuraava

Bachelor's Thesis survey on smart hotels

6. Please rate the following statements, 7 being the highest value. *

	1	2	3	4	5	6	7
It is important to me to have a a fun, interactive check-in process rather than a fast, automated one.	○	○	○	○	○	○	○
New technologies make me feel superior to people with older technologies.	○	○	○	○	○	○	○
I like sharing pictures of a hotel room I am happy with.	○	○	○	○	○	○	○
It is important to me that the hotel management benefits from the data I provide during my stay.	○	○	○	○	○	○	○

7. What are the things that you enjoy about staying in a hotel? *

Edellinen Seuraava

Bachelor's Thesis survey on smart hotels

8. Please rate the following statements, 7 being the highest value. *

	1	2	3	4	5	6	7
It is important to me to be able to control the in-room lights and temperature of the room from my hotel bed.	○	○	○	○	○	○	○
It is important that my hotel room is homely when I arrive.	○	○	○	○	○	○	○
It is more fun to order a taxi online than get one by calling.	○	○	○	○	○	○	○
It is important to me that other visitors benefit from the data I provide to the hotel during my stay.	○	○	○	○	○	○	○

9. What is important to you in the check-in process? *

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Bachelor's Thesis survey on smart hotels

10. What is your age? (In years, e.g. 25) *

11. What is your country of origin? *

Valitse

12. What is your gender? *

Valitse

Edellinen Lähetä