NTNU
Norwegian University of
Science and Technology

Business potential for next generation of hotel experience

Sebastian Jørgensen

Master of Science in Communication Technology
Submission date: June 2017
Supervisor: Harald Øverby, IIK
Co-supervisor: Thomas Jelle, IIK
Jan A. Audestad, IIK

Norwegian University of Science and Technology
Department of Information Security and Communication Technology

Title: Next Generation Hotel Experience

Student: Sebastian Jørgensen

Problem description:

What is the next generation hotel experience, and could indoor maps play an extensive role in this solution? MazeMap have together with partners been able to offer a wide array of solutions within the indoor maps and indoor navigation market. The hotel industry is developing toward an increased usage of digital tools to improve customer experience. The primary objective of this master thesis is to deduce if there is an international business potential for indoor maps and indoor navigation features in the next generation digital hotel solution. In the case where a business potential is confirmed, the secondary objective will be to explore potential business models.

The international business potential will be investigated for local hotel executives and corporate executives within hotel brand management. The investigation will be conducted through a survey, due to the survey's advantages such as its inexpensiveness, its ability in gathering descriptive data, its ability to cover a wide range of topics, and the survey format enables analyzing using a variety of existing software. However, should the survey be unable to uncover in-depth market information, the use of in-depth interviews or observation may be deployed. Important questions will include how the solution can provide value to the customers, and how this value can be monetized. In addition to which indoor maps and navigation solutions are of interest for the customer in a value proposition.

The secondary objective addresses potential business models with the usage of Osterwalders model as a starting point. The main task will be to use creativity and innovation to identify a value proposition and a sustainable business model for which can be proposed toward professionals in the hotel industry. To differentiate and quantify, and furthermore analyze the economical value will become key elements in the construction of a feasible economic model. A basis for comparison can be found in the airline industry, in regard to seat reservation statistics.

The project plan includes the following key elements:
- Design of international survey, "The Next Generation Hotel Experience"
- Design a survey targeting frequent travelers
- Contact of Non-Governmental Organizations working toward hotel industry interest
- Identify potential business models and investigate their viability
- Evaluate and analyse (with statistics) the survey results

Responsible professor: Harald Øverby, ITEM
Supervisor: Thomas Jelle, MazeMap

Abstract

The hospitality industry is growing, at the same time the number of competitors is increasing. The sharing economy and online travel agencies are seizing increasing parts of the profit. In order to maintain the strong position, incremental innovation is an important tool. One of the possibilities for approving the market situation is the implementation of new digital solutions, for example, within mobile applications and booking solutions. In recent years online travel agencies have taken over the online traffic flow, where hotel guests utilize solutions such as Expedia or Booking.com when booking online.

This thesis investigates if indoor map services possess business potential in the next generation digital hotel solutions, and consider if indoor map services can improve the value proposition hotels deliver to its customers. MazeMap is a prominent vendor providing indoor map services to a selection of customers, including governmental institutions and venues such as universities, shopping malls, and hospitals. This thesis utilizes the MazeMap solution and their features as a basis for conducting market research.

The results of the investigation performed in this thesis will be composed into a potential business model. In order to propose a viable business model, an international market survey has been conducted targeting hotel executives in the hospitality industry. The survey gathered 134 responses from 40 countries. The result display that a majority of the respondent, 52.2%, are initially positive or already utilizing indoor maps. To compose an overall impression of economic value and indoor map interest, respondents were asked to specify their willingness to invest and interest toward different indoor map services. Based on the survey results and market research, a potential business model was composed following Alexander Osterwalder's Business Model Canvas.

Sammendrag

Hotellbransjen vokser, samtidig som antall konkurrenter øker. Delingsøkonomien og nettbaserte reisebyråer tar en økende del av overskuddet. For å opprettholde en sterk posisjon er inkrementell innovasjon et viktig verktøy. En av de mulige løsningene for å forbedre markedssituasjonen er implementasjon av nye digitale løsninger, for eksempel innen mobilapplikasjoner og bestillingsløsninger. I de seneste årene har spesielt nettbaserte reisebyråer tatt over internettrafikken, der hotellgjester benytter løsninger som Expedia eller Booking.com når de bestiller via nett.

Denne masteroppgaven undersøker om innendørs karttjenester har forretningspotensial i neste generasjons digitale hotelløsninger, og vurderer om innendørs karttjenester kan forbedre verdiforslaget hoteller leverer til sine kunder. MazeMap er en fremtredende leverandør som tilbyr innendørs karttjenester til et utvalg kunder, inkludert offentlige institusjoner og arenaer slik som universiteter, kjøpesentre og sykehus. Denne oppgaven benytter MazeMap sin løsning og deres tjenester som et grunnlag for markedsundersøkelser.

Resultatet av undersøkelser utført i denne masteroppgaven vil bli sammensatt i en potensiell forretningsmodell. For å kunne foreslå en bærekraftig forretningsmodell har en internasjonal spørreundersøkelse blitt utført, rettet mot ledende personell i hotellbransjen. Spørreundersøkelsen samlet 134 svar fordelt på 40 land. Resultatet viser at et flertall av respondentene, 52,2%, er i utgangspunktet positive eller allerede benytter innendørskart. For å sette sammen et overordnet bilde av økonomiske verdier og interesse for innendørskart, ble respondenter bedt om å spesifisere deres vilje til å investere og interesse for ulike innendørs karttjenester. Basert på resultatene fra spørreundersøkelsens og markedsundersøkelser har en potensiell forretningsmodell blitt utformet etter rammeverket i forretningsmodellen til Alexander Osterwalders.

Preface

This master thesis was written in the spring of 2017 as the final part of my M.Sc. degree in Communication Technology at the Norwegian University of Science and Technology. The thesis is part of my specialization in Digital economy at the Department of Information Security and Communication Technology (IIK), belonging to the Faculty of Information Technology and Electrical Engineering (IE).

I wish to thank my responsible professor Harald Øverby and supervisor Thomas Jelle for their valuable support, guidance and feedback throughout the semester. Furthermore, I would like to thank the respondents of the survey for their vital contribution and constructive comments. Lastly, I would like to thank my proofreaders Anja Beate Andersen and Roar Jørgensen for their great contribution and feedback during the development of this master thesis.

Contents

List of Figures

List of Tables

List of Acronyms

BCR Benefit Cost-Ratio.

CAD Computer-Aided Design.

CAGR Compound Annual Growth Rate.

CRM Customer Relationship Management.

HHonors Hilton Honors Loyalty Reward Program.

ICT Information Communication Technology.

IE Faculty of Information Technology and Electrical Engineering.

IIK Department of Information Security and Communication Technology.

IoT Internet of Things.

ITU International Telecommunication Union.

NGO Non-Governmental Organization.

NTNU Norwegian University of Science and Technology.

OTA Online Travel Agency.

POI Points-of-Interest.

RevPar Revenue Per Available Room.

SLAM Simultaneous Localization And Mapping.

VPN Virtual Private Network.

WLAN Wireless Local Area Network.

WPS Wi-Fi Positioning System.

Chapter 1
Introduction

Digital features and solutions have become vital for the hotel industry in a continuously changing business environment. Several competitors have emerged to challenge the traditional hospitality model. However, the well-established hotel brands are developing the next generation hotel management systems and what will become the next generation hotel experience. In this thesis, it is investigated if indoor maps and accompanying features could become one of the main digital contributors in the next generation hotel experience.

This introductory chapter introduces the thesis motivation and problem context. Furthermore, the research questions are presented, followed by the contribution of this master thesis. The outline is presented at the end of the chapter.

1.1 Problem Context and Motivation

The provided topic for this master thesis was given by NTNU in collaboration with MazeMap. The topic originates from MazeMap's desire to investigate new markets for indoor maps or similar solutions. One of the identified market sectors were the hospitality industry. The increased awareness around indoor maps, smartphone penetration, and an investment friendly environment, are all positive trends and could be an indication for increased demand toward indoor map services. Several of the large hotel brands are currently looking into new digital systems and property management systems [53][26], and this thesis aims to investigate the possibility and interest in including indoor maps in the next generation hotel solutions.

MazeMap started as a venture from a research and development company, Wireless Trondheim, which together with NTNU collaborate to create sustainable ventures from new ideas. MazeMap delivers indoor mapping services, in addition to indoor map based features, such as navigation and digital wayfinding, together with selected partners. The MazeMap solution provides a scalable indoor map engine, which, through the help of machine learning, convert digital floor plans, into full-scale

interactive digital indoor maps. The indoor mapping services have primarily targeted large institutions and venues, for instance, universities, hospitals, conferences and shopping malls. The mentioned institutions and venues have a common interest; The optimal utilization of space. In particular, the focus of this thesis, hotels, aim for high occupancy and room utilization. Increased occupancy translates to higher revenue streams and the optimal use of space can reduce operational cost. Space can be viewed as a valuable and expensive resource for institutions where this is converted to value.

The emerge of Internet of Things (IoT) can pose a number of opportunities for indoor maps. The International Telecommunication Union (ITU) defined Internet of Things as "a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies" [24]. Interpreted in regard to indoor maps, IoT is a tool to bridge the gap between the physical and virtual. Indoor maps enable the display of a physical object in a digital environment. [38] identified location and positioning systems as an important part of the future IoT infrastructure. The increased usage of smart devices, for instance, smartphones and tablets, could result in an increased demand for cost-efficient solutions to confront the escalating need.

Until recently indoor maps have only seen large-scale deployment in the airline industry. The motivation behind the investigation toward the hotel industry is a result of the logical business potential that can be estimated. The world's ten largest brands had in April 2016 a total of 5,829,467 rooms [45]. In comparison to the airline industry, where seating is relatively similar for each plane model, every hotel is unique and would need individual mapping. The implementation of indoor maps could result in both an advantage toward Online Travel Agencies as well as result in new ancillary revenue streams. However, due to several factors discussed later in this thesis, implementation of new innovative technical solutions pose a large challenge for selected hotels.

1.2 Research Questions

This master thesis seeks to investigate the commercial potential for indoor maps and accompanying features in the next generation hotel experience. Then, if the investigation is positive, explore potential business models or how current business models can be altered. To enable understanding and reach the purpose that has been outlined, the objective has been composed into the main research question:

- Do indoor maps and accompanying features possess business potential in the next generation hotel experience?

This master thesis will investigate the use case where indoor maps are utilized during the booking or check-in phase, and with indoor maps as a foundation for other services, such as navigation.

Furthermore, two additional minor research questions have been constructed to narrow down the research approach. In brief, this is related to the short time frame of this master thesis and the magnitude of the selected topic.

1. How viable are the different main features that accompany indoor maps in regards to business potential?

   Indoor maps create a foundation for a selection of features, such as indoor navigation or digital floor plans. Thus, would the selection of accompanying features increase the potential for usage of indoor maps in the next generation digital solution. Parts of the thesis attempt to identify interest from hoteliers and hotel brand executives toward these features.

2. How can a business model be designed or re-designed to provide a viable business model?

   On the basis of Alexander Osterwalder's Business Model Generation framework, the Business Model Canvas, this thesis will attempt to design a viable business model for indoor map and features. With the objective to identify an innovative approach to the value proposition and revenue streams.

1.3 Contribution

The key contribution and originality of this thesis are the global market research targeting the hotel industry directly through executive personnel. The international market survey together with an investigation of enabling future technologies are the fundamental contributors to the development of a potential business model and concluding remarks. The statistics and comments provided from the survey are the basis for discussion regarding the feasibility for indoor map services in the hotel industry.

1.4 Limitations

Although this master thesis reached its objectives, there were some unavoidable limitations. Firstly, the limitations of time have resulted in a small sample size for the survey related to the population size. Therefore, to increase the accuracy of the generalization, the research should have involved more participants at different organizational levels. Secondly, the tool used for sampling was not able to provide

up-to-date information, such that one-third of the samples could not be reached. The inefficiency of the used tool has resulted in added time-consumption and a smaller number of respondents. Finally, the absence of market information and studies has slowed down the thesis progress, especially regarding background research. The available market information has been locked behind payment walls, where several thousand dollars would be necessary to gain access to the material. Parts of different reports and statistics have been published through sites such as Statista, but the available information and numbers are severely limited.

1.5 Master Thesis Outline

This thesis is divided into six main chapters. Chapter 1 introduces and describes the thesis objective through the problem context and research questions. Furthermore, the thesis relevance, motivation, and contribution are briefly touched upon.
Chapter 2 presents the background in regard to technological aspects as well as the current state of the art. Emphasized are the current commercial solutions and various enabling technologies for indoor maps and accompanying features. The state of the art is introduced together with the current prevalence. Additionally, related industries which utilize indoor maps, such as airlines, are given a brief introduction together with Online Travel Agencies, which pose a great challenge for modern hotels.
Chapter 3 briefly introduces the different research methodologies applied during the thesis. The key aspects include the international market survey design and underlying theory, Alexander Osterwalder's model for a business model generation, and the various methods applied when analyzing survey data sets.
Chapter 4 presents the survey question distribution together with metadata, such as response rate and geographical spread. Graphs and diagrams showcasing correlation and interesting relationships between questions are included as well. In addition, results from the utilized data analysis methods mentioned in the methodology are presented graphically.
Chapter 5 presents a potential business model and its feasibility based on the investigation performed in this thesis. The business model is described and designed with the business model framework presented in Alexander Osterwalders works which is further introduced in the methodology and Appendix.
Chapter 6 main theme is the discussion centered around the central research question; if there exist a business potential for indoor maps in the next generation hotel experience. Furthermore, technical difficulties and enabling future technologies will be briefly discussed. Moreover, selected comments submitted from respondents will be examined and discussed. The lack of public available information and research, and how this have affected this thesis investigation is examined.
Finally, Chapter 7 concludes this thesis with concluding remarks attempting to answer the initial research objective. Moreover, recommendations and suggestions

for further work and future research are briefly stated.

Chapter 2
Background

This chapter provides a selection of relevant information and theory in order to introduce the reader to the topics and frameworks employed later in the thesis. In addition, this chapter aims to educate the reader regarding the indoor map technology and the features that may hold high relevance for the next generation hotel experience.
The current commercialized indoor map technology together with features utilizing indoor maps as a foundation will be described. Followed by an introduction to the current indoor map market, its predicted size, and prospect.
Indoor maps represent a minor part in the development of new digital hotel solutions. The reasoning behind the integration of such services are the fierce competition between hotel brands, but also between hotels and Online Travel Agencies, which attempt to capitalize parts of the profit. To further understand how Online Travel Agencies (OTAs) capitalize on hotels, branded or unbranded, their business model is briefly described together with an introduction to the global hotel industry.
Lastly, the airline industry, the only identified highly related industry, together with their use of ancillary revenue is shortly mentioned.

2.1 Indoor Maps

The technology behind indoor map solutions is plentiful and a variety of minor and major companies are attempting to create the leading technology standard. The large investment toward the indoor map industry has been absent until recently. However, after the market reached “maturity”, some of the major technology companies, such as Google and Facebook have begun their development. The issues and opportunities with indoor positioning were identified by Facebook as early as 2014 [39].

Indoor map services in the hotel industry, as well as other industries, are influenced by global trends and factors. The implementation of such services at Hilton Hotels has not immediately led to a large consumer demand nor have their competitors

pursued similar solutions. One of the key issues is the lacking awareness of indoor map and indoor location technology [32]. However, these circumstances are likely to change due to several key market drivers [32].

- Increased usage of smartphones, 36% of the world's population is projected to use smartphones by 2018, from an initial 10% in 2011 [43]
- Inefficiency and inaccuracy with GPS technology indoor [32]
- Indoor maps can function as a reliable assistance to ensure public safety for governments [32]

The following sections introduce indoor map technologies, in addition to the indoor map features that have been identified as relevant for the hotel industry.

2.1.1 Indoor Map Technologies

Commercialized indoor map technologies can be divided into three different groups; manual labor, artificial intelligence/algorithms and Simultaneous Localization And Mapping (SLAM).The usage of manual labor to translate building plans into digital indoor floor plans and maps is both labor intensive and cost demanding. However, manual labor is often used for quality insurance of the result from the other two methods/technologies.

Solutions utilizing artificial intelligence or algorithms use Computer-aided design (CAD) as the foundation for creating indoor maps. Through algorithms, machine learning or artificial intelligence the building design is translated into a 2D or 3D digital map. The usage of such methods result in special properties for the resulting maps, they are searchable and linkable, and can easily be updated provided the CAD files as the basis.

SLAM is a computational problem within robotic mapping, whereas one attempt to construct or update a map of an unknown environment while simultaneous keeping track of ones location within the map. The recent advances in computational methods have resulted in this method finding commercial use. Additionally, further advances in computational methods and formulations of the SLAM problem can be expected. Further increasing the commercial value of the technology. [9] [7]
Mapping with SLAM is done with the help of a sensor device and a radio map is generated. Furthermore, the generated data can be transformed into a 2D or 3D map based on preference [7]. Several existing algorithms solve the problem, however, they struggle in regard to performance and if the device/robot is in motion [7]. The first commercial solution with SLAM for indoor mapping and positioning were introduced to the market in January 2016 by Indoo.rs [40].

The simplicity behind the generation of indoor maps through the use of SLAM has resulted in the expectation that this technology will revolutionize the indoor mapping market. Tests performed by Indoo.rs have demonstrated that a single person can map a building within a day, simply by walking around [40]. The impact of SLAM could drastically change the industry margins and become a game changer.

Figure 2.1 illustrate the three different approaches regarding generation of indoor maps with a SLAM engine. The left picture illustrates the approach to generate a simple radio map, whereas a person registers "key points" while walking around the perimeter. The picture in the middle illustrates a big data approach where the radio map is automatically updated with help from the crowd engine. The right picture illustrates a crowd learning approach where the generated map is created from numerous low-quality crowd collected data. [40]

Figure 2.1: Illustration of commercial SLAM method for generating indoor maps [22]

2.1.2 Indoor Navigation

Outdoor navigation and positioning have until present been realized by utilizing three different technologies. The selected technology will vary depending on the use case and requirements toward accuracy, reliability, and area of effect. [39]

- Cellular: Large area of effect, low power requirements, and high reliability. Cellular positioning depends on the service provider's network infrastructure, and can, therefore, be easily implemented without affecting devices. In spite of the positive characteristics, the accuracy is highly dependable on the concentration of base stations and the positioning method applied. [39]

- Global Positioning System: Global availability and satisfactory accuracy for navigation purposes. However, the system is less accurate in urban canyons due to large building masses shielding toward satellite coverage and buildings reflecting signals, such that a slight delay is introduced to the link between satellite and recipient. [39]

– Wi-Fi: Limited range and therefore often utilized within a city block. Wi-Fi positioning will in many instances augment GPS positioning. The downside with a Wi-Fi only location service is the restriction toward devices, where only Wi-Fi accepted devices will function. [39]

Unfortunately, outdoor positioning technologies struggle when confronted with the necessity to determine floor level. In addition, the construction of large buildings consisting of conducting materials, such as steel, can result in weakened signals or in the worst case, a complete loss of signals. This situation is commonly described as a Faraday cage, an enclosure used to block electromagnetic signals, where reception or transmission of signals to or from an antenna is heavily attenuated or blocked. [33]

Currently, two main camps of indoor positioning technologies are commercialized, non-radio technologies or wireless technologies. Due to the scope of this thesis, the next generation hotel solution, the most dominant and relevant technology for the hotel use case will be introduced from each group.

2.1.2.1 Magnetic positioning

Magnetic positioning as the name indicate rely upon the Earth's magnetic fields and is inspired by animal wayfinding in nature, where magnetic fields enable the animal to locate themselves in relation to their destination. The smartphone is able to detect and respond to magnetic fields in buildings, and with the increasing penetration of smartphones, such a positioning solution becomes more viable. [49] [33]

Every construction has a unique magnetic fingerprint based on how the building materials affect the persistent magnetic field generated by the Earth. These unique patterns or distortions can be specifically assigned to floor plans in an indoor map. Smartphones function as positioning devices due to their magnetic field detection ability and have an accuracy of 1-2 meters. Figure 2.2 illustrates the magnetic fingerprint principle. [25]

2.1.2.2 Wi-Fi-based positioning system (WPS)

WPS is based on Wireless Local Area Network (WLAN) infrastructure and has a number of advantages over its competitors, such as easy deployment, signal stability, and low deployment cost. From a commercial point-of-view, WPS is the preferred solution on the grounds that most buildings and public spaces already are equipped with WLAN access points. Moreover, given that most mobile devices, such as smartphones, have a wireless radio communication network interface (for example Wi-Fi) enabled, protocols which provide positioning estimation are becoming more popular and advanced. In addition, WLAN offers longer ranges than its alternatives, together with the system characteristics as both reusable and scalable. [13]

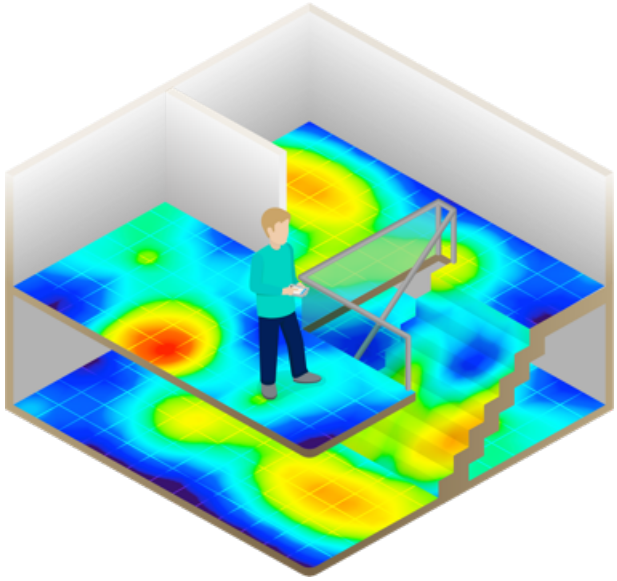

Figure 2.2: Illustration of magnetic indoor positioning [21]

The accuracy of the position estimation depends on the signal strength from the WLAN infrastructure. Unfortunately, positioning systems utilizing WLAN technology possess two main disadvantages. Firstly, the system operates with fingerprints and stored information when estimating location. This results in increased operational costs when a large group of users uses the system. Lastly, a complex indoor environment can drastically affect the signal strength and consecutively the system accuracy. [13]

2.1.3 Digital floor plans

The recent digitization trends have proceeded to transfer physical signage and floor plans to a digital format, an increasing number of institutions, malls and other venues are employing such solutions. The possibility for continuous customization of design and presentation are key elements when optimization customer reach, and the utilization of a digital solution offers the possibility to provide diverse information. For example, a mall can display distinct information if the customer wish to view all venues operating within Food & Beverage or Clothing.

2.2 Indoor map market

The first utilization of indoor maps in a commercial environment for hospitality services appeared in 2011 at a selected few Hilton Hotels [53]. However, the service

did not launch worldwide before July 2014 with an integration toward all devices. Following the successful launch, a number of smaller similar solutions were introduced to the market in 2015 and 2016, at Schani Hotel and GLH respectively.

A recent interview with some of the large hotel brands has not identified indoor maps as a focus area in the development of new digital solutions [53]. However, Hilton the world second largest brand was able to implement such a service in 2014 [58]. The implementation of a new digital solution was made possible due to Hilton's tech-based corporate investment a number of years earlier in a comprehensive property management system [53]. Due to this advantage, Hilton is at this point in time the exclusive large hotel brand offering this degree of customization.

Indoor maps and their creation are predicted to become a major market, MarketsAndMarkets [32] forecast a market size worth USD 23.13 Billion by 2021, from a market size of USD 4.72 Billion in 2016. Resulting in a Compound Annual Growth Rate (CAGR) of 37.4%. The major forces driving the market is a result of three key elements, an increased utilization of smartphones, reliable assistance for governmental institutions to ensure public safety and the inefficiency of location technology in indoor premises. [32]

Indoor maps and navigation tend to be described together, the reason being their complementing ability. The prerequisite for indoor navigation is the existence of digital maps of the building plans. Currently, indoor maps can be found for a majority of public spaces, such as hospitals, exhibition halls, stations, airports, town halls, malls and educational institutions. The key issue is that a majority of the data is proprietory and not available to use in public. In addition, no considerable work have been performed to create a common standard for the technology itself or the generated data. As will be shown later in this chapter, a wide collection of solutions are present in the commercial market. [28]

2.2.1 The Hilton Solution

In August 2014, Hilton Hotels, one of the world's largest hotel brands launched an update to their Hilton Loyalty program (HHonors) application. The update introduced the option for guests to select a specific room from a floor plan using their mobile device or web browser. Thus, being the first large hospitality brand introducing a Choose Your Own Room service. The long-term aim is to enable the service across their 4,000 hotels, covering 650,000 rooms. [58][56][12]

The introduced service offers the functionality where Hilton HHonors members can access their account through a mobile device, tablet or computer 6 a.m. the day before the booked stay, and proceed to check-in and choose a preferred room. Additionally, photos of rooms and inventory are available for review. [12][58]

In May 2016 the application was extended further to include room views, such that guests can perceive where the room is located in relation to the building's surroundings. The feature is a result of integration with Google Maps, and an attempt to provide incentives for the customer to book directly through Hilton hotels rather than online travel agencies. [55]

2.2.2 Hotel Schani Future Hotel

Hotel Schani Wien and Hetra, a cloud-based hotel management system provider, presented their take on the next generation hotel booking system in May 2015. Together with a selection of project partners, they developed a number of smart and innovative solutions, where choosing your own room is one of the emphasized features. The primary goal of the new modern solution was to increase guest satisfaction by introducing an additional element of personal preference. [14]

In addition, Hotel Schani is part of the FutureHotel project by the Fraunhofer Institue, a neutral research organization conducting various projects related to the hospitality industry. The FutureHotel project is a collaboration between different industry representatives from Germany and Austria, and aspire to explore future technological solutions for hotels. Moreover, design concepts and potential solutions are tested and evaluated, with the goal to create sustainable and environmental-friendly future hotel solutions.

2.2.3 London GLH Launch

London hotel group GLH launched their Choose Your Own Room service July 4th, 2016 [18]. The service is included for the hotel brands 15 different locations across London [10]. GLH has been road testing such a service to battle the influence from OTA's, and change patron behavior [10]. The new booking feature carries a close resemblance to Airbnb and their simple user interface with a wide array of different filters, such as price, location, amenities and type of trip [5]. Additionally, the feature enables guest reviews to be captured for specific rooms, not the entire hotel [10].The previously mentioned solutions at Hetra and Hilton have not moved past the basic choosing your room close to check-in [10]. However, at GLH, customers are able to book a particular room up to 50 weeks in advance [10].

2.3 The Global Hotel Market

The travel and tourism industry contributed 7.61 billion USD to the global economy in 2016, whereas the hotel industry contributed 493.76 billion USD in 2015 and is forecasted to contribute 553.8 billion USD in 2018 [46]. Hotels are categorized under lodging, a facility where guests will spend a minimum of one night.

The global room supply per January 2016 is 22,715,865 rooms, where 44% of the rooms are branded [36]. Table 2.1 illustrate the regional differences. From this table, especially two instances should be highlighted. Firstly the European room supply is the highest with approximately 35% of the global room supply. Secondly, the ratio between branded and unbranded hotels is exceptionally large in North America, where 72% of the rooms are branded. Table 2.2 present the average occupancy sorted by region. The average room occupancy can be used as a measurement for how well the hotel is managed. The average occupancy rate worldwide is estimated to 67.63%, and is based upon the room supply distribution per region from [36] and average room occupancy by region from [47].

Table 2.3 display the average Revenue per Available Room (RevPAR) by region. RevPar is a performance metric used in the hotel industry and is the result of multiplying a hotel's average daily rate by its average occupancy rate. For example, given a business/conference hotel with 250 rooms, with an average occupancy rate of 85% and average daily rate of 100 USD. The resulting RevPAR would be 100 USD * 90% = 90 USD. In other words, the hotel generates approximately 90 USD in revenue per day for each of the hotel rooms.

Studies performed by [19] investigated the distribution between booking methods. Their findings show that when the nature of visit is leisure, 62% of the bookings are performed online, while for Conference travels only 20% of the bookings are performed online [19].

Regions	**Room supply**	**Unbranded rooms**	**Branded rooms**	**Percentage of Branded rooms**
South and Central America	2,487,263	1,998,506	488,757	20%
Europe	7,911,456	5,808,986	2,102,470	27%
Africa and the Middle East	1,539,489	976,616	562,873	37%
Asia and Oceania	5,355,105	2,473,827	2,881,279	54%
North America	5,422,552	1,539,207	3,883,345	72%
Worldwide	22,715,865	12,797,141	9,918,724	44%

Table 2.1: Global Hotel Industry: Room Supply by Region [36]

Regions	Average Occupancy rate
Asia Pacific	69.0%
America	65.1%
Europe	70.4%
Middle East/Africa	61.6%

Table 2.2: Global Hotel Industry: Average Room Occupancy by Region [47]

Regions	Revenue per Available Room
Asia Pacific	69.34 USD
America	80.31 USD
Europe	85.18 USD
Middle East/Africa	91.79 USD

Table 2.3: Global Hotel Industry: Revenue per Available Room by Region [48]

2.4 Online Travel Agencies

The term Online Travel Agencies (OTAs) was introduced to the commercial market in 1996 when Microsoft launched their Expedia Travel Service in the USA . Closely behind, in Europe, a counterpart in the form of Priceline would be founded in 1997. The services both enabled customers to book their vacation online. However, the service was initially perceived as a dubious tool for booking, but with the increased penetration of Internet, the trend quickly turned around. Originally the service only consisted of hotel services, but gradually expanded to include cars, flights, cruises, restaurants and holiday packages. By 2013 the travel sale generated from OTAs accounted for 45% of the total European sales revenue. The two original OTAs, Expedia Travel Service and Priceline, have established themselves as the major players within this market segment and (were responsible) for 76% of the generated travel sales revenue, with 18% and 82% respectively. Since the establishment of OTA, there have existed two prominent models for revenue/commission. [27]

– **The merchant model** is also commonly known as the “net contracted rates” model and originated from individual wholesale and tour operators. The model operates based on contracted rates agreed upon between the wholesalers or tour operators and hotels for sale of a fixed number of hotel rooms. Due to the low net rates, wholesalers and tour operators provide enhanced visibility, more incremental bookings and revenue for the partner hotels, as a result from the assured allotments. [27]

– **The agent model** can be more accurately described as a commission or "success fee" model. Originally, wholesalers, tour operators, and OTAs utilized the merchant model, but with time the agent model became more applicable. This model provides a fixed commission per booking, with reference to per room and per night, and presents the option for the client to either fulfill the payment at check-in or during the booking. The extent of the commission depends on the hotels market share, wished exposure and buying power. Depending on the bargaining power the hotel possesses the commission can be as high as 30% of rooms revenue and as low as 15%. [27]

The commission rates are a source of concern for hoteliers due to the heavy burden they place on hotel profit margins. Furthermore, recent trends have shown that OTAs are attempting to enter the loyalty program segment, which is one of the hotels selling points when comparing OTAs and hotel brands [27]. The illustrated disadvantages for hotels are made up by the market exposure large OTAs can provide, especially for smaller brands or independent hotels. Global market exposure is one of the key selling points, together with their ability to offer country-specific domains and country-specific marketing campaigns. An equivalent level of exposure is difficult to reach even for the largest hotel groups, let alone an independent hotel. [4] [27]

2.5 Related Industries

The utilization of indoor maps in a commercial environment is still in the initial stages and future growth could be expected. However, one industry implemented indoor maps in their offered services years ago, the airline industry. Previously, the "choose your own room" feature have been described and a close affinity can be identified with seat selection or seat reservation in the airline industry. The seat reservation or seat selection belong in the category of ancillary services and is a major source of revenue [54]. Ancillary revenue is commonly defined as the "revenue beyond the sale of tickets that is generated by direct sales to passengers or indirectly as part of the travel experience" [31]. In practice, this is the accumulation of revenue streams from onboard sales, ticket change fees, excess baggage fees and other miscellaneous charges [31].

One of the previously unique characteristics of the low-cost carriers was their utilization of ancillary services [31]. However, during the recent global financial downturn, the traditional airlines experiences dwindling revenue resulting from lowered yields and reduced travels [31]. The continuous competition over recent years has resulted in strong incentives to improve operations efficiency and reduce cost, in order to increase revenue and achieve profitability [31]. The business practice of low-cost airlines, such as Ryanair, exposed the inefficiency of traditional airlines

and the missed potential revenue. In the second quarter of 2015, ancillary revenue accounted for 8.0% of total revenue, whereas the ancillary revenue accounted for less than 3% ten years ago [54].

Chapter 3
Methodology

This chapter describes the methods and approaches used for information gathering and analysis on which this thesis is based upon. This chapter introduces three key elements, the fundamental methodology to design a market survey, the tools to perform data analysis, and a framework to develop a potential business model. Furthermore, the justification and reasoning for utilizing the selected tools and methods are described.

3.1 Research Design - Quantitative, Qualitative or Mixed

Research is the process of collecting, analyzing, and interpreting data in order to understand a phenomenon [57]. The research process is systematic and follows an established framework in accordance with existing guidelines [42].

Currently, there is commonly used one of three different approaches when conducting research, qualitative, quantitative, and mixed methods. The research design refers to a particular type of inquiry within one of these approaches, another description for the term is, "strategies of inquiry". The methods describe the type of data generated through the research process and are designed to address a certain type of research question/objective. Based on the type of anticipated data needed to fulfill the research objective, a selection of correct research method is done. [57] [8]

Quantitative research methods involve a numeric or statistical approach, where data is used to objectively measure reality [57]. "Quantitative researchers seek explanations and predictions that will generate to other persons and places. The intent is to establish, confirm, or validate relationships and to develop generalizations that contribute to theory" [57]. Quantitative research can be divided into three main classifications:

– Descriptive: Investigate the current situation and identification of attributes

pertained to a particular phenomenon or the correlation between two or more phenomenon. [57]

- Experimental: Investigate and measure the outcome of different treatments introduced to a study group. The validity of the experimental research is decided by the degree of control in the experiment. [57]
- Causal Comparative: Investigate how independent variables are affected by dependent variables and the relationship between variables. [57]

Qualitative research methods involve a holistic approach that includes discovery [57]. "An unfolding model that occurs in a natural setting that enables the researcher to develop a level of detail from high involvement in the actual experience" [57]. The qualitative research includes five areas built upon inductive reasoning: case study, ethnography study, phenomenological study, grounded theory study, and content analysis [57]. The major disparency from quantitative research, where the researcher is strictly outside the phenomena investigated, is the strong correlation between the data and the observer (researcher). [57].

Mixed Methods aim to collect or analyze data pertained from quantitative and qualitative research methods into a single research study. To best illustrate the method an example could be, in order to collect mixed data, researchers may use a survey that consists of closed-ended questions to collect numerical data (quantitative) and conduct an interview to collect open-ended questions which gather narrative data (qualitative). The purpose to use mixed methods is to draw from the strengths and lessen the weaknesses of the respective research approaches. [57][8]

3.1.1 Research Method

During the pre-project, a qualitative research method in the form of interviews was performed due to the lack of information pertained to the thesis topic [29]. The main advantage of this approach is its ability to yield rich data, details and new insight, and the opportunity for the interviewer to clarify and be flexible regarding questions and responses [11]. However, this method is severely time-consuming and expensive [11]. Employing the same method in this master thesis would harshly limit the number of respondents and the international approach. Therefore, the pre-project concluded that the most beneficial approach would be through quantitative methods [29].

The quantitative and qualitative approach provide a tradeoff between depth and width, and between targeting a specific population and generalization [11]. Additionally, the utilization of standardized methods in quantitative methods is believed to produce more objective and accurate information [11]. Provided with this

thesis research objective, to explore the business potential for indoor maps, objective and accurate information should create the basis for concluding business potential. Furthermore, the standardized methods and generalization would be advantages when adopting an international approach.

3.1.2 Data collection

The quantitative research approach includes a number of different methods, depending on the research topic/objective. Common methods in descriptive research include correlational, developmental design, observational studies, and survey. In experimental and causal comparative research identical methods are employed to various degree. [57]

Provided the nature of this thesis, the preferred research method to reach a broad audience within the given time constraint is the survey approach. The survey research method is used for sampling data from respondents that are representative of a population [11]. The method commonly attempts to capture phenomena at the moment and is therefore highly suitable for this thesis research objective. This method possesses the ability to obtain information on a wide range of topics when in-depth knowledge is not necessary, and the target group is large [11].

Unfortunately, independent of the selected research method, there will still be advantages and disadvantages. For the survey research method the most prominent of these can be described as [11]:

- Advantages:
  - Good for gathering descriptive data
  - Can cover a wide range of topics
  - Are relatively inexpensive to use
  - Can be analyzed using a variety of existing software
- Disadvantages:
  - Self-report may lead to biased reporting
  - Data may provide a general picture, but lack depth
  - May not provide adequate information on context

3.1.3 Population and Sampling

Population refers to a specific group we want to generalize with the use of the survey research method. Identifying the population is commonly performed through of the given methods [8]:

- Single-stage: The researcher has access to names in the population and can directly sample people or elements. [8]
- Multistage (also referred to as clustering): The researcher identifies clusters (groups), followed by obtaining names of the individuals and then performing sampling from the composed list. This approach is ideal to employ when it is impossible or impractical to assemble a list of people or elements from the population. [8]

The pre-project determined that relevant respondents for the survey would either be general managers at local hotels or executive personnel within brand management [29]. The use of multistage/clustering would cause the best results as the survey is aimed at two different groups within an enormous group of hospitality personnel.

Sampling is the process where a selection is made from a population with the goal that by investigating the sample it is possible to generalize the results back to the population [8].

- Random Sample: Each individual in the population has an equal probability of being selected. A randomized approach provides the ability to generalize the population. [8]
- Systematic Sample: Individuals are selected from a list with a specified interval, where the researcher choose a random starting point on the list. In other words, every X numbered people on the list is selected, for example, 1 out of every 50th person. [8]
- Convenience Sample: Respondents are selected based on their convenience and availability, and can be described as a non-probability sample. [8]

The random sample approach was the selected method for identifying contact list. However, the sampling was limited to publicly available information. The process behind sampling contact lists is further described in Chapter 3.2.3.

3.2 International Market Survey

The International Market Survey is the product of the determined research method within quantitative research, the survey approach. Another added element to the research approach is the aim of market research at an international level. This section will introduce the reader to the thoughts behind the survey questions and the underlying theory.

3.2.1 Survey Design

The layout of survey questions is a careful consideration based on empirical research and theory [30]. Several considerations need to be deliberated to optimize the reliability and validity of the survey.

Reliability is the extent to which repeatedly measuring the same property produces the same result [35]. In other words, the survey question should hold the same meaning to everyone, including the administrator of the survey [35].
Validity is the extent to which a survey question measures the property it is supposed to measure [35]. Strictly speaking, this refers to utilizing the correct tools and measurements to receive optimized results.

The survey's intention is to answer or provide a basis for answering the research objectives. To ensure that all answers were given in the same format, in addition, to counteract misunderstanding of question phrasing, the closed question format was decided for all survey questions. Closed questions provide a list of acceptable responses, either through a checklist, true/false, multiple choice, or attitude scales [35]. The main advantage to such an approach is that respondents may find it easier and less time-consuming [35]. In comparison, open-ended questions offer the respondent the opportunity to provide in-depth and reflected answers, and unanticipated responses may surface [35]. To counteract the disadvantage of closed questions, a text field is added at the end of the survey where respondents can comment or share opinions.

The survey consist of ten questions and the estimated time for respondents to complete the survey is 4-7 minutes. The survey can be divided into three main parts, the introductory questions (Question 1-3), measuring interest (Question 4) and measuring willingness to invest (Question 5). During the survey design the following common knowledge was employed:

- Use simple, familiar words and syntax. [30]
- Strive for wording that is specific and concrete. [30]
- Make responses options exhaustive and mutually exclusive, and avoid single or double negation. [30]
- Questions on the same topic should be grouped together, and proceed from general to specific [30]
- Visual layout is clean, simple, and consistent [35]

3.2.2 Question Design

The survey is aimed at executive personnel in the hotel industry. However, the pre-project determined that there could be differences between local hotel executives and hotel brand executive [29]. The sampling is random and not able to determine the affiliation of the receiver.

Question 1 is purposely designed to divide the respondents into two categories.

Question 1: Would you describe your position as...
Answers:
- "Corporate position in a hotel group"
- "Local hotel executive"

Depending on the response, the respondent will either be forwarded to Question 2.1 or Question 2.2, respectively.

Question 2.1 is designed to segment the respondents with a "Corporate position in a hotel group" into one of the four main hotel group segments. The underlying thought is to investigate if specific hotel group segments find indoor maps of higher importance than others.

Question 2.1: Would you describe your hotel group within the segment...
Answers:
- "Conference/Business"
- "Luxury & Resort"
- "Budget/Limited Service"
- "Boutique"

Question 2.2 investigate the size of the respondent's hotel, estimated in number of rooms, when the "local hotel executive" option is selected. The underlying intention corresponds with Question 2.1, where the purpose is to investigate differences between groups and determine possible interested parties for indoor maps.

Question 2.2: What is the number of rooms at your hotel?
Answers: "20-50", "50-100", "100-200", "200-500", "500-1000", "1000+"

Independent on the answer from Question 2.1 or 2.2, all the respondents will be forwarded to Question 3 and the following questions.

Question 3 describes how indoor maps can be utilized at hotels, and included in the description is a concept sketch of a possible use case (see Figure 5.1). This question aims to investigate the respondent's general opinion toward indoor maps, and the description presented to the respondent reflects current indoor map solutions present in the market (Chapter 2.2).

Question 3: Would you be interested in implementing indoor map services?
Answers: "Yes", "No", "Already in use"

After performing research during the pre-project and initial phases of this master thesis, four use cases (indoor map services) for indoor maps in the hotel industry were identified [29]. Question 4.1-4 measures the respondent's interest toward the selected indoor map services. Each of the questions presents a rating scale consisting of 5-points (1-5), denoting low to high interest. Question 3 ask for the respondent's general attitude, while Question 4.1-4 are specific. The deliberation concerning which indoor map services could be relevant were performed during the pre-project and further discussed in the initial phase of this master thesis.

Question 4.1 introduce the potential indoor map service "select your own room". The survey presents the indoor map service through the following description: "The option for customers to choose specific seating at commercial flights has become available. A similar service could be provided for hotel guests, allowing guests to select their own room from a digital floor plan upon the check-in procedure or online room reservation."

Question 4.1: Interest toward the feature "Select your own room
Answers: "1-5"

Question 4.2 introduce indoor navigation and wayfinding, which could provide advantages for guests navigating complex facilities. The size of the hotel should be the determining factor for the interest toward such a service. The survey presents the indoor map service through the following description: "While not necessarily a component of an indoor map service, navigation and indoor pathfinding can help users find their desired location. Several different technological solutions exist, where the most prominent solutions include the usage of Wi-Fi infrastructure, Bluetooth, beacons, smartphone sensors and magnetic positioning."

Question 4.2: Interest toward Navigation and indoor wayfinding
Answers: "1-5"

Question 4.3 presents digital floor plan services, a service that can be commonly spotted at public institutions and large venues. The survey presents the indoor map service through the following description: "Locating the facilities and services at complex structures such as hotels can be a challenge for first-time guests. The digital floor plan offers an alternative form of reassurance in opposition to the physical signs and directions."

Question 4.3: Interest toward Digital floor plans
Answers: "1-5"

Question 4.4 describe a possible digital emergency application that would be able to add another layer to fire security. The survey presents the indoor map service through the following description: "A digital version of the emergency plan could be available for every guest on their chosen device, and would enable the guest to find the closest emergency exit upon emergency situations."

Question 4.4: Interest toward Digital emergency plan
Answers: "1-5"

Question 5 is directly related to the potential business model. The lack of public data regarding profit margins and investment potential resulted in the survey's last question. The question desire to provide an indication if the respondents would be willing to invest in indoor map services. In the case where the respondent is willing to invest, how much would be crucial for estimating revenue streams. Provided with previous experience from MazeMap personnel, the following options were composed. The alternative, "15-20% of extra revenue" indicate the 15-20% of the ancillary revenue hotels receive when utilizing the "select your own room" service.

Question 5: Would you be willing to invest in such a service? If so, how much?
Answers:
- *"0"*
- *"15-20% of extra income"*
- *"15-25 USD per room per year"*
- *"25-50 USD per room per year"*
- *"50-75 USD per room per year"*
- *"More than 75 USD per room per year"*

3.2.3 Survey Delivery

Previous research performed in the pre-project [29] indicated that personnel at the executive level would possess the necessary knowledge and business overview to respond to the topics introduced in the market survey. The sampling process of identifying and extracting contact information was performed with the tool Synthio [50] to increase efficiency and drastically reduce time consumption toward data-mining. The sampling was performed by providing Synthio with a number of conditions, in regard to the contacts corporate position, country of origin etc. After providing the key details Synthio would provide contact list that fulfills the initial search criteria. Synthio offers a business-to-business platform for conducting contact searches. The service extract data from online communities, such as LinkedIn, and proceed to further cleanse, standardize and synthesize the data. The utilization of Synthio was made possible with the help and cooperation of MazeMap and their account license.

The process pertained to the distribution of the market survey was performed in two steps. The first step included designing a generic email based on cold-emailing theory. Appendix B display the cold-email utilized in the survey delivery. Harvard Business Review mention key elements pertained to the framework for designing cold emails, to receive attention from the receiver the email should be short, simple and actionable [34]. Primarily, the underlying purpose of the email can be described as capturing the reader's attention and interest, and to increase this possibility the key elements mentioned in [34] were adopted. Additionally, the email includes a brief statement regarding the anonymous and voluntary characteristic of the survey.

The second step dealt with the delivery of the previously created cold-email. Due to the time constraint of the thesis and international focus, two methods were identified as feasible. The issue regarding time zones became apparent in the starting phase, and to cope with this problem, the online tool iContact was employed. iContact offers an online marketing solution for conducting large volumes of market research or for similar purposes. The solution enables the subscriber to schedule delivery of pre-made emails to pre-uploaded mailing lists. In addition, the service permits the user to observe statistics pertained to the sending metadata. However, iContact adhere to strict restrictions of emails sent per month if not a large monetary compensation is given. The limitations from iContact resulted in the utilization of a Google Docs Spreadsheet together with Google Apps Script for the congenial time zones. Google Docs Spreadsheets offers the possibility to include key contact information together with the cold-email. Moreover, Google Apps Script, a simple scripting language derived from JavaScrip, enable the user to "program" the spreadsheet, such that an email is constructed based on various columns [20]. Figure 3.2 displays the simple code with comments, and figure 3.1 show the corresponding columns and the spreadsheet layout. All services are run across Google's servers and the email

responses are directly sent to the Google account where the script is used.

A simple method to increase the response rate of cold-emails can be to send a follow-up mail to the respondents that do not reply to the initial mail. This route of action was implemented from the beginning, to produce the optimal result and lessen the time consumption. The follow-up mail was created based on the same principles as the cold-email and utilized the same delivery scheme (see Appendix B for sample email).

The survey was implemented through the use of Google Forms, a simple and easily accessible service offered through Google Apps. The resulting responses can without difficulty be accessed through Google Spreadsheet or downloaded in Microsoft Excel format. The cold-email contained a short URL pointing toward the survey. Unfortunately, URL links are often blocked by internal security systems and in China, Google links are inaccessible in case a Virtual Private Network (VPN) is not utilized. In cases where these issues became apparent the recipient were given the option to receive the survey questions by mail. However, none opted to provide answers through this method. Appendix C show how the survey is presented to the respondents.

1	Row[0] Fname	Row[1] Email	Row[2] Intro	Row[3] Text	Row[4] Subject
2	Name	Name@example.	Dear	, I hope your day is progressing w I reach out to you because I bel https://docs.google.com/forms/d Your responses are voluntary an Thank you for your time and cor Best wishes, Sebastian Jørgensen MSc ICT at NTNU	Your opinion regarding the Next Generation Hotel Experience

Figure 3.1: Google spreadsheet to contain key contact information and cold-email

```
function sendEmails1() {
  var sheet = SpreadsheetApp.getActiveSheet();
  var startRow = 2; //First email to send

  var dataRange = sheet.getRange(startRow, 1,270, 11)
  //Number of rows to include in the data range

  // Fetch values for each row in the Range.
  var data = dataRange.getValues();

  //Combines the key information provided in the spreadsheet
  for (var i = 0; i < data.length; ++i) {
    var row = data[i];
    var emailAddress = row[1];  //Recipient email address
    var subject = row [4];      //Email Subject
    var message = row[2] + row[0] + row[3]; //Email body

    MailApp.sendEmail(emailAddress, subject, message);

    SpreadsheetApp.flush();
    }
  }
```

Figure 3.2: Email delivery script written in Google Apps Script

3.3 Data analysis

The data analysis aim to identify descriptive statistics from the collected data. These statistics include mean value and standard deviation. Furthermore, median and variance can offer useful insight into the data. To enable the use of statistical methods, the survey needs to contain a question group where the responses can be expressed in numerical values, for example through scaling. The second group of questions, measuring interest, include these characteristics.

- *Mean*: Also known as average is the sum of all the scores divided by the total number of scores. The use of mean enables the opportunity to measure the central tendency.
- *Standard Deviation*: Described how closely the scores are concentrated around the mean.
- *Variance*: The expectation of the squared deviation of a random variable from its mean.
- *Median*: The median describes the "middle" value or the score with the most occurrences. In comparison to mean value, the median is not influenced by extreme values and can provide an impression of the "typical" answer given to the survey question.

Reliability is an important aspect of quantitative methods, in regard to the survey approach, this can be measured through correlation, where a consistency in scoring

can be observed [8]. The correlation test is performed to determine if two or more variables are related, the result can be illustrated in a graph or expressed with the correlation coefficient [57]. Commonly, the Pearson Correlation Coefficient is used when estimating the "r" coefficient (correlation coefficient) [57]. The resulting decimal number is located in the range between -1 and 1, where a number close to 1 will symbolize positive correlation.

Special relationships between survey questions were investigated through the use of in-built filter options and the in-built function COUNTIFS in Google Docs Spreadsheet, which select specific data if it fulfills certain conditions. The term special relationships refer to interesting connections, for example, a scenario where local hotel executives have a significantly higher number of responses which are interested in indoor maps, or if specific segments view indoor maps with negatively.

Google Docs Spreadsheet have been used to calculate the descriptive statistical values, such as mean, median, standard deviation, and variance, with the utilization of the in-built functions AVERAGE, MEDIAN, STDEV and VAR, respectively. The calculation of correlation coefficient used the same method, with the in-built function CORREL. The figures displaying the survey results and the figures illustrating the results of the data analysis are plotted with the help of Google Docs Spreadsheet.

3.4 Business model

Business models and their design have received increased attention over the last decades, and in a rapidly changing world the business model concept can enable companies to make better decisions and adapt to change. Today's complex business environment is a result of a fast moving industry due to continuous new information, technology and competitors [37]. The definition of a business model has varied throughout time, however, it can be defined as "management's hypothesis about what customers want, how they want it and what they will pay, and how an enterprise can organize to best meet customer need, and get paid well for doing so" [52]; "Architecture of the revenue" [52]; "The logic of the firm - how it operates and how it creates value for its stakeholders" [41]. As presented in Chapter 1, one of the objectives of this master thesis is to develop a potential business model. The framework employed in Chapter 5 is the Osterwalder's Business Model Canvas and will be further introduced in this chapter.

In 2004 Alexander Osterwalder published his initial work regarding Business Model innovation [37], where the traditional Business Model perspective was deconstructed and key elements were identified. The Business Model Concept and Components elaborated in this chapter are based upon Osterwalder's initial publication. Later, in 2010, Osterwalder published Business Model Generation with co-author Yves Pigneur,

their framework to design tomorrow's Business Model. The framework introduced in their work, Business Model Generation [1], will form the foundation for the Business Model design and will be briefly introduced in Chapter 3.4.3.

The underlying principles, theory and concepts in the design of the Next Generation Hotel Experience Business Model is introduced in Chapter 3.4.1 and 3.4.2

3.4.1 Business model concept

Business models function as a conceptual tool that expresses the company's logic of how to make money. It describes the key elements and their relationships, in a way the business model can be described as the architecture the company is based upon. The purpose being to describe how a company offers value to one or several segments, in order to generate profitable and sustainable revenue streams. [37]

The business model can be illustrated as a conceptual link between strategy, organization and ICT, and function as a focal point between the three. The conceptual business model is utilized in order to assure a smooth implementation of business visions and (alignment) between the different groups. A highly competitive and highly performing firm requires clear communication of concepts and understandings between involved parties. Using Osterwalder's approach, where an ontological method is utilized, it is possible to create a shared and common understanding of the company profit origin and facilitate communication channels between personnel and application systems. [37]

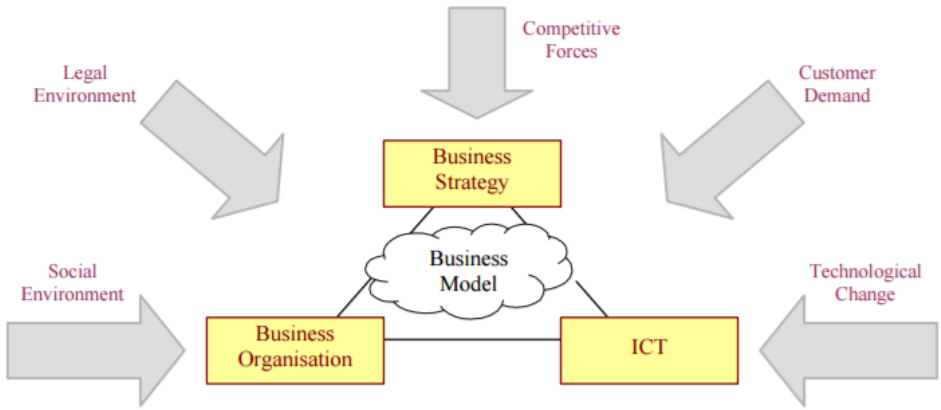

Figure 3.3: The relationship between the Business Model, Strategy, Organization, Environment, Process and Information Systems [37]

- **Strategy and Business Models**: The domain of strategy is enormous where little consensus exist and abode of definitions occur. Some of the prevalent views include that strategy is about providing a company vision, designing an organization that achieves a fit between internal strengths and weaknesses and external threats and opportunities, and defining a set of goals and objectives. The business model is a translation of strategy where the company's vision, goals and position is expressed. [37]
- **Business Organization and Business Models**: The business organization centers around the material, such as departments, units, structure, processes and workflows. The business model is an implementation of the necessary structure and processes for the designated objective. Understanding the infrastructure dimension of a business model can result in optimized business organization. [37]
- **ICT and Business Models**: The final element in the triangle is Information Communication Technology, in a business model scenario this involves the software, hardware and systems employed at the company. Furthermore, the business model highlights the ICT processes and the technological consequences of implementing change. [37]
- **Environment and Business Model**: The environment is a collection of the external pressure companies are exposed toward. The external forces represent the continuously changing business environment and the incremental changes the business model need to front. [37]

3.4.2 Business model components

Alexander Osterwalder (2004) proposed a framework consisting of the four primary areas that a business model has to address. Furthermore, the four areas can be divided into nine interrelated business model building blocks. [37]

3.4.2.1 Product

The first of the four pillars, Product, represents the offering from the company to its customers. Traditionally, the companies have focused to identify the right position along the value chain, with the corresponding right product and market segments, and the right value-added services. However, the rapidly changing business environment, with the development of new markets and radical technologies, has resulted in a requirement for the ability to conduct product innovation. Experience implies that companies that innovate and constantly transform their value proposition perform better than their peers. The business model illustrate the product innovation in the pillar Product, and Osterwalder defined this as "Product covers all aspects of what a firm offers its customers. This compromises not only the company's bundles

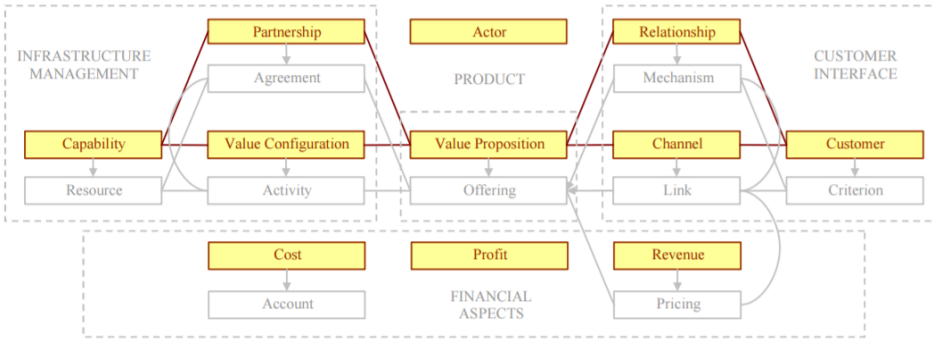

Figure 3.4: The Business Model Ontology [37]

of products and services but the manner in which it differentiates itself from its competitors. Product is composed of the element Value Proposition, which can be decomposed into its elementary Offering(s)". [37]

– **Value Proposition**: The value proposition describes how items of value, such as products and services, are bundled and offered to fulfill customer needs. This element offers the complete view of products or services creating value toward a specific customer segment. In other words, it describes how the company differentiates itself from its peers and why customers should purchase their product over the competitors. [37]

  The value proposition can be further decomposed into offerings, which describes a part of the offered bundle of products or services. An offering outline the value of the specific product or service to the customer. Together, a number of offerings represent a value proposition. Following, an offering consist of a number of variables and research questions, such as reasoning, price level, customer utility and value life cycle. [37]

3.4.2.2 Customer Interface

The Customer Interface, also described as the Customer Relationship, represent a vital part of business operations. Customer Relations have later advanced into the Customer Relationship Management (CRM) concept, where a wide array of company's offers assisting CRM software solutions. The business model aims to help assist personnel to understand the relation between the company's value proposition, target customer segments, distribution channels and the real customer interaction. The development of Internet has increased the importance of implementing ICT to perform better than their peers. The utilization of customer databases, scanners in

supermarkets, toll-free numbers and various communication channels have evolved how companies perform customer interaction. [37]

Osterwalder defined this as "Customer Interface covers all customer related aspects. This compromise the choice of a firm's Target Customers, the Channels through which it gets in touch with them and the kind of Relationships the company wants to establish with its customers. The Cusomer Interface describes how and to whom it delivers its Value Proposition, which is the firm's bundle of products and services". [37]

- **Target Customer**: The Target Customer is centered around segmentation of the market. Based on an effective segmentation, resources will be invested to target customers that will experience a high level of attraction toward the Value Proposition. The implementation and usage of ICT have resulted in an increased accuracy in identifying market segments. Furthermore, a selection of Criterion is utilized to determine the correct criteria, such as geographical or socio-demographic nature. [37]

- **Distribution Channel**: The Distribution Channel represents the connection between the Value Proposition and Target Customer. The Channel allows for direct or indirect delivery of value to its customers, and with the introduction of ICT, the traditional channels have evolved to include new digital approaches. Specifically, a distribution channel describes how a company communicates with its customers, where the goal is to manufacture the correct quantity, to the right price, at the right time, to the right customer. A Channel can be further decomposed into several Links, where each link represents a specific marketing task. [37]

- **Relationship**: The Relationship element describes the relationships between the company and its customers. Numerous possible types of relationships exist between a company and their customers, however, every type of relationship carriers a different price. Therefore, a company has to carefully deliberate what type of relationship is preferable toward their target customers. The profit from customer relationships can be described as the lifeline of all businesses, where these profits can be acquired from procurement of new customers or enhancement of existing customer relationships. [37]

3.4.2.3 Infrastructure Management

The Infrastructure Management concerns how the company creates value, and describes the necessary abilities to be provide its Value Proposition and maintain its Customer Interface. Specifically, this pillar describes the Business Model's capabilities

and resources, their owners and providers, who execute a certain activity and how the activities relate. [37]

Osterwalder used the definition, "Infrastructure Management describes the Value System Configuration that is necessary to deliver the Value Proposition and maintain Customer Interfaces. This compromises the Value Configuration of the firm, in other words the activities to create and deliver value, and, the relationship between them, the in-house Capabilities and those acquired through the firm's Partnership network". [37]

- **Value Configuration**: The Value Configuration describes the arrangement of activities in order to deliver the Value Proposition. In other words, the activities necessary and the links between them to create value for the customer. The activity refer to the heart of the business, the actions a business performs to create value. An activity is performed by the business itself or one a partner. The value configuration can relate to the value chain and the designated activities. [37]
- **Capability**: The Capability element describes the set of capabilities a company has to dispose in order to provide its Value Proposition. In other words, "a capability describes the ability to execute a repeatable pattern of actions". The influxes of ICT have enabled companies to deconstruct and outsource capabilities and resources, such that they no longer belong to core business operations. Capability directly relate to resources, in regard to resources the business dispose in order to deliver the value proposition. [37]
- **Partnership**: A Partnership is a voluntarily initiated cooperative agreement between two or more companies in order to create value for the customer. The partnership or partnership network outline the distribution of resources between the company and its partners. Partnering can offer the opportunity to acquire new markets, knowledge or resources. Outsourcing activities have in recent years become a common method to reduce cost and optimize the value chain. [37]

3.4.2.4 Financial Aspects

The Financial Aspects is the result of the rest of the business model's configuration. The last of the four pillars can be further decomposed into Revenue Model and Cost Structure, together, they determine the company's ability to survive based the profit- or loss-making logic. [37]

- **Cost Structure**: The Cost Structure, as the name suggest, measures the entire cost incurred by the company in order to create, market and deliver

value to its customer. All the key elements that lead to company expenditure, such as resources, assets, activities, exchanges and relationships, are assigned a price tag. The collection of numerous accounts composes the Cost Structure, whereas an account defines a particular type of expenditure. [37]

– **Revenue Model**: The Revenue Model represents different revenue streams that possess different pricing mechanisms. The essential point of the Revenue Model is to measure the company's ability to transform the offered customer value into money and revenue streams. [37]

  Additionally, revenue stream and pricing is an important building block in the Revenue Model. The importance of the element arises from the fact it defines which mechanism is utilized to determine the price of the offered value. To elaborate, the revenue stream and pricing is the combined result of the attributes Stream Type and Pricing Method. They describe respectively the type of economic activity the company generates its revenue stream from and the one out of three pricing mechanisms applied (fixed price, differential pricing and market pricing). [37]

3.4.3 Business Model Canvas

The Business Model Canvas is introduced in [1] and is based on previous research and underlying theory presented in [37]. The Business model Canvas present a simplified model/framework for business development built on previous published research. Given the limitations of this master thesis the Business Model Canvas is used to described the business model for the Next Generation Hotel Experience. The business model elements is based on the methodology described throughout Chapter 3.4. Appendix A display the Business Model Canvas from [1].

Osterwalder's framework for Business model generation have seen a great deal of usage at NTNU. This could be related to the simplicity and extensive available knowledge of the framework. Previous and inspirational business models within the field of Digital Economy include "Business scenarios for Virtual Traffic Lights" [6], "Tele-economics of Village Telco" [23] and "Business Models for Future Networked 3D Services" [6]. The mentioned master theses utilize a methodical approach where each element in the business model is broken down and analyzed. Additionally, the business modelling related to indoor maps performed in "International Potential for a Free Model in a B2B&C Market" [51] and "International Business Potential for Analytics of Room Utilization" [3] and their approach have provided assistance in analyzing indoor map elements.

Chapter 4
Results

This chapter intends to present the results of the performed investigation and research. Furthermore, the conducted international market survey represents the main pillar in this chapter and the following data analysis. The surveys metadata is presented together with the geographical spread. As previously mentioned in Chapter 3.2, the survey questions can be decomposed into three parts and will be presented thereafter. The results of the data analysis are composed of the two sections Data Relations and Correlation Analysis.

4.1 Respondents

The respondents to the international market survey have their origin in a number of countries. Based upon sampling theory mentioned in Chapter 3.1.3, a selection of contacts in the hotel industry was compiled. Figure 4.1 illustrates the geographical diversification of the respondents. The countries colored in green represent countries where one or more hotel executives have been contacted, and the gray represent the excluded countries. A detailed country list can be found bellow.

- **Europe**: Ireland, France, Netherlands, Belgium, Spain, Portugal, Italy, Germany, Austria, Romania, Slovakia, Poland, Belarus, Lithuania, Estonia, Ukraine, Moldova, Russia, Greece, Serbia, Croatia, Turkey, Montenegro, Luxembourg

- **Asia**: Indonesia, Philippines, Malaysia, China, South Korea, Japan, Thailand, Saudi Arabia, United Arab Emirates, Oman, Qatar

- **North America**: Canada, United States of America, Mexico

- **Oceania**: Australia, New Zealand

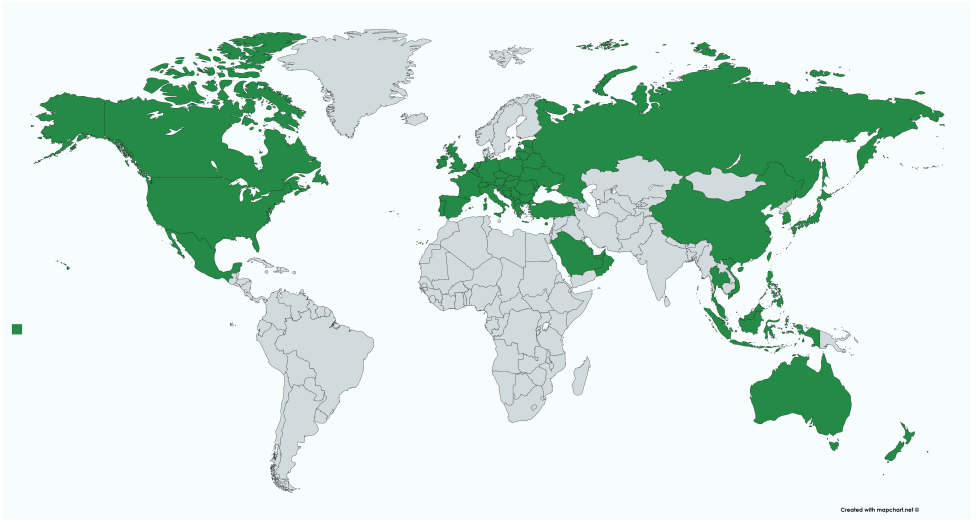

Figure 4.1: Geographical representation of countries with respondents to the Market Survey. Green denotes countries with one or more contacted executives, while grey denotes the countries not contacted

Given the language of the survey, English, countries with English as a first or second language were given priority. In addition, due to the main indoor map market being located in North America and Europe, countries belonging to these regions were prioritized. Provided with the survey characteristic of being anonymous there exist no accurate data regarding the individual response rate for each country. Furthermore, the utilized email list used when mailing the survey were not sorted by country, but rather by regions to provide an extra layer of privacy. Given the anonymity characteristic of the involved respondents, no names of personnel, email addresses or hotels/brands will be disclosed in this thesis, nor have any of the contacted parties agreed to disclose such information.

Due to the limitations of the data mining tools, several of the respondents have the same brand affiliation. In some occasions, the respondents have the same hotel affinity or are members of the same management team. However, given the strict search criteria used in the sampling, none of the respondents with the same affiliation should possess the same position.

Table 4.1 displays the number of contacted personnel sorted by region. However, the displayed numbers are the number of valid email addresses. The total number of contacts data mined across the four continents amounts to 3,055. Table 4.2 illustrates the total number of contacted personnel and respondents.

Region	**Contacted**
Europe	940
Asia	562
North America	504
Oceania	49
Total	2055

Table 4.1: Market survey: Contacted personnel by Region

Number of contacted personnel	2055
Number of respondents	134
Response rate	**6,52%**

Table 4.2: Market survey: Response Rate

4.2 Introductory questions

The international market survey has been decomposed into three parts to better present the survey results in a clear way to the reader. The first group of questions can be viewed as introductory and enable a simple segmentation between local hoteliers (executive level) and brand management executives, and their initial interest toward indoor maps. The complete list of questions included in this section can be viewed in Table 4.3.

Keyword	**Question phrasing**
Q1	Would you describe your position as a ...
Q2,1	Would you describe your hotel group within the segment ...
Q2,2	What is the number of rooms at your hotel?
Q3	Would you be interested in implementing indoor map services?

Table 4.3: Market survey: Introductory questions

Figure 4.2 illustrates Question 1 (Q1) and the distribution between Local and Corporate employees. "Corporate position in a hotel group" represent brand management executives, in other words, executive personnel employed within hotel brand administration. On the other hand, "local hotel executives", represent local hoteliers at General Manager level. To reach an even distribution between the two categories, have been an intention when data mining and conducting the survey. Depending on the chosen option the respondent will either be forwarded to Q2,1 or Q2,2.

Question 2.1 (Q2.1) relates to the segmentation of the different hotel brands. There

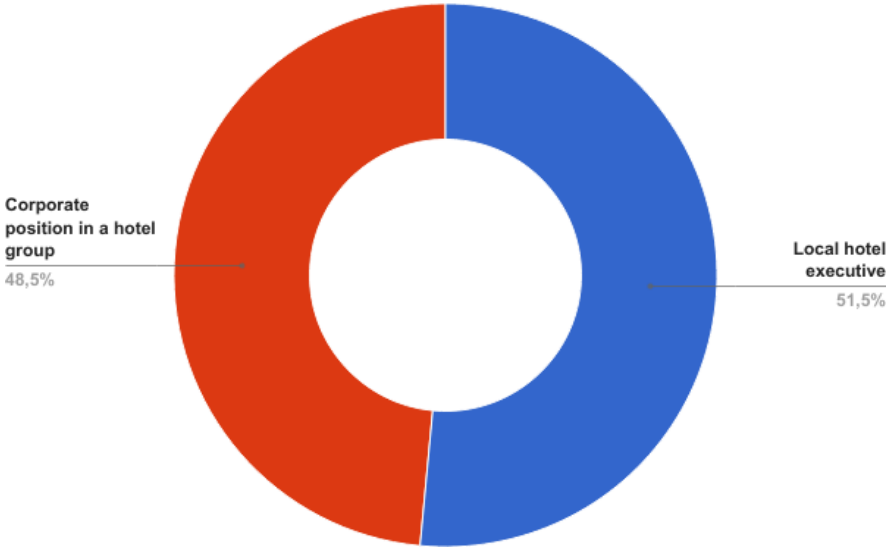

Figure 4.2: Results Q1: "Would you describe your position as a ..."

exist four main market segments (Chapter 3), Luxury & Resort, Conference/Business, Budget/Limited services, and Boutique. Figure 4.3 presents the distribution between the various categories. Provided with the information related to previous indoor maps solutions, Chapter 2.2, it can be observed that to this date only high-end hotel brands in the upper price level have elected to implement such services. This corresponds well with the respondents where Luxury & Resorts and Conference/Business are responsible for 56.9% and 33.8% of the responses respectively.

The central point that should be highlighted from this result is that a majority of the respondents with Corporate Positions should be aware of the solution presented in this survey. Especially due to the fact that Hilton Hotel Group is a major contributor and actor in the Luxury & Resorts and Conference/Business market.

In comparison to Q2.1, Question 2.2 (Q2.2) relates to the local hotel executives or the local hoteliers. Furthermore, it can be observed that a majority of the hotels can be located in the segment with 200-500 rooms, with 56.5%. The survey has not targeted a specific segment and the results can be described as random. However, logic implies that a majority of hotels should be in this room range, something the result confirms.

Question 3 (Q3) relates to the respondent's interest in implementing indoor map services. Provided with the fact that close to 4,500 Hilton hotels will be implementing such services 2.2.1, a minor share of the respondents should select the option "Already

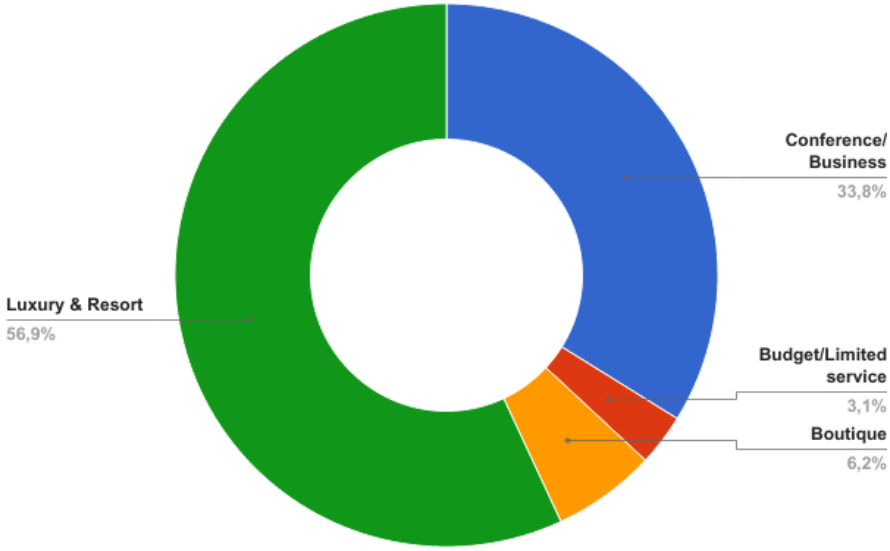

Figure 4.3: Results Q2,1: "Would you describe your hotel group within the segment ..."

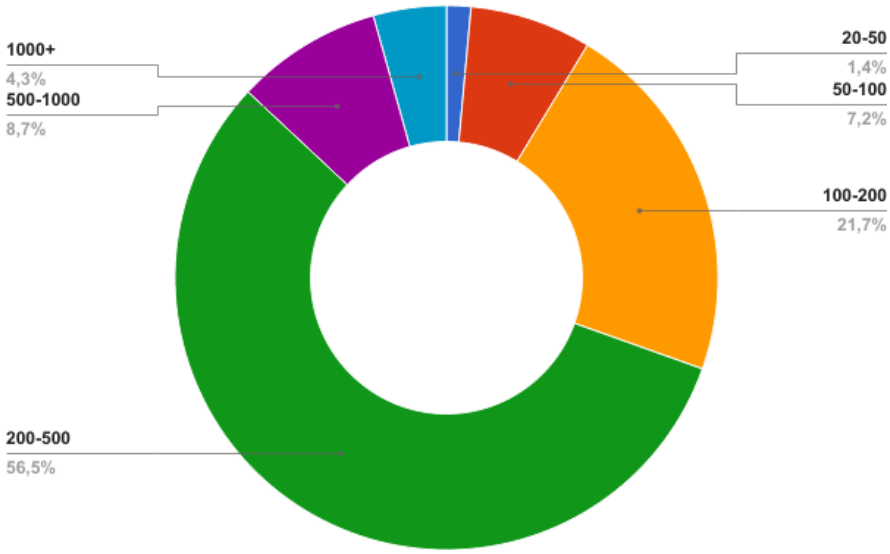

Figure 4.4: Results Q2,2: "What is the number of rooms at your hotel?"

in use". Observing Figure 4.5 this assumption can be confirmed where 16.4% of respondents already have indoor maps or similar services implemented.

Given the result from this initial question, it can be argued that the interest toward

indoor maps is high, where 47.8% display direct interest and 16.4% already have installed such solutions. The negative response representing 35.8% of the respondents constitute a major part. However, the negative response does not necessarily indicate a low interest toward indoor maps as a product or possible accompanying features. Due to circumstances not covered by this survey, the implementation of such services could be inconvenient or drastically influence revenue streams and in turn the profit margins.

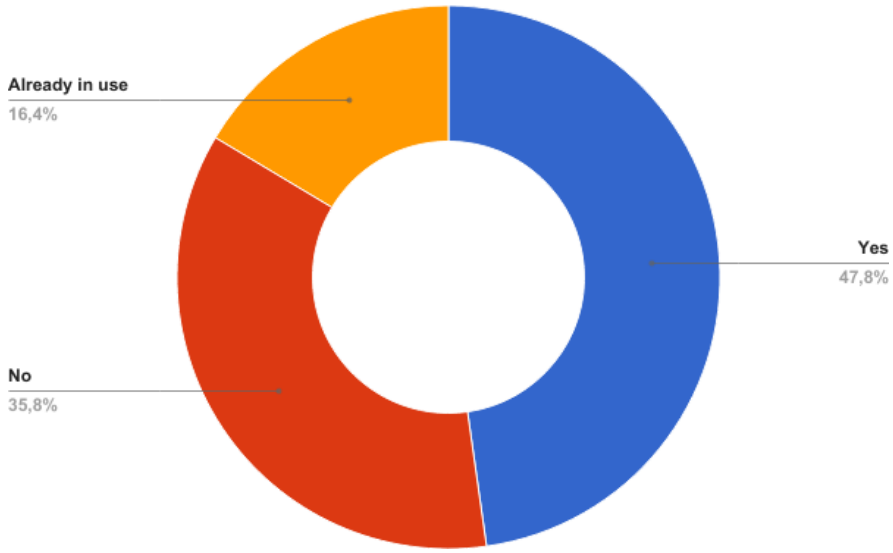

Figure 4.5: Results Q3: "Would you be interested in implementing indoor map services?"

4.3 Measuring Interest

This section consists of questions designed to measure the interest in different indoor map features. The structure of each question, as described in Chapter 3.2.2, can be decomposed into two parts. Firstly, a brief explanation is provided for the specific feature. Secondly, a scale ranging from low interest to high interest is provided the respondent. Table 4.4 displays the several indoor maps features the questions compose. The vertical axis denotes the number of respondents, while the horizontal axis denotes the grade of interest the respondent assign the feature. Every figure illustrating "measured interest" possess the same axis alignment.

Table 4.5 displays the statistical properties for the questions Q4.1-Q4.4. The statistical properties displayed are the sample size, mean, median, standard deviation

and variance. The table aims to provide the reader with numerical data regarding the survey's questions measuring interest.

Keyword	**Question phrasing**
Q4,1	"Select your own room"
Q4,2	Navigation and indoor wayfinding
Q4,3	Digital floor plans
Q4,4	Digital emergency plan

Table 4.4: Market survey: Measuring level of interest toward the following features

Question	Q4.1	Q4.2	Q4.3	Q4.4
Sample size	134	134	134	134
Mean	3.313	3.328	3.597	3.813
Median	3	4	4	4
Standard deviation	1.422	1.273	1.183	1.215
Variance	2.006	1.620	1.400	1.476

Table 4.5: Market survey: Statistics Q4.1-Q4.4

Figure 4.6 illustrates the first questions within this category, concerning interest toward an indoor map feature where guest can select their own room from the inventory. Compared with the other questions concerning measuring interest, it can be observed that Q1 possess an even distribution of interest, with a slight majority of the upper levels of the scale. Furthermore, the majority of feedback/comments from respondents concerns this feature and is elaborated further in Chapter 6.3 and Appendix D.

By looking closer at the statistical properties shown in Table 4.5, it can be seen that Q1 possess the lowest mean value with 3.313 together with the highest standard deviation and variance, of 1.422 and 2.006 respectively. This corresponds well with the properties observed in the Figure 4.6.

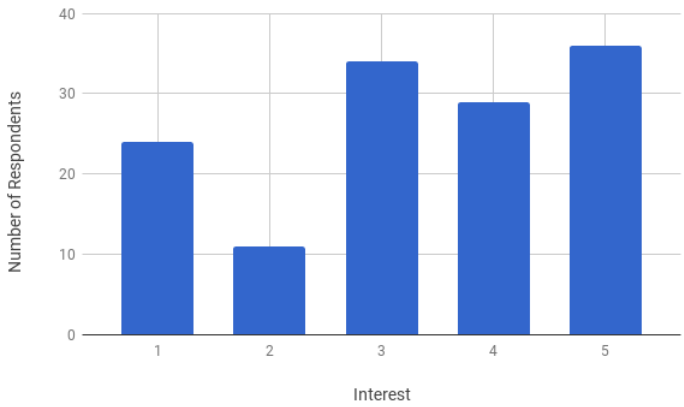

Figure 4.6: Results Q4,1: Interest toward the feature "Select your own room"

The indoor navigation feature (Q3) describe as the name imply, an indoor oriented positioning service. A significantly lower variance and standard deviation can be observed compared to Q1. Table 4.5 show a median of 4 and mean value of 3.328. The utilization of indoor positioning is often related to Wi-Fi infrastructure, which in turn can be a major expenditure and could be a reason for the low interest.

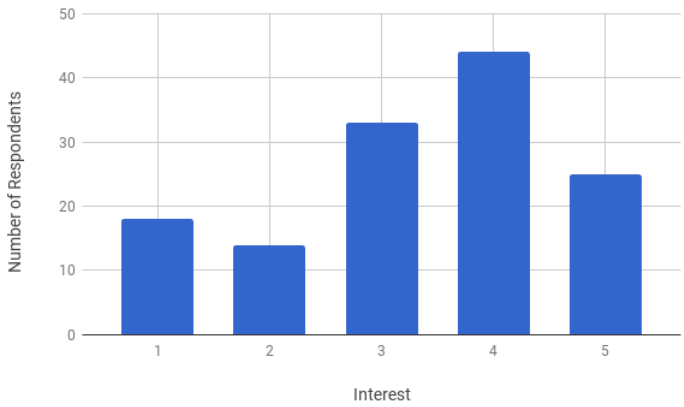

Figure 4.7: Results Q4,2: Interest toward Navigation and indoor wayfinding

Figure 4.8 illustrate Question 3 (Q3) and the respondent's interest in the digital floor plan feature. The other features may be abstract concepts for the respondents, however, digital floor plans and digital signage is a growing trend 2.1.3 and can be

described as a concrete concept for most. Therefore, a high interest was expected, which can be confirmed in Table 4.5 with a mean of 3.597 and variance of 1.400. The variance is the lowest for the measuring interest question group.

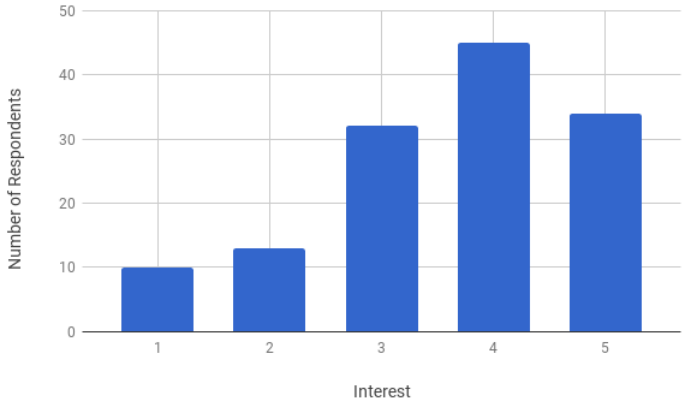

Figure 4.8: Results Q4,3: Interest toward Digital floor plans

The last question (Q4) in the group concerns the emergency plan feature and possess the highest mean value of 3.813. This can relate to trending where Environment, Health and Safety have become an important marketing tool. In addition, such a solution should increase the experienced safety for hotel guests. However, the specific use cases for a digital emergency plan were not elaborated extensively, but the feature experienced the highest interest. Figure 4.9 demonstrate these findings.

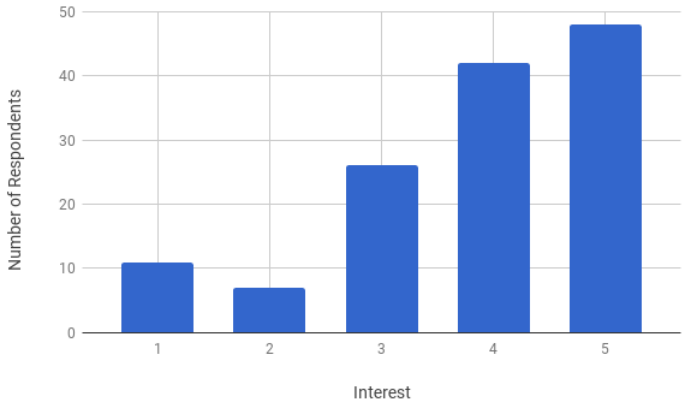

Figure 4.9: Results Q4,4: Interest toward Digital emergency plan

4.4 Measuring willingness to invest

The last part of the survey concerns the willingness to invest in indoor maps and/or indoor map features. The possibility of a promising solution to increase competitiveness and the value proposition does not necessarily translate into a viable solution with a stable commercial demand. Therefore, the goal of this question is to uncover an indication if a business potential is present in the current hotel market.

Table 4.6 shows the question phrasing. Figure 4.10 displays the willingness to invest, whereas "15-20% of extra revenue" symbolize 15-20% of the new revenue stream implementing such a service would deliver. For example: To enable the option for guests to "select their own room" a fee of USD 20 is applicable. In the mentioned example, the income from such an arrangement would grant the service provider USD 3-5 every time a room reservation with the option enabled is completed. The option "XX-YY USD" represent a yearly license fee per room given to the service provider.

Keyword	Question phrasing
Q5	Would you be willing to invest in such a service? If so, how much?

Table 4.6: Market survey: Measuring willingness to invest

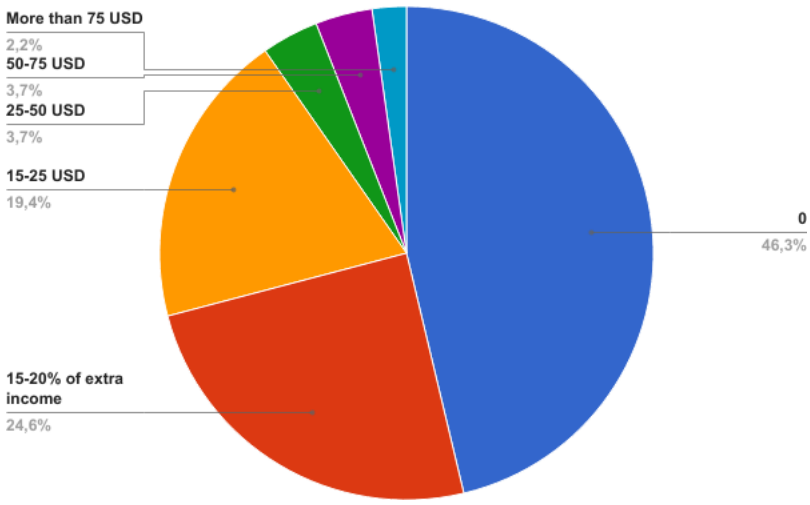

Figure 4.10: Results Q5: "Would you be willing to invest in such a service? If so, how much?". The "XX-YY" USD implies license fee paid yearly

4.5 Correlation Analysis

The consistency between answers can be described through the use of a correlation test, where the result can be displayed through a correlation coefficient or graphically. The internal consistency illustrates the probability for a respondent to select the same alternative for both questions. If the corresponding correlation coefficient is zero, there is no internal consistency. However, if the number is positive, the probability for a respondent to have consistent responses (selection of the same alternative) is high. In the case where the correlation coefficient is negative, the answers will move in opposite direction, such that the respondent select 1 for the first question and 5 for the next question.

The following graphs illustrate the internal consistency between answers by measuring the correlation. The axes denote the different questions, and the plotted line illustrate correlation. Figure 4.11 display the correlation between Question 1 and Question 2, the correlation coefficient is 0.497, and is the lowest. Figure 4.12 display the correlations between Question 2 and Question 3, and retain the highest positive correlation. The correlation coefficient is set to 0.662 and is significantly higher that than for Figure 4.11. Figure 4.13 display the correlation between Question 3 and Question 4, and have a correlation coefficient of 0.606.

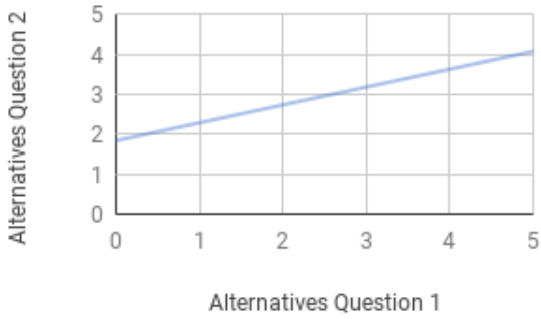

Figure 4.11: Illustration of the correlation between Question 1 and Question 2. The vertical axis denote the respondents answer to Question 2, while the horizontal axis denote the respondents answer to Question 1

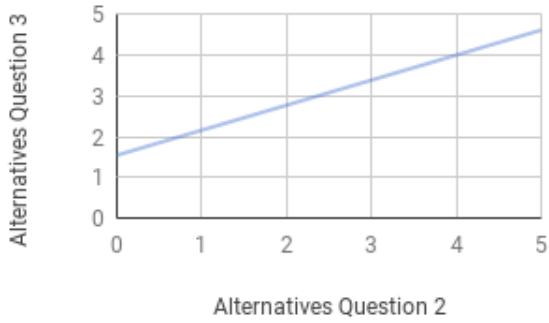

Figure 4.12: Illustration of the correlation between Question 2 and Question 3. The vertical axis denote the respondents answer to Question 3, while the horizontal axis denote the respondents answer to Question 2

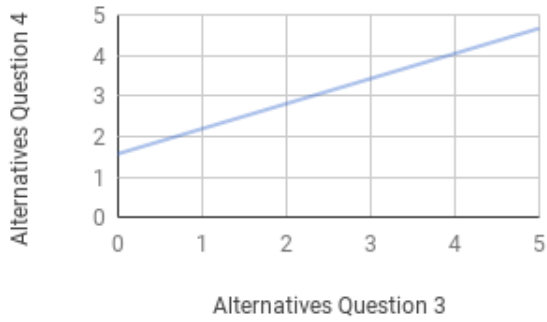

Figure 4.13: Illustration of the correlation between Question 3 and Question 4. The vertical axis denote the respondents answer to Question 4, while the horizontal axis denote the respondents answer to Question 3

4.6 Data Relationships

Numerous relations between the nine questions exist, however, the number of interesting and relevant relationships should not be that large. Given the research objectives, especially the business model design, relationships related to the distribution of interest per hotel segment or hotel size (room number) provides relevant information.

Figure 4.14 and 4.15 display the positive and negative interest toward indoor maps. Positive interest is denoted "Yes" and "Already in use" because the purpose with this illustration is to investigate which hotel segments or hotel sizes is most likely

to find indoor maps attractive. Furthermore, the results could reflect the demand within the defined segments/sizes.

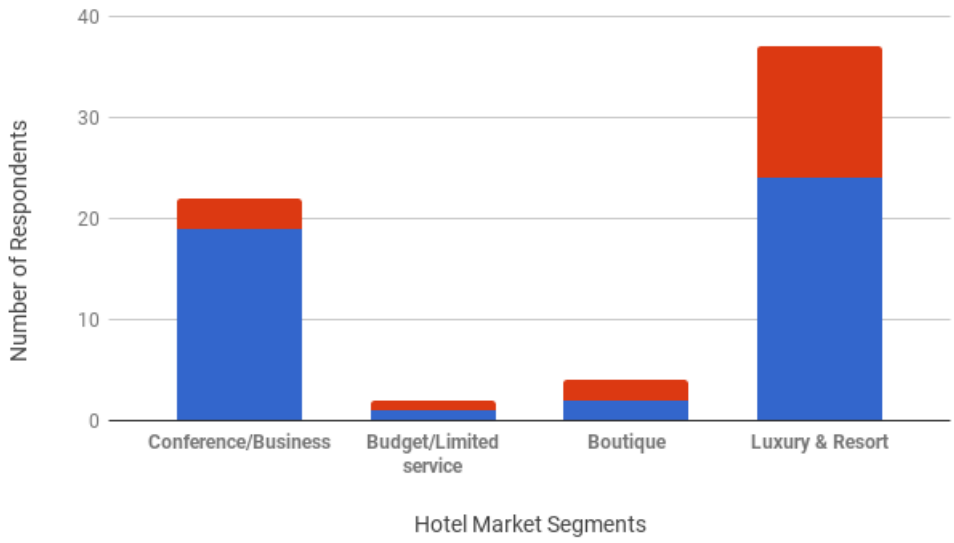

Figure 4.14: Representation of the distribution of responses between Question 3 (Interest in Indoor Maps) and Question 2.1 (Number of rooms). Blue demonstrate the respondents with a positive answer ("Yes" or "Already in use"), and red demonstrate the respondents with a negative response ("No").

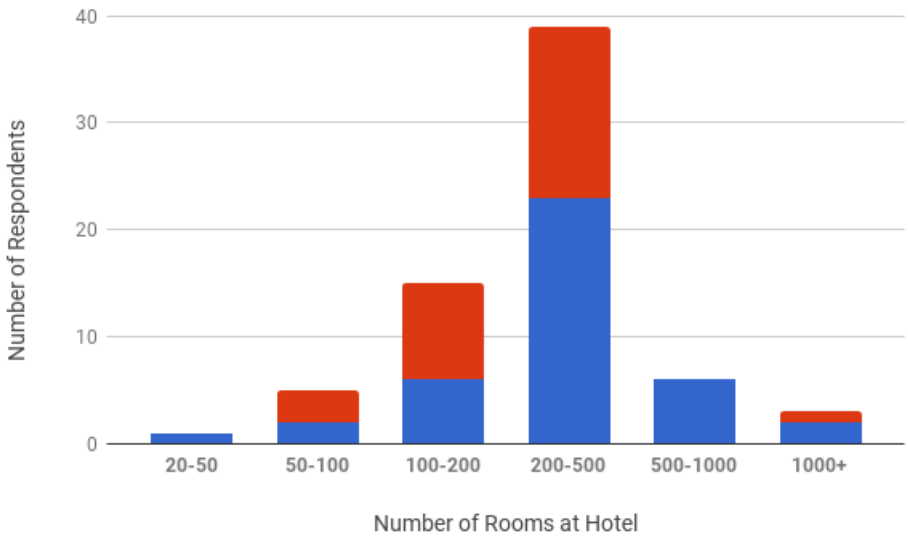

Figure 4.15: Representation of the distribution of responses between Question 3 (Interest in Indoor Maps) and Question 2.2 (Hotel group segment). Blue demonstrate the respondents with a positive answer ("Yes" or "Already in use"), and red demonstrate the respondents with a negative response ("No").

Earlier, figure 4.10 displayed Question 5 included all the respondent. However, if the respondents initially had a negative or indifferent opinion toward indoor maps this may have resulted in unjust results. Figure 4.16 display Question 5 for the respondents which answered "Yes" to Question 3 for their interest in indoor maps. The largest difference can be observed in that the segment composing of "0" have experienced a significant reduction from 46.3% to 29.7%. The reduction can be seen distributed across the other options, especially "15-25 USD per room per year" and "15-20% of extra income", with an increase of 7.2% and 6.7% respectively.

Figure 4.17 demonstrate what could be expected, where the respondents interested in indoor maps initially (answered "Yes" to Question3) show a higher willingness to pay when compared with all respondents. The figure contain two separate data sets.

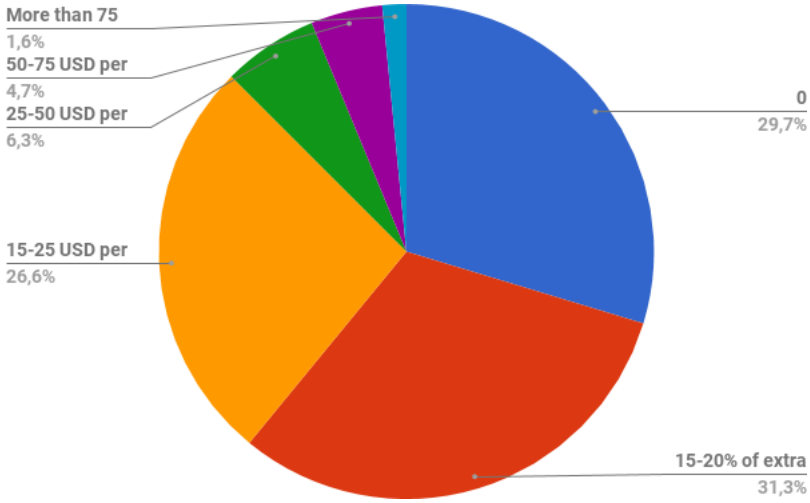

Figure 4.16: Illustrates Question 5 (Willingness to invest), provided the respondent answered "Yes" in Question 3.

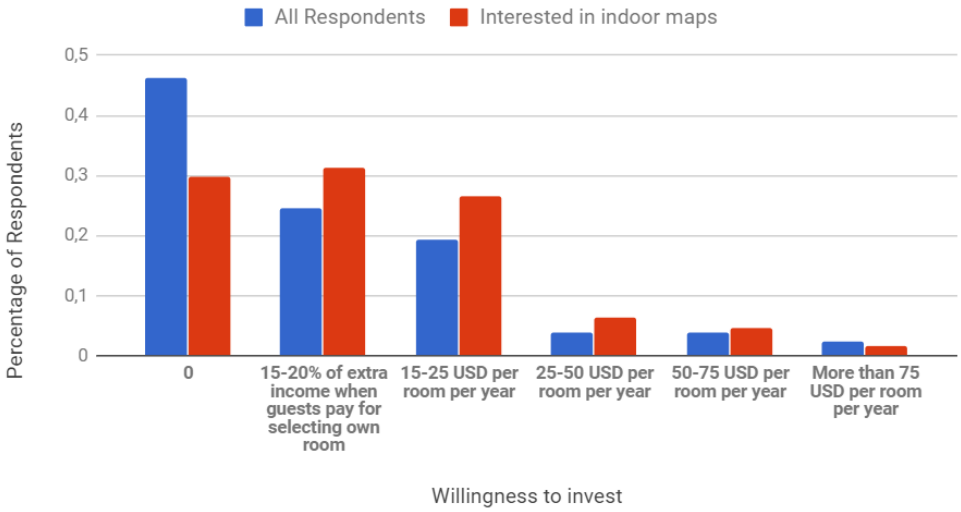

Figure 4.17: Graphical comparison between the willingness to invest for All respondents and the respondents with interest toward indoor maps (Answered Yes in Question 3).

Chapter 5
Business model

This chapter introduces a potential business model for indoor maps in the Next Generation Hotel Experience. The business model is based on the findings from the international market survey and investigation of indoor map technology. However, note that the proposed business model is a proposal and demonstrate how a feasible and robust business model for indoor map services could look like. The business model is designed considering the technological solutions MazeMap deliver today. The reason for this approach is the available cost and revenue estimations made available from MazeMap. The Business Model methodology described in Chapter 3.4 is applied to analyze and describe the model.

5.1 Next Generation Hotel Experience Business Model

The Next Generation Business Model is a presentation of a potential business model for the indoor map service "Select your own room". The service consists of an interactive indoor map illustrating each floor, where rooms can be selected and viewed, and the selected room can be directly booked through the service. Realization of the service can be completed with existing technology and knowledge company's such as MazeMap possess. Figure 5.1 illustrate a concept sketch of the service. The indoor maps service "Select your own room" described further in this business model will be written as indoor map service for short.

Figure 5.1: Concept sketch for the indoor map service "Select your own room"

5.1.1 Customer Segments

The customer segment consists of the parties who are created value for. This thesis has performed research aimed toward the hotel industry, and the customer segment will, in this case, consist of hotels. However, from the performed international survey it can be observed that the interest for indoor map services differs depending on the hotel's size and segment affiliation. The hotels contacted through the survey were selected at random and the result offers a generalized impression of the various hotel segments and their interest. Previously, indoor maps have been implemented at large institutions with a high number of users or visitors. The survey confirms that larger venues are initially more positive toward indoor map services than smaller venues. From the survey, it can be concluded that the prime customers are operating within the Business/Conference or Luxury & Resorts segment. The hotel facilities would typically have more than 500 rooms.

Currently, the launched indoor map solutions in the hotel industry are in the Luxury & Resort and Business/Conference segment. In addition, especially Luxury & Resort hotels have an abundance of facilities to increase customer satisfaction. The complexity from numerous facilities or a high number of rooms is a prime target for indoor map services to increase guest satisfaction. In smaller and/or less complex facilities indoor map services would not necessarily reach its full potential, and

hotel guests are not certain to recognize the value. Based on this line of thought, the Budget/Limited Services, Boutique, and facilities with less than 500 rooms are not viewed as having the same potential. Table 5.1 displays some of the essential characteristics for the target customer. Brand affiliation refers to if the hotel is branded or unbranded, and the primary target customer segment would be branded hotels. The major advantage in regard to branded hotels is the number of sale cycles, where an agreement toward a brand could result in the deployment of the solution at hundreds, if not thousands of hotels. In comparison, every unbranded hotel would need an individual sale cycle, this would severely limit resources and potential revenue.

Key Characteristics	**Target Hotel**
Number of rooms	> 500
Segment affiliation	Business/Conference, Luxury & Resort
Incentives for use	Complex facilities, increase customer satisfaction
Financial capabilities	Good
Brand Affiliation	Yes

Table 5.1: Customer Segments: Key characteristics for target customers

5.1.2 Value Proposition

The Value Proposition describe the service and bundle of products that create value for the target customer segment. The target customer segment is selected based on where indoor maps can be utilized to its full potential and where hotel guests may be interested in such services. Hotels positioned in the high price hotel market and conference/business hotels would likely experience more demanding customers in regard to the customer service expectations. The implementation of indoor map services increase the level of personal customization of the hotel stay and can be regarded as a tool for strengthening the customer service. Furthermore, guest utilizing the service could experience an increased level of ownership to the booking, since the guest is more involved in the process.

Research from [19] have revealed that a majority of hotel guests book their stay through online websites. As previously described in Chapter 2.4, OTAs can have a significant impact on hotel profits, and the utilization of indoor maps exclusively at the hotel's homepage could result in a considerable change in the traffic flow between the hotel homepage and OTAs websites. The change in traffic flow could enable the hotel to "steal" back some of their lost profit, which is paid as commission. Recently, several of the large OTAs have introduced their own loyalty programs, a feature previously exclusive to hotels. The introduction of unique services to loyalty program

members at hotels could increase the competitiveness. The Hilton Hotel group uses this approach where only HHonor (Hilton Loyalty Program) is offered the utilization of indoor map services through their applications.

The implementation of indoor map services provides an opportunity for a new ancillary revenue stream. The price for utilizing indoor map services can be presented hotel guests as incorporated in the room price or as an extra fee when booking the room. Information from related industries (Chapter 2.5) have demonstrated the importance of ancillary revenue, and the introduction of similar services at hotels could result in significantly higher margins. It is important to note that the extent of success the indoor map service experience is significantly related to how the service is marketed and promoted toward hotel guests.

Implementing "Select your own room" consist of transforming the building plans into digital interactive indoor maps, implementing point-of-interest for each room such that guest can view further room details, and connect the service with the local property management system resulting in coherent communication between system entities.

5.1.3 Channels

Channels describe how the customer segments can be reached. Indoor map services in the hotel industry is a relatively new service, where a similar solution is only present at one hotel group, and determining which channels to use can, therefore, be difficult. The general survey respondents were unfamiliar with indoor maps, and it should be stressed that the indoor map service potential should be emphasized in the value proposition to increase customer awareness.

Given the lack of awareness around indoor map services and the advantages of being an early mover, a direct approach should be adopted. The key element is to reach decision makers or other possible stakeholders. Identifying the right person in a large hotel group is not necessarily trivial, but all large organizations should have personnel responsible for room utilization or digital solutions. The pre-project [29] identified the relevant decision makers within the IT and Room Management department. Despite the awareness around key personnel, reaching the person may pose a challenge, therefore, going through staff can increase efficiency.

Participation at hospitality conferences and approaching Non-Governmental Organization (NGO) may provide valuable visibility and result in a viable channel. Commonly, conferences are arranged annually and NGOs arrange meetings and expositions. A pilot solution should be developed and presented through the different channels to increase awareness and present the value proposition. Table 5.2 describe the five phases in Channels with the corresponding channels. Direct communication

without a medium in-between offer the least time-consumption and reduce the probability for misinterpretation of information. Globally, there exist only a small group of suppliers in regard to furniture, electronics, and equipment, and direct contact or partnership with such suppliers could offer grand opportunities. The use of pre-established communication channels would be a valuable asset in the initial phases.

Phase	**Channel**
Awareness	Conferences, Meetings, Media, NGOs, Phone, Hotel suppliers
Evaluation	Conferences, Meetings, E-mail, Phone
Purchase	Conferences, Meetings, E-mail
Delivery	Meetings
After Sale	E-mail, Phone

Table 5.2: Channels: The five phases and the corresponding channels

5.1.4 Customer Relationships

Customer Relationships defines the relationship the customer segments expect and how it is maintained. The relationship changes over time and as the service mature to provide the optimal outcome. The aim of the customer relationship is to reach and maintain a productive relationship with decision makers and stakeholders. Furthermore, it is important to create a bilateral relationship toward the entities that integrate and make use of the service daily.
During all phases, one of the major challenges is to accommodate the customer's expectations. The distance between the initial expectations and the actual service can in many cases be large. To bridge the gap, continuous communication and customer support are key. The opportunity for incremental sale after implementation is easy to spot with a close customer relationship and may bring extra revenue streams.

Table 5.3 display the key customer relationship strategies for the different product phases. In the initial phase where a pilot is designed and created an iterative strategy with co-creation of the service may be preferable. The co-creation would enable the customer to provide input and improve the service. Dedicated personal assistance is an important tool during the introduction phase, where the level of novelty and innovation is high. The dedication toward each customer creates a sustainable relationship, and also an opportunity to learn from the early adopters. The growth phase indicates that the service is running stable and do not require the same amount of dedication. Therefore, personal assistance would fulfill the requirement on a regular basis. Upon reaching the maturity phase, creation of communities where customers can share experience and best practices becomes of increased importance, elevating

some of the need for customer service. The self-service strategy offers reduced costs through providing complete documentation and self-help tools. This strategy mostly removes the personal relationship between the customer and service provider.

Phase	**Customer Relationship Strategy**
Pilot	Co-creation, key partnership
Introduction	Dedicated Personal Assistance
Growth	Personal Assistance
Maturity	Communities
Decline	Self Service

Table 5.3: Customer Relationships: Customer Relationship Strategy for different product phases

5.1.5 Key Resources

Key Resources indicate the necessary resources enabling delivery of the value proposition. The delivery of indoor map services to hotels require allocation of several resources to fulfill the value proposition. The server infrastructure is a vital part in the delivery of software services, and having a centralized, consolidated infrastructure would enable short response time to customer issues, as well as an up-to-date version of the service. However, in the current market, servers have become a commodity, but good intellectual capital and a sales force are not necessarily easily acquired. Table 5.4 present the proposal for key resources divided into types.

Type of Resource	**Resource Description**
Physical	Server infrastructure, Software development
Intellectual	Digital floor plans, Software rights, industry partners, customer relationships
Human	Research & Development, Marketing/Sales personnel, Software developers
Financial	Investment/Funding to enable development and implementation

Table 5.4: Key Resources: Overview of key resources by category

Continuously improvements of the service in the initial phases, and increasing the efficiency and scaling capabilities in the service is highly dependent on the human resources, and especially the software developers. Given the lack of awareness around indoor maps in the hotel industry, marketing/sales personnel will perform a crucial role when increasing awareness and delivering the value proposition. The initial de-

velopment of the service will be dependent on cooperation with customers to improve the pilot solution. Indoor maps can operate as the foundation for several solutions, such as navigation, predetermined industrial partners could provide assistance and expand the number of distribution channels. In addition, the intellectual capital from industry partners and customer relationship present valuable resources. Financial capabilities determine the speed of development and expansion. Currently, the indoor map market consists of a number of technologies but transforming these applications to fit a new use case require financial aid.

5.1.6 Key Activities

The Key Activities in a company describe the crucial activities that enable delivery of the value proposition. The identified key activities include the following:

- **Software Development**: Software is the underlying foundation for the service and software development is a vital part of the key activities, this includes the development, operation and maintenance of the service.
- **Business Development**: Continuous business development is an important element to reach the determined customer segments. The ability to adapt and evolve the business model to a changing technological and economic environment is important for the development of the service.
- **Customer Support**: An important part of the customer relationships is the activity customer support. This activity includes the processes after a sales agreement and ensures that the customer receives a good and stable service. Close contact through customer support may uncover opportunities for additional sales.
- **Sales & Marketing**: Customer acquisition is represented through sales & marketing. This activity also involves raising awareness toward the service.
- **Community creation**: The creation of a community produce benefits for both the company and customers. The company creates a community where customers can interact, and should the community produce input that receives traction, the input can be implemented and utilized.

5.1.7 Key Partnerships

Key Partnerships describe the network of suppliers and partners that make the business model work. A crucial part in the development of an indoor map service would be committed partner in the hotel industry that can provide input and continuously test the solution during development, and perform extensive testing of

the pilot. Furthermore, creating a positive relationship or a partnership with one or more NGOs could extend awareness and the value proposition.

Partnerships toward hotel suppliers may enable the opportunity to use their contact network or their sale processes. Partnering with a major hotel supplier could provide insight and knowledge into the current market and its conditions. HOIST is a prominent supplier within this market and could offer assistance and fulfill the criteria for a partnership [15].

5.1.8 Revenue Stream and Cost Structure

5.1.8.1 Revenue Stream

The Revenue Stream illustrate the cash flow a company generates from each Customer Segment. The "Select your own room" feature could function as a standalone service or be bundled together with additional indoor map services, if the customer is interested. The estimations performed in this section will be based on the standalone service.

Investigation of the survey results shows that 31.3% of the respondents interested in indoor maps selected the alternative "15-20% of extra income" when rating their willingness to invest. The second most selected alternative, which constitutes 26.6% of the responses was the alternative "15-25 USD per room per year". The alternative receiving the majority of the responses will be used further in the estimations, and Figure 4.16 offer details concerning the distribution of responses regarding willingness to invest.

The Target Customer Segments are hotels with more than 500 rooms, positioned in the Business/Conference or Luxury & Resort segment, and with a brand affiliation. The number of branded hotel rooms per 2016 is 44% of the global room supply, approximately 9,918,724 rooms [36]. Investigation performed by [2] found that 10.55% of the room supply in the USA is from hotels with more than 500 rooms. A pessimistic approximation of the total market size measured in a number of rooms would be 10.55% of the global room supply, resulting in 1,047,016 rooms worldwide. The related industry, airlines, is comparable regarding the fee for seat selection, which often is located in the range 10-20 USD per reservation. Due to lack of information, the same range will be used in these estimations. In regard to the Average Length of Stay, statistics from Las Vegas is utilized [44].

Estimation of Revenue Stream based on "15-20% of extra income"

Key numbers:
Market size = 1,047,016
Global Average Room Occupancy = 67.63%

Average Length of Stay = 3.4 Nights [44]
Booking fee for utilizing "select your own room" = 10-20 USD

The Average Number of Bookings performed per year in the target market can be estimated with: $\frac{(MarketSize \times AverageGlobalRoomOccupancy) \times 365}{AverageLengthofStay}$

Average Number of Bookings per year = 76,016,376 bookings

The range for the Revenue Stream has a upper and lower bound depending on the Booking fee, in addition to the percentage of the extra income (15-20%).

Formula for estimation of lower/upper bound:
$(AverageNumberofBookingsperyear) \times (BookingFee) \times (Percentageofextraincome)$

Range	Booking Fee	% of extra income
Lower Bound	10 USD	15%
Upper Bound	20 USD	20%

Table 5.5: Revenue Stream: Estimation variables

Estimation of Revenue Stream range: 114,039,564 - 304,065,504 USD

The previous estimation display the total market value, however, if looking toward a specific target customer with 500 rooms, and utilizing the same formulas.
Average Number of Bookings each year for Target Customer = 36,301
Estimated Revenue Stream Range for Target Customer = 54,301.5 - 145,204 USD

Bundling is a prominent pricing strategy, where a product or a service is sold in a package deal, or bundle. The utilization of this method reduce diversity in valuation and reservation prices for the customer. The internal synergies in the bundle make this package attractive. In the case of indoor maps, a typical bundle could consist of indoor maps, navigation and "select your own room" service. Additionally, investment in a large bundle will contribute to a strong lock-in effect upon a large investment contribute to a strong lock-in effect upon contract agreement.

5.1.8.2 Cost Structure

The cost structure describes all the cost incurred to operate the business model. The cornerstones in the cost structure are the variable and fixed costs. Further elaboration of these can be found in Table 5.6. The intellectual capital is highly valuable, but also incur a high cost. High performing software developers and an experienced sales force/marketing group are both expensive.

The "Select your own room" service would need the following to operate:

- Digitizing the floor plans.
- Integration toward local property management system.
- Points-of-interest for each room to display room information, such as price, size, room utilities.

Type of Cost	**Description**
Fixed costs	Software Development, Operational costs, Salaries, Rent
Variable costs	Implementation/Deployment, Integration, Marketing & Sales, Hardware

Table 5.6: Cost Structure: Overview of fixed and variable costs

The following example contains information related to the cost incurred at MazeMap when implementing and maintaining an indoor map service at hotels. The numbers describe a basic service, in other words, a basic interactive indoor map of the hotel floor plan, without points-of-interest or additional services. A natural course of action would be to integrate the hotel's property management system toward the indoor map service or include additional services. However, no cost estimation or information is available at this point in time.

The estimated cost bellow do not take into consideration costs related to the process before deployment of the system, such as travel cost to meetings, communication, and more. The estimation examines the costs related to implementation and operation/maintenance.

- **Implementation of service**:
  - Implementation of Floor plans: The transformation to interactive digital indoor maps is performed at 15 minutes per floor, where the hourly cost in resources is 600 NOK.
  - Integration toward local property management system: The integration cost depends on the condition of the system and the connectivity, and in some cases, the development of a new property management system could be necessary. The cost of implementation would compose of numerous processes and integration phases.

    - Points-of-Interest: The integration of points-of-interest require resources to the same cost as transformation of floor plans, 600 NOK per hour. The process consist of structuring data and implementation.

- **Operation/Maintenance**: Operation and Maintenance include server infrastructure, third-party vendors, updates of indoor maps and more. The cost has been estimated at 0.30 NOK per session, whereas one session can be described as one booking.

Given a hotel with 500 rooms, divided across 15 floors would incur the following costs structure:

Implementation of service:

- Cost related to implementation of floor plans can be calculated by utilizing the formula, $\frac{Hourlyrate \times (Numberoffloors \times Timespentperfloor)}{60minutesperhour}$
  Implementation of floor plans cost = 2,250 NOK

- Cost related to integration toward property management systems is challenging to estimate, dependent on the state of the property management system and the necessary development of connection/links, the range of costs can be 50,000-100,000 NOK. The cost of arranging the agreement is incorporated in the cost estimate, such as travel expenses, salaries, design of material/proposals and more.

- POI cost relates to the size of the building mass, where 1,000 square meters would have an estimated cost of 600 NOK. The average room size is 330 square feet, or 30,65 square meters, for a hotel consisting of 500 rooms this would result in a total of 15,325 square meters of area [16][17]. The following formula can be utilized, $\frac{Totalsquaremeters \times Hourlyrate)}{1000squaremeters}$, rounding up.
  Implementation of POI cost = 9,600 NOK

Operation and Maintenance:

- The operational cost per booking is estimated at 0.30 NOK. Chapter 2.3 stated the global average occupancy rate at 67.63% and Average Length of Stay at 3.4 nights.
  Bookings per year = $\frac{(NumberofRooms \times AverageOccupancyRate) \times 365days}{AverageLengthofStay}$
  Bookings per year with 500 rooms hotel = 36,201 bookings
  Cost of Operations per year = $Bookingsperyear \times Operationcostperbooking$
  = 10,860.3 NOK

– The cost of maintenance is incorporated in the operation cost of 0.30 NOK per session/booking

The total cost incurred by a hotel with 500 rooms = 72,710.3 - 122,710,3 NOK
Converted to USD (NOK/USD: 0,117232) = 8,524 - 14,385.6 USD

5.1.8.3 Profitability

The profitability of a product or service can be expressed through various factors and calculations. The following analysis will attempt to include the most commonly seen approaches.

Previously, the cost and revenue stream have been calculated for a 500 room hotel, and the following numbers have been estimated:

– Estimated Revenue Stream $\in [54,301.5USD, 145,204USD]$

– Total cost $\in [8,524USD, 14,385.6USD]$

Profit Margin measures the net income for each USD in the total revenue. A profit margin of 15% would indicate that the company would earn $0.15 for every USD made in sales. Benefit Cost-Ratio (BCR) illustrate the relationship between a possible benefits and costs, where a value greater than 1 indicates that the benefits outweighs the costs. The estimations will consider the range consisting of the worst-case (Lowest Revenue & Highest Cost) and best-case (Highest Revenue & Lowest Cost) scenarios.

$$Profit = Income - Cost$$
$$ProgitMargin = \frac{NetIncome}{NetSales}$$
$$BCR = \frac{Benefit(Profit)}{Costs}$$

Estimations - 100% of Bookings performed with "Select your own room":

Profit $\in [39,915.9USD, 136,680USD]$
Profit Margin $\in [73.50\%, 94.13\%]$
BCR $\in 2.77, 16.03]$

The estimation for Revenue Stream is based on the assumption that all bookings are using the "Select your own room" service, however, the probability for this best case scenario is low. Making the assumption that 30-50% of the hotel guests will utilize the service result in the following estimation:

– Estimated Revenue Stream $\in [16,290.45USD, 72,602USD]$

– Total cost $\in [8,524USD, 14,385.6USD]$

Estimations - 30-50% of Bookings performed with "Select your own room":

Profit $\in [1,904.85USD, 64,078USD]$
Profit Margin $\in [11.70\%, 80.20\%]$
BCR $\in [0.13, 7.52]$

Provided with the given cost and revenue stream, the number of bookings necessary to break-even in can be estimated.

$$MinimumPercentageofBookings = \frac{Cost}{RevenueStream}$$

The Minimum Percentage of Bookings is dependent on the cost scenario, and is estimated to be in the range 15.7-26.5%.

5.2 Summary

A summary of the Next Generation Hotel Experience business model is displayed with Osterwalder's business model onthology through Osterwalder's Business Model Canvas filled with key words for each element, see Figure 5.2.

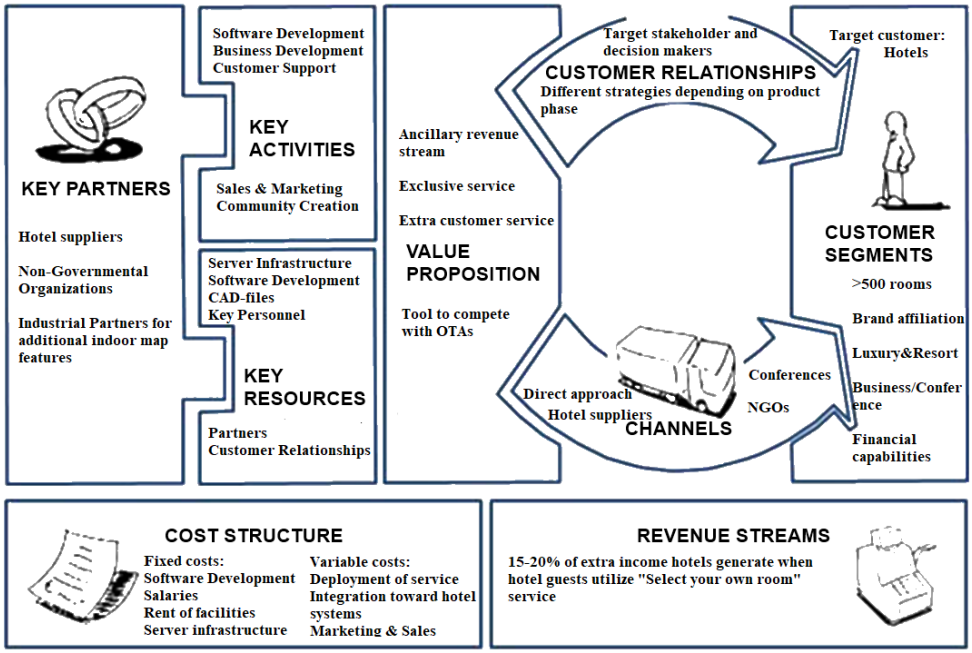

Figure 5.2: Business model summary illustrated through the Business Model Canvas

Chapter 6
Discussion

This Chapter intend to discuss and present possible improvements of the methodology, Business Model and Financial Analysis. Furthermore, how the lack of publicly available references have affected this thesis is briefly mentioned. From the survey comments, a small selection have been displayed to affirm certain difficult aspects of indoor map services. The two competitive technologies from MazeMap and Indoo.rs is compared and investigation of their prime use cases is identified.

6.1 Competitive Technologies

Multiple technologies and methods are currently present in the indoor map market, where the Background Chapter introduced three main categories. From the introduced technologies the SLAM approach is currently forecasted to be a revolutionizing technology. SLAM have no requirements in regard to specific equipment or format of building plans, the service can be used to digitalize a building by walking with a device that create a radio map. In comparison, the MazeMap solution utilizes machine learning and algorithms to automatically transform the building plans (preferably in CAD-format) into interactive digital maps. In cases where hotels do not possess accurate floor plans and have no digital files the MazeMap solution would not be applicable, whereas the SLAM solution will be applicable in all cases. However, the main difference between the two approaches is related to accuracy and time-consumption. MazeMap currently attain the assumed lowest roll-out time in the industry because of their extremely efficient algorithm and optimized deployment/implementation team. Currently, SLAM needs to translate the radio map into an interactive digital indoor map.

Both solutions are highly competitive, and the preferred solution for a hotel should vary depending on the building complexity and if appropriate digital building plans are available. Displayed in the Cost Structure under the Business Model Chapter, the necessary time for MazeMap to map one hotel floor is mentioned. SLAM is

marketed to use one day to map a floor [40], while MazeMap report the same mapping task takes 15 minutes. In other words, currently, the MazeMap approach is the significantly fastest method available in the market.

The survey attempt to investigate the interest and distribution of the respondents. In retrospective, the international market survey or an additional survey could have investigated the current technological standard at the various hotels and brands. The investigation could have uncovered information related to the distribution of hotels that have CAD-files in their possession and the current implemented Wi-Fi system. Currently, no information exist in regard to which technological solutions would be strategic to implement.

6.2 Methodology revisited

The survey method was selected as the research approach to fulfill the research objective. However, as previously described in the Methodology Chapter, numerous different Quantitative, Qualitative and Mixed methods exist. Given the characteristics of the research objective, a generalized and objective view of the population would provide favored results. Still, a different research approach could have been attempted to insure quality the survey results. For example, the use of mixed methods could have been beneficial, where the research method can be decomposed into two parts. Firstly, an international market survey with closed-questions is distributed to selected contacts. Second, a small number of in-depth interviews with personnel in hotel supply organizations, NGOs and hotel market. This approach would enable the collection of both quantitative and qualitative data.

The compilation of contact lists with relevant hotel personnel was composed through a third-party service. Unfortunately, only 2/3 of the contacts were usable, and even though the process significantly reduced time consumption, the lack of control resulted in a 33% loss. The market research performed was conducted at an international level, but the ability to observe differences in responses depending on region or country was absent. The combination of compiled contacts lists from a third party and cold-emails delivered in large volume provided this flaw. In the case this information was present, the results could have been utilized to add further depth to the data analysis and identify the region with the highest interest.

The survey was designed to segment the respondents, measure interest, and measure willingness to invest. In regard to measuring scales, social science includes several well-documented approaches, but the favored choice is the 5-point Likert-scale. The main difference between the Likert-scale and the utilized scaling in the survey can be observed in the question phrasing and the question alternatives. The Likert-scale is formulated such that the respondent Strongly Disagree, Disagree, Neither, Agree or

Strongly Agree to a statement. For example, a statement could be “I am happy with the course AFR1000?”. This type of scaling is especially useful when investigating attitude or satisfaction.

6.3 Survey Comments & Feedback

The last question in the survey offered the opportunity for the respondent to provide comments or feedback. The following five comments are selected to display all the various topics mentioned throughout the comments/feedback.

> *"The mapping would have to work with our online booking engine that we already have. The challenge is that guests tend to use a lot of third party booking agents such as Expedia more than they do with our own website. You will find that this is the case for many independent resorts and hotels. For this to be cost effective for us, as well as beneficial to the guest, Expedia would have to utilize this software as well. Finally as an operation we probably wouldn't put 100% of our available inventory up for this option. We have a mix of room blocks for business and wedding groups that require pre-assigned room types. I like where you are trying to go with this. I think this would work well at a metropolitan business hotel. Business travelers are generally less demanding in their needs than leisure travelers. Feel free to contact me directly for additional feedback. Also, it puts a lot of pressure on having housekeeping clean specific rooms instead of room types. This could cause guests to wait for their specific room to become ready. "*

The major difference between branded and unbranded hotels is the amount of marketing power and marketing channels they occupy. Branded hotels that have access to a marketing department and promotion campaigns would not necessarily share the same wish as an independent hotel to share an exclusive service such as indoor map services. From the comment, especially the part concerning extra pressure for housekeeping and OTA cooperation should be highlighted. Additionally, the respondent raise an important point, independent hotel (unbranded) often offer extra services on a regular basis, such as wedding arrangements, and relies on the extra revenue. Extra services could impact the available inventory and restrict the use of indoor map services.

> *"Most of these items are not really relevant to a property of our size which runs nearly 96% occupancy year-round. I believe that selective-room practices may detract from the overall intent to book if the desired room location is not available. "*

Previously, the business model described how the process of selecting your own room could result in an increased sense of ownership. However, as highlighted in this comment, should the room be occupied the service could have the exact opposite effect where the customer abstain from booking at this hotel.

> *"Although this might not be feasible in the near future because guest room assignments are more complicated than seat selection due to length of stays, extension stays, room issues, guest room preferences, etc."*

The implementation of indoor map services would limit the flexibility hotel staff experience today. As the respondent mention, guest room assignment can become complicated. For example, guests wish to extend their stay, but another pair have selected the room. In the cases where the service "select your own room" is not present, the hotel staff would just assign a random room to the new pair without any experienced inconvenience for any of the guests.

> *"Your project is not easy to apply with real guests and properties with lot of different room types and rates, also you may loose sales as the guest is choosing his/her own room therefore not able to maximize the room inventory, especially if your length of stay is longer than 1 night."*

The respondent highlight the same element as previous respondents, where the lack of flexibility could severely limit some hotels due to high occupancy rate or the lacking utilization of room inventory.

> *"1. Because rooms inventory is so dynamic it would not be possible (in my view) to do this at reservation stage as there are so many variables and movements in rooms all the time.*
> *2. It could possibly be done at check in - but there are complexities with when rooms will become available/ guests checking out late / duration of stay etc. You would have to choose if the map showed all rooms available that night irrespective of their current status / availability or whether you just showed rooms ready to be occupied immediately*
> *3. It would probably work much better in larger hotels - smaller boutique hotels are more difficult.*
> *4. As you know many people book through third party booking engines rather than direct to the hotels so you would be missing this segment. But it might also help drive more traffic direct to the hotel if guests thought it an important tool - which would be good for the hotels. "*

The final comment reflect the previous statements and summarize the identified problems. In addition, the respondent highlight the positive element concerning competition toward OTAs. Previously, another respondent pointed out that indoor map services would not necessarily prove advantages for small hotels. However, for large hotels this may provide an incentive to use their websites. The results of the survey and the comments resulted in the target customer criteria where the hotel should contain more than 500 rooms.

Appendix D include the complete list of all the comments submitted from respondents.

6.4 Business model use case

The survey included four different basic use cases for indoor maps, "select your own room" service, indoor navigation, digital floor plans, and digital emergency application. The Next Generation Business model could have been designed around all these four services.

The initial assumption regarding the different services was that "select your own room" would be the service highlighted, therefore, the last question related to willingness to invest directly relate to this feature. Thus, when proposing a potential business model this service would be used as the basis. Unexpectedly, the survey reflected the opposite result, where the "select your own room" service ranked with the lowest mean value and the Digital Emergency service ranked the highest. The resulting business model from using the Digital Emergency service would be similar to the present model. The major difference would be in the Value Proposition and Revenue Streams. A Digital Emergency service ensure the health and safety of the guests and would not be natural to restrict behind a pay-wall for hotel guests. The Revenue Stream could consist of a license fee depending on the size of the building mass, in m^2. The Value Proposition could describe the additional layers of safety such a service would provide for guests and staff alike.

The target customer segment reflects the results from the survey, the results are illustrated in Figure 4.14 and Figure 4.15. Unfortunately, the target customer group is limited in regard to number of respondents, and the lack of respondents prevents a good and accurate analysis.

6.4.1 Financial Analysis

The lack of financial information concerning income and expenses has resulted in a simple economic model and calculations. Increased information could have resulted in calculations pertained to Internal Rate of Return and estimation of long-term

cash flow. The revenue streams and cost structure do not take into consideration operation/maintenance for more than one year. In the methods utilized to express profitability, Net Present Value is commonly used, however, due to the lack of accurate information concerning cash flows the estimations are rather crude.
The estimations performed in the business model reflect a high level of uncertainty and the range of the estimations are at times considerably large. Information concerning guest preferences could provide the necessary data to significantly improve the estimation of Revenue Streams.

6.5 References

The field of indoor maps in the hotels industry is a new topic and have currently not experienced any studies, reports or proceedings. Information and publications related to indoor map technology and the global hotel market are available, but specific estimations and detailed information are either not publicly available or closed behind pay-walls. The lack of publications and reliable sources have resulted in a majority of the references originating from web articles, news statements and proceedings. The reliability of these sources is not necessarily high, therefore, in most cases several sources have been utilized to ensure the authenticity of the reference. Regrettably, in some cases this was not made possible due to scarcity of secondary information.

Chapter 7
Concluding Remarks and Further Work

7.1 Concluding Remarks

This master thesis presents an investigation of business potential for indoor maps and the viability of main indoor map features in the next generation hotel experience. Additionally, research pertained to how existing business models can be altered or how a new model can be adopted to provide a sustainable service is performed. The objectives of the thesis have been achieved through the employment of an international market survey, background/market research and data provided from MazeMap.

The framework of Osterwalder's business model ontology and canvas is utilized to describe the proposed business model. Identification of customer segments, value proposition, revenue streams and the other aspects is a result of the international market survey and background research. The annual cost involved with deployment and operations is low, mostly due to the low-cost related to transformation of building plans. In spite of the low transformation cost, the cost related to integration toward property management systems is uncertain and an assumption is made.

The key figures of the business model demonstrate the viability of implementing indoor map services, where the profit margin for a hotel with 500 rooms was estimated to 11.7-80.2%. The total market size is estimated at 1,047,016 rooms worldwide for the identified target customers. The wide range is a result of a high level of uncertainty in the revenue stream and cost structure. The previous profit margin estimation assumes 30-50% of all bookings is performed through the "select your own room" service. However, if 100% of all bookings is performed utilized the service the profit margin increases to 73.50-94.13%. The viability of indoor map services in the next generation hotel experience is dependent on the number of bookings performed. In the case where "15-20% of extra income" is utilized as a basis for revenue stream, the break-even is estimated at 15.7-26.5% of guest bookings. The present technology in the market meet the requirement for implementing indoor map

services, the vulnerability of this implementation is the technological standard at the hotels implementing the service.

Based on the identified elements in the business model, the target customer for indoor map services are hotels located in the Luxury & Resort or Business/Conference hotel segment, contain more than 500 rooms, possess good financial capabilities and have brand affiliation.

Considering the high uncertainties involved in the analysis of revenue stream, cost structure and profitability some topics are suggested for further work in the following section.

7.2 Further Work

Several aspects surrounding the Next Generation Hotel Experience and how indoor maps can be utilized can be further addressed. Upon closure of the survey, 134 respondents had expressed their interest toward indoor maps, possible services and their willingness to invest. The survey method offer the opportunity to generalize a population based on a sample, however, to increase the accuracy a sufficient number of respondents should be included. Further large survey studies should be performed to ensure the concluding results from this thesis. The survey could be composed in widely spread languages, such as French, Spanish and German, to increase the response rate and reduce the probability of misinterpretation. Limited information is published related to the current technological condition in the hotel industry. Thus, conducting a survey to investigate the market conditions by region could be highly beneficial. An investigation of technological conditions could, however, uncover the current state of property management systems and if hotels are in possession of CAD-files of the building mass. This information could further reveal the optimal target customer based on technological readiness and interest from hotel executives.

The market survey and background research have been concentrated toward the hotel industry and related information. However, the hotel guests preferences and their interest toward indoor map services have not been investigated. The investigation of guest preferences would be a key element for hotels if they decide to invest in indoor maps services or abstain. Initially, one of the objectives in this master thesis were to investigate guest preferences, however, due to time constraint this objective was not fulfilled.
Furthermore, development of a pilot or prototype could highlight additional circumstances related to the technical aspect of indoor map services. The illustration of a pilot could enhance the understanding for guests and executive hotel personnel in case additional market research is conducted.

References

[1] Yves Pigneur Alexander Osterwalder. *Business Model Generation.* John Wiley Sons inc, Hoboken, New Jersey, 2010.

[2] AHLA American Hotel & Lodging Association. Lodging industry trends 2015. https://www.ahla.com/sites/default/files/Lodging_Industry_Trends_2015.pdf, 2015.

[3] Karl Bernhoff Binde. International business potential for analytics of room utilization. Master of science in communication technology, Norwegian University of Science and Technology, June 2015.

[4] Willem Obermann Bram Lentz. *Hospitality 2015 Game changers or spectators?* Deloitte, 2 New Street Square, London, EC4A 3BZ, United Kingdom, 2010.

[5] Alex Butler. London hotel group launches site to let you choose your own room. http://www.lonelyplanet.com/news/2016/07/08/hotel-choose-your-own-room/, July 2016.

[6] Marianne Bøhler. Business models for future networked 3d services. Master of science in communication technology, Norwegian University of Science and Technology, June 2011.

[7] C. Cadena, L. Carlone, H. Carrillo, Y. Latif, D. Scaramuzza, J. Neira, I. Reid, and J.J. Leonard. Past, present, and future of simultaneous localization and mapping: Towards the robust-perception age, 2016.

[8] John W. Creswell. *Research Design: Qualitative, Quantitative, and Mixed Methods approaches.* SAGE Publications Inc., Thousand Oaks, California 91320, 2014. 4th Edition.

[9] Hugh Durrant-Whyte and Tim Bailey. Simultaneous localization and mapping: Part i. http://e-collection.library.ethz.ch/eserv/eth:5659/eth-5659-01.pdf, June 2006.

[10] Jess Farley. London's glh hotels launches new 'choose your own room' booking site. https://awardwallet.com/blog/londons-glh-hotels-launches-new-choose-your-own-room-booking-site/, February 2017.

[11] Joy Frechtling. The 2002 user friendly handbook for project evaluation, January 2002.

[12] Karen Gardiner. At hilton hotels, you can now choose your own room. https://blog.shermanstravel.com/2014/at-hilton-hotels-you-can-now-choose-your-own-room/, August 2014.

[13] Robin Henniges. Current approches of wi-fi positioning. TU Berlin, SERVICE-CENTRIC NETWORKING - SEMINAR WS2011/2012, 2012.

[14] Hetras. Choosing your own room. http://www.hetras.com/blog/choosing-your-own-room, May 2015.

[15] HOIST. Company presentation. http://www.hoistgroup.com/wp-content/uploads/2014/12/hl-company-presentation-2014-uk.pdf, December 2014.

[16] Orourke Hospitality. Average hotel room size is shrinking. http://www.orourkehospitality.com/average-hotel-room-size-is-shrinking/, 2016.

[17] Hotelmarketing'. Hotel room size is trending smaller, November 2016.

[18] GLH Hotels. glh hotels launches choose your own room booking site, letting guests select their exact room. http://www.prnewswire.com/news-releases/glh-hotels-launches-choose-your-own-room-booking-site-letting-guests-select-their-exact-room-585
html, July 2016.

[19] Sasa Karlovcan Igor H. Crnojevac, Jadranka Gugic. etourism: A comparison of online and offline bookings and the importance of hotel attributes. *JIOS*, 34(1), 2010.

[20] Google Inc. Overview of google apps script. https://developers.google.com/apps-script/overview, May 2017.

[21] IndoorAtlas. Geomagnetic technology image. http://www.indooratlas.com/wp-content/uploads/2015/08/geomagnetic-technology-img.png, 2017. [Online; accessed June 02, 2017].

[22] Indoo.rs. 3 tiers of slam. https://slaminfo.indoo.rs/wp-content/uploads/2016/10/3-tiers-of-SLAM.png, 2017. [Online; accessed June 12, 2017].

[23] Marte Berg Innset. Tele-economics of village telco. Master of science in communication technology, Norwegian University of Science and Technology, June 2014.

[24] ITU-T. Overview of the internet of things. Technical Report Y.2060, Telecommunication Standarization Sector of ITU, June 2012.

[25] Chris Schmandt Micaela Wiseman Jaewoo Chung, Matt Donahoe. Indoor location sensing using geo-magnetism. In *Proceedings of the 9th International Conference on Mobile Systems, Applications, and Services*, Bethesda, MD, USA, January 2011. MobiSys 2011.

[26] Blake Jessop. *Smartphones Can Get You to Your Destination, But Indoor Mapping Apps Can Help You Find What You Need.* ScreenMedia, February 2013.

[27] Sophie Perret Jill Barthel. *OTAs - A Hotel's Friend or Foe? How Reliant are Hotels on OTAs?* HVS, 7-10 Chandos St., London, July 2015.

[28] Jevon Snell John Carpenter. Future trends in geospatial information management: the five to ten year vision. Technical Report ISBN: 978-0-319-08792-3, United Nations Initiative on Global Geospatial Information Management, January 2013. Second Edition.

[29] Sebastian Jørgensen. Business potential for the next generation hotel experiene, November 2016. Pre-Project in TTM4502.

[30] Jon A. Krosnick and Stanley Presser. *Handbook of Survey Research.* Emerald Group Publishing Limited, Bingley BD16 1WA, United Kingdom, 2010. Chapter 9, Second Edition.

[31] Raphael Kuuchi. Ancillary revenue, the new craze for airlines. http://www.afraa.org/index.php?view=download&alias=121-ancillary-revenue-the-new-craze-for-airlines-by-mr-raphael-kuuchi&category_slug=2009-articles-and-research-papers&option=com_docman&Itemid=160, 2011.

[32] MarketsandMarkets. Indoor location market by component, application, end user, and region - global forecast to 2021. Executive Summary Brochure, October 2016.

[33] Rainer Mautz. Indoor positioning technologies. http://e-collection.library.ethz.ch/eserv/eth:5659/eth-5659-01.pdf, February 2012.

[34] Tucker Max. A guide to cold emailing. https://hbr.org/2016/09/a-guide-to-cold-emailing, September 2016.

[35] Kelly Elver Nora Cate Schaeffer John Stevenson Nancy Thayer-Hart, Jennifer Dykema. Survey fundamentals.

[36] Hospitality ON. Worldwide hotel supply 2016: Latin america and asia drive growth in the global supply. http://hospitality-on.com/en/news/2016/07/07/worldwide-hotel-supply-2016-latin-america-and-asia-drive-growth-in-the-global-supply/, July 2016.

[37] Alexander Osterwalder. *The Business Model Ontology A Proposition in a Design Science Approach.* PhD thesis, Universite De Lausanne, 2004.

[38] Peter Friess Ovidiu Vermesan. *Internet of Things - Converging Technologies for Smart Environments and Integrated Ecosystems.* River Publishers, Algade 42, 9000 Aalborg, Denmark, 2013. Chapter 2.5.4.

[39] Nav Patel, editor. *Taking Core Location Indoors.* Apple Inc., Apple Worldwide Developers Conference (WWDC) 2014, 2014. Session 708.

[40] Silvia Pichler. The future of indoor mapping. https://www.proximity.directory/blog/the-future-of-indoor-mapping, February 2016.

[41] John E. Ricart Ramon Casadesus-Masanell. From strategy to business models and onto tactics. *Long Range Planning*, 43(195-215), 2010.

[42] Jeremy Holland Sabine Barbarino. Quantitative and qualitative methods in impact evaluation and measuring results, March 2009.

[43] Statista. Number of smartphone users worldwide from 2014 to 2020 (in billions). https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/, 2015.

[44] Statista. Average length of visits to las vegas from 2009 to 2016. https://www.statista.com/statistics/411733/average-length-of-visits-to-las-vegas/, 2016.

[45] Statista. International hotel groups by number of hotel rooms worldwide as of april 2016. https://www.statista.com/statistics/245690/number-of-hotel-rooms-of-international-hotel-groups/, 2016.

[46] Statista. Total revenue of the global hotel industry. https://www.statista.com/statistics/247264/total-revenue-of-the-global-hotel-industry/, December 2016.

[47] Statista. Occupancy rate of the hotel industry worldwide from 2008 to 2016, by region. https://www.statista.com/statistics/266741/occupancy-rate-of-hotels-worldwide-by-region/, January 2017.

[48] Statista. Revenue per available room of the hotel industry worldwide from 2008 to 2016, by region (in u.s. dollars). https://www.statista.com/statistics/245763/revenue-per-available-room-of-hotels-worldwide-by-region/, January 2017.

[49] Greg Sterling. *Magnetic Positioning The Arrival of 'Indoor GPS'*. Opus Research Inc., 350 Brannan St., Suite 340, San Francisco, CA 94107, June 2014.

[50] Synthio. Navigating the b2b data technology landscape. [Accessed Online 15.06.2017].

[51] Kristian Tagensen. International potential for a free model in a b2bc market. Master of science in communication technology, Norwegian University of Science and Technology, June 2016.

[52] David J. Teece. Business models, business strategy and innovation. *Long Range Planning*, 43(172-194), 2010.

[53] Deanna Ting. This is 2016. why can't we still book specific rooms in a hotel? https://skift.com/2016/05/17/this-is-2016-why-cant-we-still-book-specific-rooms-in-a-hotel/, May 2016.

[54] Aaron Taylor Tom Stalnaker, Khalid Usman. *Airline Economic Analysis*. Oliver Wyman, 2015-2016.

[55] Nancy Trejoc. Hilton lets guests choose rooms with views via google maps. May 2016.

[56] Nancy Trejos. Hilton lets guests pick rooms, use smartphones as keys. https://www.usatoday.com/story/travel/hotels/2014/07/28/hilton-smartphone-key-room-selection-digital-check-in/13284595/, July 2014.

[57] Carrie Williams. Research methods. *Journal of Business Economic Research*, 5(3), Marcg 2017.

[58] Hilton Worldwide. Hilton revolutionizes hotel experience with digital check-in, room selection and customization, and check-out across 650,000-plus rooms at more than 4,000 properties worldwide. http://newsroom.hilton.com/index.cfm/news/hilton-revolutionizes-hotel-experience-with-digital-checkin-room-selection-and-customization-and July 2014.

Appendix A

Business Model Canvas

Appendix B
Cold-Email

Dear [First name],

I hope your day is progressing well! I am a graduate student within Digitalization and Technology at the Norwegian University of Science and Technology in Norway, studying the topic "Next generation hotel experience".

I reach out to you because I believe you have important insight and I would value your opinions. Therefore, I hope you would take the time to respond to my attached survey concerning the "Next generation hotel experience". The survey has 6 sections and takes approximately 5 minutes to complete.

https://docs.google.com/forms/d/e/1FAIpQLSdgZV1lnd_nKlkagMlk aWdGtzERdtaDqq5lQTTnbJIBTTkAgA/viewform?usp=sf_link

Your responses are voluntary and will be confidential. Responses will not be identified by individual. All responses will be compiled together and analyzed as a group. If you have any questions or concerns, please don't hesitate to contact me at sebastian@mazemap.com.

Thank you for your time and contribution.

Best wishes,
Sebastian Jørgensen
MSc ICT at NTNU

Figure B.1: Cold-Email utilized for survey delivery

Hello again [First name]!

Did you have a chance to review this email I sent you a few days ago? I reached out to you because I believe you have important insight and I would value your opinions. Your contribution is of great help to my Master thesis and would enable me to perform a feasible analysis.

Please let me know if you have any concerns or questions.
If you have already submitted the survey please disregard this email, I apologize for the inconvenience this may have caused!

Best wishes,
Sebastian Jørgensen
MSc ICT at NTNU

Figure B.2: Follow-up email to increase response rate

Appendix C
International Market Survey Presentation

The international market survey was implemented through Google Forms and the following Figures display how the Survey is presented to the receivers.

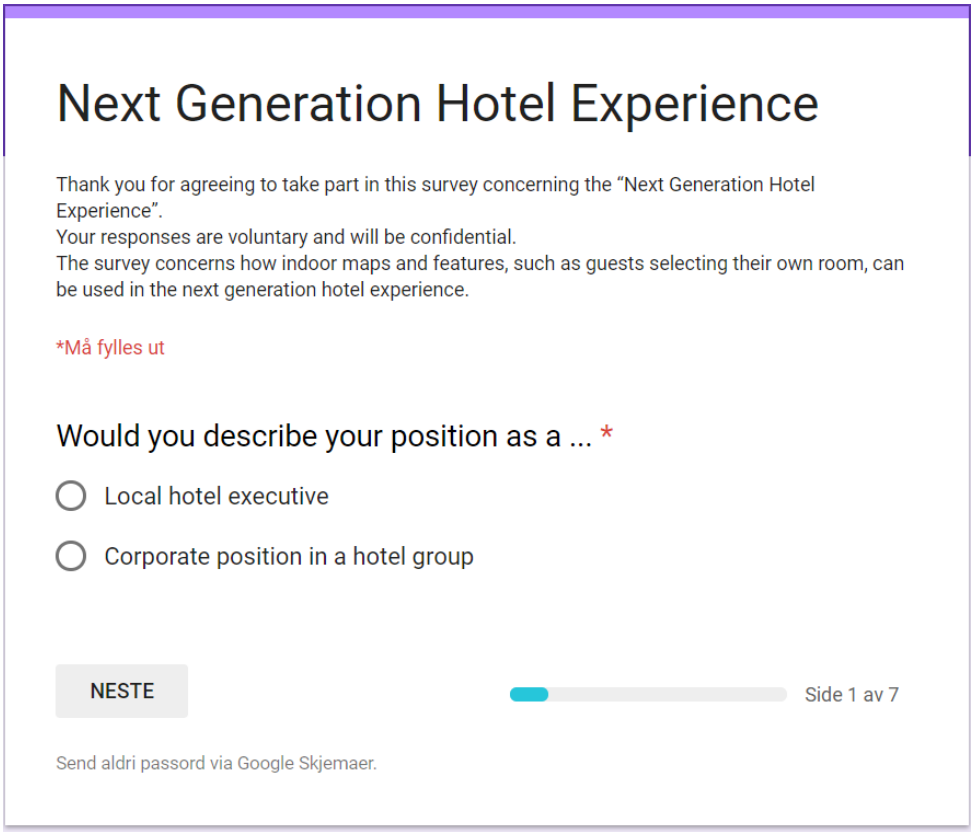

Figure C.1: Survey Presentation: Introduction

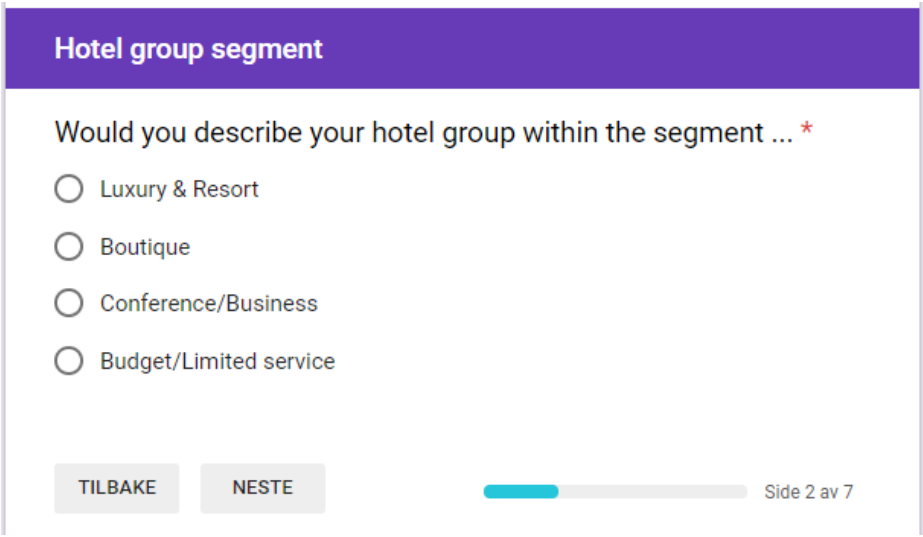

Figure C.2: Survey Presentation: Question 2.1 - Hotel size

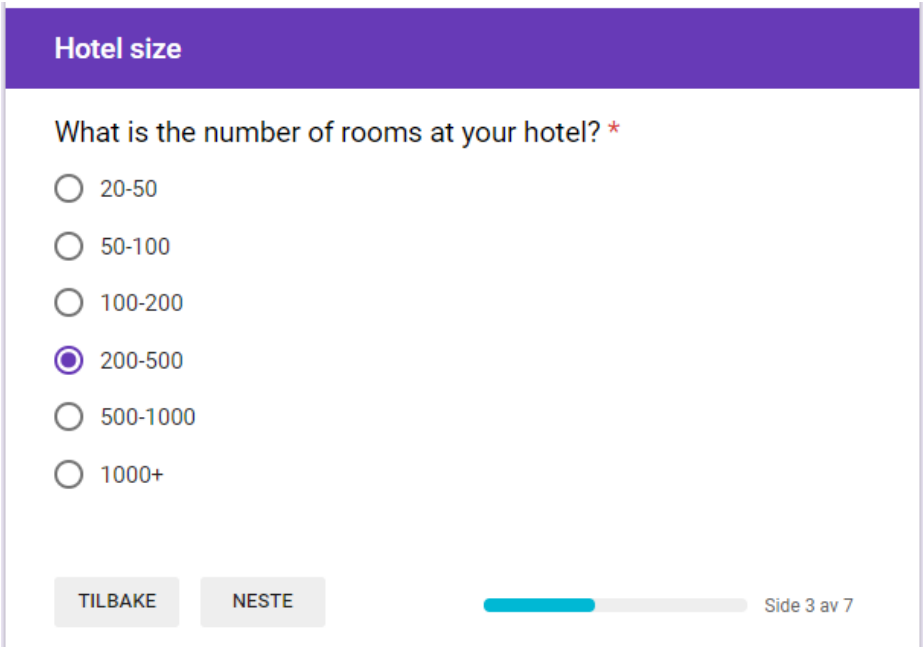

Figure C.3: Survey Presentation: Question 2.2 - Hotel Segment

Indoor maps

Implementation of an indoor map solution would enable the usage of "select your own room" services, where guests are able to select rooms from a displayed digital floor map (see concept sketch for reference). This type of service could be included in the online room reservation process, or during the check-in procedure.Booking with indoor maps (Concept sketch)

Would you be interested in implementing indoor map services? *

- Yes
- No
- Already in use

TILBAKE NESTE Side 4 av 7

Figure C.4: Survey Presentation: Question 3 - Initial Interest

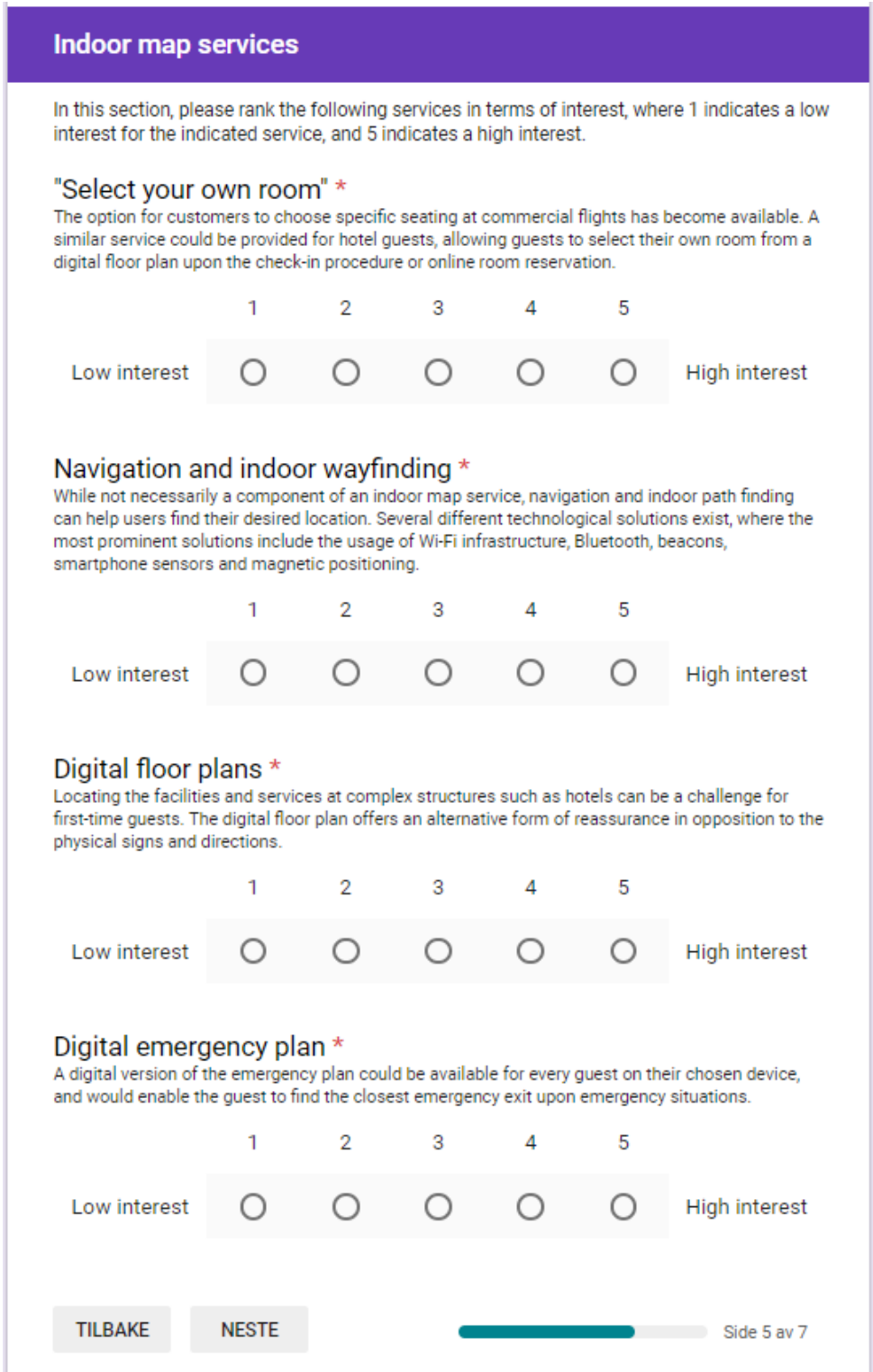

Figure C.5: Survey Presentation: Question 4.1-4 - Measuring Interest

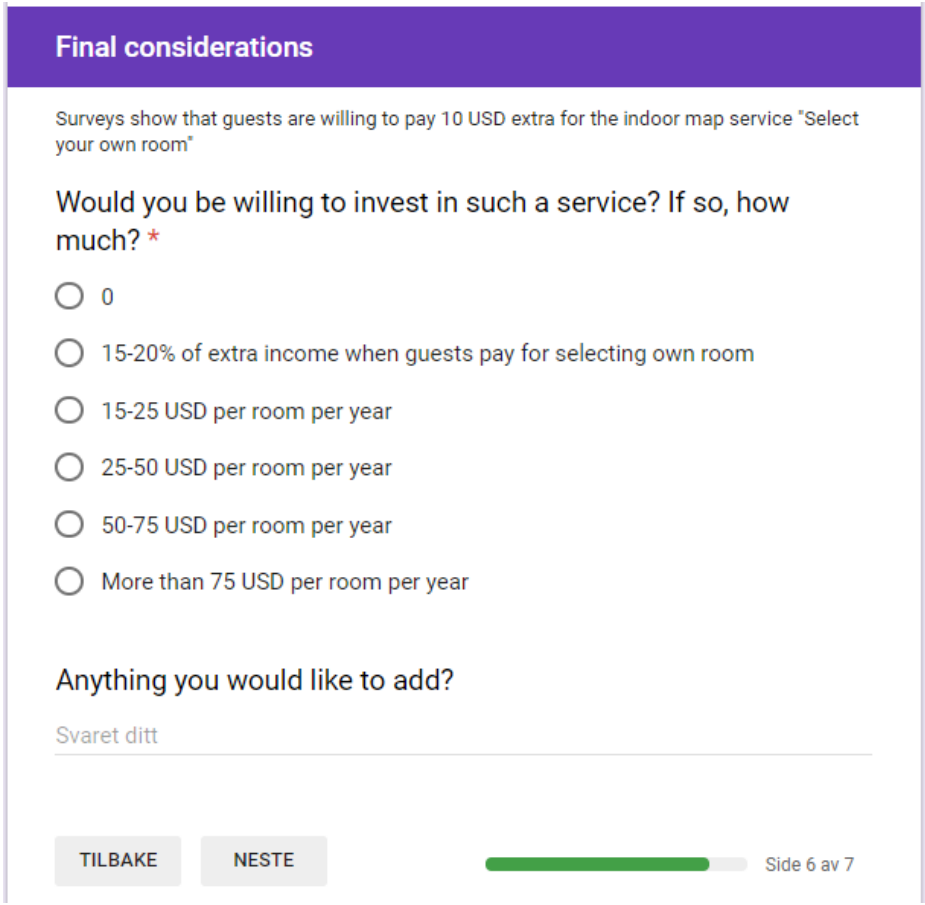

Figure C.6: Survey Presentation: Question 5 - Willingness to Invest

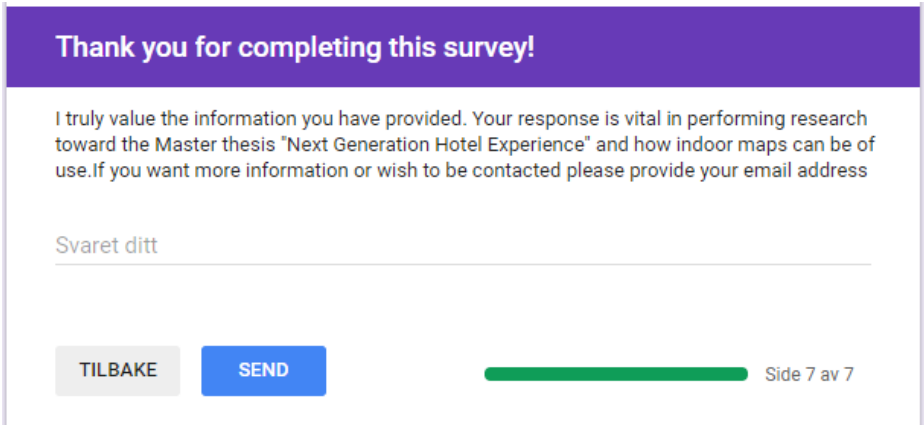

Figure C.7: Survey Presentation: Finish

Appendix D
Survey Comments

This Appendix include the relevant comments submitted by the 134 respondents. In total 20 relevant comments were submitted. The comments are sorted based on their time of submission and will be presented with date

"I think that this is a nice idea, but have the following comments: 1. Because rooms inventory is so dynamic it would not be possible (in my view) to do this at reservation stage as there are so many variables and movements in rooms all the time. 2. It could possibly be done at check in - but there are complexities with when rooms will become available / guests checking out late / duration of stay etc. You would have to choose if the map showed all rooms available that night irrespective of their current status / availability or whether you just showed rooms ready to be occupied immediately 3. It would probably work much better in larger hotels - smaller boutique hotels are more difficult. 4. As you know many people book through third party booking engines rather than direct to the hotels so you would be missing this segment. But it might also help drive more traffic direct to the hotel if guests thought it an important tool - which would be good for the hotels. "

"Interesting concept but I believe this will cost so much. Any hotel that been implemented this?"

"Although this might not be feasible in the near future because guest room assignments are more complicated than seat selection due to length of stays, extension stays, room issues, guest room preferences, etc."

"I would not be interested in "Select Your Own Room" technology due to our length of stay (min 5+ nights), varied room types, mix of business...it would dramatically limit our ability to best fill the house and meet all the needs of our demanding, high-touch guests."

"I am working un a similar solution, but if you have the service finished, I am very interesting in do business with you."

"The idea is really good. However, as for a hotel operator, the priority is to make profit for the owner while bring service to the guests. I would suggest you also look into different online hotel booking channels, brand website, OTA, OTP, etc., and loyalty club member tier. This kind of service would be preferred by hotel operator when exclusive to brand website channel, high tier member. My humble opinion. :)"

"Your project is not easy to apply with real guests and properties with lot of different room types and rates, also you may loose sales as the guest is choosing his/her own room therefore not able to maximize the room inventory, especially if your length of stay is longer than 1 night."

"With high occupancies and Hotels with very different room types it is risky to allow guest to choose their room. it might have an impact in rooms sales."

"Selecting your own room is great in a commodity product as airlines is great, but in the majority the same room category is different. Front office teams like to keep the flexibilty of allocating the room in most hotels. In hotels with all the same rooms it is great."

"the airplane seat system is pretty universal across all regular planes (all planes interiors very much the same), with the hotel buildings this can be a bit tricky as there are more differences - but in general it may work fine as well"

"I see a challenge with availabilities of the selected room by guests (e.g. previous guest not checking out) "

"I can see the other services apart from Select your own room being interesting. However I do not see selecting one's room very practical since room allocations are usually performed 1 or 2 days in advance and guests will be allocated rooms based on availability. Allocating or promising selected rooms in advance can easily cripple the front desk operation or end up disappointing customers."

"It will be challenging with different room categories and also sizes, even in the same category you might find different shapes and sqmÂ´s. it is not easy to handle if you have bigger bunch of frequent customers. However can be also used as a great upsell tool."

"The price for "Select your own room" would be dependet on the product. It sounds interesting but does not automatically justify an annual fee payable to the provider. Would need to look at the offer and the goodies it brings to the hotel and evaluate."

"Not feasible for a luxury hotel with group business"

"This is nothing new, I believe Hilton is implementing this already. Good luck!"

"As we are a corporate hotel we have regulars who will have their preferences allocated already, also we run at high occupancy levels so we do allocate the remainder of rooms upon guests arrival as they the rooms become vacant ready "

"Most of these items are not really relevant to a property of our size which runs nearly 96% occupancy year-round. I believe that selective-room practices may detract from the overall intent to book if the desired room location is not available. "

"The mapping would have to work with our online booking engine that we already have. The challenge is that guests tend to use a lot of third party booking agents such as Expedia more than they do with our own website. You will find that this is the case for many independent resorts and hotels. For this to be cost effective for us, as well as beneficial to the guest, Expedia would have to utilize this software as well. Finally as an operation we probably wouldn't put 100% of our available inventory up for this option. We have a mix of room blocks for business and wedding groups that require pre-assigned room types. I like where you are trying to go with this. I think this would work well at a metropolitan business hotel. Business travelers are generally less demanding in their needs than leisure travelers. Feel free to contact me directly for additional feedback. Also it puts a lot of pressure on having housekeeping clean specific rooms instead of room types. This could cause guests to wait for their specific room to become ready. "

"Wayfinding in a convention setting would be a higher priority for our organization"