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UNDERSTANDING EVOLUTION OF CUSTOMERS' EXPECTATIONS ON FINNISH HOTELS

Master's Thesis

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Abstract

Hotel industry is a special characterized industry which is immaterial, non-storable, non-transportable and always include integration of external factors. Therefore, worth of mouth (WOM) or electronic-WOM is considered the most important reference in guests' decision making process of hotel brand selection. Thanks to the development of user-generated-content (UGC) platform, guest users have been expanding their roles from information receivers to active content creators. That makes the voice of customers more remarkable and crucial than ever. Although many studies have been conducted in understanding customer behavior, there are gaps between customer expectation and hotelier perspective. The purpose of this study was to investigate online reviews from the guests of Helsinki hotels in order to identify their evolving expectations.

Customer expectations on hotel service are believed to be evolving with time. Nonetheless, there is a lack of studies investigating how hotel customers' expectations evolve with time. In this vein, this thesis investigated the changes in the most important topics and their related keywords that are manifested in online hotel reviews at different years. This study employed keywords extraction and sentiment analysis approaches pertaining to the methods such as POS tagging, N-gram and word frequency analysis.

This research offers both academic and practical implications. For academics, the mining framework can be applied in many different industries. This can be considered as the antecedence of further automatic mining model such as co-occurrence analysis. Practically, the findings confirm most important hotel attributes such as "room" "breakfast" "location" "staff", "cleanliness", etc. The results revealed some interesting changes in customer expectations on hotel service. For instance example, new keyword "wifi" is replacing the presentation of old keywords "tv" and "internet". These replacement prove the clear evolution of customer expectation that need to be concentrated by hotelier.

Keywords Text mining, Keyword extraction, Sentiment analysis, Customer expectation

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1 Introduction

1.1 Background - Hotel industry in digital age

With the extraordinary growth of the internet, customer behavior has been changing in various dimensions, especially the practice of sourcing information and purchasing products and services. During the last few decades, the evolution of social media and user-generated content (UGC) platform have inspired the development of new online communication approaches, and thus, have brought crucial impact on tourism and hospitality industry.

Like most other sectors in services, the hotel industry has special characteristics as *"immaterial, non-storable, non-transportable and always include integration of external factors, such as the tourist or guests"* (Chehimi, 2013, p. 29). The quality of service is usually mysterious for customers until it is consumed (Litvin, Goldsmith, & Pan, 2008). Therefore, the word-of-mouth (WOM) is considered as the most important factor in decision-making process (Ye, Law, Gu, & Chen, 2010). In the world-wide-web context, the electronic-WOM has been applied broadly in the hospitality industry and empowered communication for guests and travelers (Gretzel & Kyung , 2008). E-WOM has been changing the fundamental way for customers to gather information (Zheng & Ulrike, 2010). Besides the commercial messages from service providers, consumers have better opportunities to access more details, up-to-date and reliable information from other users in a written form via the internet (Öğüt & Onur Tas, 2012; Duan, Gu, & Whinston, 2008; Gretzel & Kyung, 2008). That means people can compare various opinions and experience from previous tourists. There are multiple forms of online platforms being used in this hospitality market. It can be as simple as hotel-owned-webpage with online rating and review functionality; it can be a virtual community where people with similar interests use social network to share and discuss experiences; or it can be more complex websites with added searching, filtering and booking functionality such as TripAdvisor, Expedia, Booking.com, Foursquare, etc. (Litvin, Goldsmith, & Pan, 2008)

Additionally, guest users have been expanding their roles from information receivers to active content creators (Chehimi, 2013). In the past, it was limited for customers to share their experiences about hotels as the information could only be shared within small circle of customers. Thanks to the emergence of UGC platforms, people nowadays can easily use online reviews to describe past experiences about significant hotels and distribute it in a public area for other people worldwide (Chehimi, 2013). From the customer point of view, it is important to consult online reviews before making a hotel selection to prevent the risk of getting unexpected services. According to Zheng & Ulrike (2010), a majority of people read through online reviews while planning their trip and choosing a hotel. They use it in different stages of traveling (Gretzel & Kyung, 2008). In particular, 64.7% of users read online reviews in the

middle of planning to narrow down their choices while 63.7% of them get inspiration for an upcoming trip. Many people have a tendency to read at least four reviews before making a purchase (Xie, Zhang, & Zhang, 2014) and would change their decisions based on negative feedbacks (Gretzel & Kyung, 2008).

Needless to say, hospitality industry is always an open business to new information and communication technologies with the involvement of customers. The generation of UGC highly increase market transparency and make it multi-dimensionally beneficial for more stakeholders. From that, all parties of tourism including consumers, travel professional agencies, online platforms and implementing organizations can be involved in sending messages. Consequently, it brings more pressure, together with more opportunities, for the hoteliers. The World Tourism Organization (2012) explained that online reviews can raise the awareness of medium hotels, but can create more pressure for 4 or 5 stars hotels if they make mistakes and receive negative reviews. On the one hand, more information brings more options for customers while choosing a hotel. Customer expectations, hence, have been evolving with many customers demanding services far beyond actual core products (Chehimi, 2013). On the other hand, service providers can utilize this information to maximize their profit by understanding customers, applying the knowledge to marketing and improving their business strategy. Specifically, hotels owners can exploit customer comments to understand customer needs faster and more accurately so that they can improve their services.

1.2 Motivation

1.2.1 Huge availability of online data

The hotel industry was one of the first most successful industries in using online reviews whose function provide tons of user feedback every day (Öğüt & Onur Tas, 2012). During the last decade, there was a boom of travel review websites with different forms in this market around the world. In fact, there are enormous amounts of people actively interacting on internet and a majority of them actually exchange information with other users by reviewing, sharing and posting information daily (Duan, Gu, & Whinston, 2008). Among them, travel-related users are one of the biggest groups of people online. Statistical reports in America show that there were 37.7 million unique online visitors in TripAdvisor during the year 2018 (TripAdvisor - Statistics & Facts, 2018) while there were 20.1 million of them in Booking.com and 18.8 million in Expedia. In those websites, users are diverse with respect to different backgrounds and purposes (Travel, Tourism & Hospitality, 2018).

There is a large range of volume and variation of data including numerical, textual, imagery, video, etc. (Zheng & Ulrike, 2010). These data sources are extracted from various forms of UGC

such as review websites, social network, virtual communities, etc. (Gretzel, 2006) (Pan, Maclaurin, & Crotts, 2007). Although textual data from online reviews is mostly unstructured and unmanaged (Murphy, Wilson, & Fierro, 2012), this source of information is valuable and informative because it truly reveals the thoughts and emotions of customers. During 2018, TripAdvisor reported 730 million reviews and opinion posted via its platform (TripAdvisor Fact Sheet, 2018). This is a great economical resource for business and service providers to analyze their customer needs and concerns, and hence develop their company competitiveness and strategic intelligence (Lau, Lee, & Ho, 2005).

1.2.2 Application of text mining in hotel industry

Analyzing these text data is not only an interesting area for data scientists, but also important for businesses to wisely use customer reviews. Customer online feedback plays an important role in the success of hotel businesses (Cheng & Loi, 2014). Studies find that the volume, valence, and variation of online reviews have positive impact in future hotel performance (Xie, Zhang, & Zhang, 2014; Zheng & Ulrike, 2010). It is also believed that customers have a tendency to rely on e-WOM more than on commercial messages provided by companies (Litvin, Goldsmith, & Pan, 2008; Wu & Wang, 2011).

Despite the fact that understanding customer feedback can support service providers to improve service quality (Wu, Greene, & Smyth, 2010), there are only a few hotels that can utilize this priceless resource. In reality, the current availability of text-based data is overwhelming for hospitality practitioners, because they do not have enough technical support to understand the available data (Lau, Lee, & Ho, 2005). In other words, the data itself is abundant and free, but the installation of information technology is costly for small and medium-sized businesses. Until now, using reviews in text format has been limited compared to just using numerical data, which is more easily understandable.

A good sign is that nowadays there are more data analysts paying more attention in this area. For instance, researchers using topic modeling to analyze the cause of hotel service complaints in the United States (Hua, Zhang, Gao, & Bose, 2019). In one of the newest studies of Joseph and Varghese (2019), they analyzed customer feedback from Airbnb in order to understand the reasons for customer satisfaction. Singh, Hu, and Roehl (2007) examined content analysis in the international hospitality management journals in order to identify the textual pattern in human resource management. In short, the application of text mining in hospitality industry is not only limited to customer understanding, but also augmented for other business usages such as operation management and human resource management.

1.2.3 Research rational and gaps

Despite the growth of studies on online feedback in hotel industry during recent years, there are some research gaps as following:

a. In hotel industry, most studies focus on customer decision making or purchasing intentions. Particularly, many studies focus on the relationship between customer rating and customer purchasing decision, customer loyalty or hotel revenue. There is limited research on the connection between different forms of feedback (both rating and text) to understand customer insight.

b. The most favorable application of text mining in hotel industry is opinion mining which indicates general customer satisfaction. There are few studies about the reasoning behind positive and negative feedback.

c. As mentioned above, text mining is more complicated than structured data analyzing. Hence, little effort is put on the qualitative content of reviews. The rating or ranking does not provide enough qualitative or subjective evaluation. In addition, there is a lack of studies using combination method for numeric and qualitative data.

d. Mostly, researchers focused on geography or psychology segmentation while analyzing online reviews. There is a lack of research on the trend or pattern of development in customer concerns. In reality, the method that hotels standardize and adjust their services is the star classification system, which has remained the same for a long time (World Tourism Organization, 2012) while customer expectations change from time to time due to the industry development. In another context, it is difficult for a hotel to read and understand all customer needs. The rating system can show their satisfaction, but cannot provide insight on which attributes are the priorities in customer concerns.

e. Most of prior online review research has occurred in popular travel destinations. Few of them have been written about Nordic countries. That is the reason that makes the findings of this research interesting. Finland is ranked as one of the happiest countries with a very high standard of living (Statstics Finland, 2018) (Rehdanz & Maddison, 2005). I would like to see how this high standard applies to hotel industry in term of the perspective of customers on their accommodation services. Moreover, the hotel industry in Finland is somehow isolated and different from other countries. While most other Nordic countries follow international regulation and system, hotels in Finland do not implement many of them (Brody, 2009). Some of the international hotels in Finland follow the brand star standard, but most local hotels use their own ranking system

(Christoforides, 2009). Possibly, there is a gap between customer expectations and hotel standard of service that motivates me to dig into this market.

1.3 Aim of the study

The aim of this study is to find out the major concerns of customers via their online feedback. I will test the influence of sentiment experience on customer comment behavior by combining numeric data from rating values with the text data in online reviews. To bridge the research gaps mentioned above, I will identify positive and negative feedback by rating segmentation and sentiment analysis before extracting the most frequent keywords and phrases. Beyond all, I would like to understand important attributes from the customer's point of view so as to propose managerial suggestions to support hotel point of view. To understand the challenges of small and medium hotels in applying technology, I would build a simple mining method with less effort for analysts to understand the concerns of traveling users.

1.4 Structure of the thesis

After this part, there will be five more sections following. The literature review covers studies on hotel industry to explain common terms in hospitality, the detailed knowledge about electric-worth-of-mouth and important attributes in hotel services. It also explains the usual measurement of hotel services, customer satisfaction and its relationship with future expectations. The reason for mining positive and negative responses, together with the importance of understanding evolving trends in customer concerns will be clarified in this section. The research question part will explicate the aim of the research in the form of qualitative questions. The research method will describe statistical report of the databases and will illustrate the mining framework. Mining results and discussion will follow in the fifth section, uncovering the motivation behind customer writing and the trend in customer expectations. From that, I will have a detailed picture of hotel business in Helsinki and can suggest managerial strategy for hotel owners. Evaluation and limitation of this research will be criticized in the conclusion section.

2 Literature Review

2.1 Background

2.1.1 Overview of hotel industry

Historically, hotel industry has been about ensuring a place to stay with enough sleeping facilities for people seeking rest and relaxation (Brody, 2009). Throughout the long history, hotel industry was considered as a section of hospitality industry which supports tourism with travelers as the target customers.

Following technological, economic and social development after the 19th century, the hotel industry has seen huge changes in customer perspective and behavior (Chehimi, 2013). With the convenience of modern transportation, it's easier for people to move from place to place. The purpose of traveling has become broader, including business trips, leisure activity or discovery vacation. Moreover, 21st century social benefits, altogether with the development of accommodation types (i.e. guesthouses, hostels, resort or international hotel chains, etc.) allow more groups of people to indulge in tourism and hospitality (Conrady & Buck, 2010). In short, target guests of tourism and hospitality has diversified. Consequently, the customer demands have changed very fast and their expectations have become more intricate.

In the current age, hotel industry is no longer a standalone accommodation service. Standard hotel quality has expanded from safe staying into providing reliable lodging, good food and additional amenities for travelers (Brody, 2009). Perspective about quality of service has also changed; the wants and needs of guests are very different from the past. They not only require the basic service to fulfill common needs, but also seek enjoyment and convenience for extra pleasantries.

Traditionally, the hotel rating system (i.e star, diamond, and crown) is used to classify the standard of hotel quality (Brody, 2009). However, there are many tourism associations around the world which suggest various systems with different criteria for the stars. Additionally, it is not easy to keep the criteria up to date. As proof, Guillet and Law (2010) claimed in their study that *"there is no standardized star rating system throughout the world"* (p.800). Local organizations and associations instead apply their own ranking system. Apparently, the four- to five-star hotels are always more luxurious and costly than the one-to-two-star hotels in the same geographic areas. However, there are gaps among hotels in the same star group located in different regions. Therefore, guest expectations and satisfaction toward the star standard of a hotel would be diverse depending on their previous experiences. The high class leads to high cost, but the satisfaction is not always comparable (Ariffin & Maghzi, 2012). Despite the

benefits of hotel rating system to various sectors such as travel agencies, tour operators, hotels, governments, and consumers (Narangajavana & Hu, 2008), it is a less appropriate method to measure hotel quality. Nowadays, using user-generated content and approaching customer perspective are, instead, more applicable and favorable for measuring hotel service quality (Tsang & Qu, 2000). This approach is based on evaluation of customers by rating, voting, and online review.

2.1.2 Gaps between hotel manager's perspective and guest's perception

For hoteliers, value for customers is a crucial factor for improving competitive advantage (Woodruff, 1997). As mentioned above, the hotel's duty has expanded to provide superior quality values to customers (Choi & Chu, 2001; Nasution & Mavondo, 2008). Unfortunately, there are existing gaps between hotel managers and their customers in terms of provided and expected hotel services. The causes of these gaps are miscomprehension in perception, misunderstanding in communication and inconsistent service implementation. Many hospitality studies have shown that the importance of hotel attributes are perceived differently between hotel managers and customers (Zheng, Gerdes Jr., Schwartz, & Uysal, 2015; Lockyer, 2005). As an example, Nasution and Mavondo(2008) stated that managers and customers will differ in their evaluation of value for "reputation for quality", "value of money" and "prestige". Depending on classes of hotels, the customer's point of view could be changed. Customers expect more about the "value of money" when paying a higher price for premium services (Brody, 2009) while managers in prime hotels think "reputation for quality" is their best value (Nasution & Mavondo, 2008).

Studies have revealed that the positions of customers and hoteliers are fundamentally unequal. In hotelier's perspective, value for customers is considered as business products and services while it is about how services are experienced in customer's perspective (Nasution & Mavondo, 2008). Hotels charge high prices for tangible products, heavier investment and expert staff, while customers value the hotel quality based on both tangible and intangible things. Nelson Tsang and Hailin Qu (2000) identified seven gaps between customers and hoteliers. The gaps are among hotel managers, hotel employees and customers in the way they perceive, deliver, expect and experience the services. For instance, customers mostly experience lower quality than they expected, especially regarding staff performance, room cleanliness and value for price. This fault may be caused by variation in services provided and how they were communicated to customers. Furthermore, hotel managers have a tendency to estimate their quality of services higher than how they are actually delivered. The reason for this is an inconsistent internal evaluation where employees' perception is lower than managers' perception. Thus, customer satisfaction is much lower than what managers think. Following

these gaps, it is suggested that hoteliers should put more effort into deeply understanding customer expectations (Cetin & Walls, 2016). Quality of services, value for price and importance of all attributes should be evaluated accurately and separately by regions, hotel classes, time, etc.

2.2 Importance of customer reviews in understanding customer expectations

2.2.1 Overview of e-WOM, UGC and online review platforms

Karam M. Ghazi (2017) defined e-WOM as "*any positive or negative statement made by potential, actual, or former customers about a product or company, which is made available to a multitude of people and institutions via the Internet*" (p.2). In simple words, it is an online environment where people share information about the goods, services and sellers. This kind of environment empowers both service providers and consumers (Jalilvand, Esfahani, & Samiei, 2011). The type of information (i.e. text, sound, video, numeric data) and form of e-WOM are various. Particularly, some of the most popular e-WOM channels are blogs, virtual communities, product reviews, chat rooms, newsgroups, email and instant messaging (Hennig-Thurau, Gwinner, Walsh, & Gremler, 2004).

UGC (user-generated content) is another term used as e-WOM, which focuses on newly created materials (Jalilvand, Esfahani, & Samiei, 2011). Ghazi (2017) suggested four main categories of UGC utilized in tourism: social networking (e.g. Facebook), review sites (e.g. Tripadvisor), supplier sites (e.g. hotel websites, tourism organizations), and visual content sharing (e.g. Flickr, YouTube).

Online reviews are considered as the most accessible and frequently used forms of UGC, which contains user-oriented information. Online review is one form of online feedback, beside rating and voting. According to Mudambi and Schuff (2010), online review website is a peer-generated purchase experience platform in which users post their positive or negative statements about products or services. Previous studies have proven many benefits of online review websites for both travels and hotel owners such as helping customers in the hotel selection process, support in evaluating alternative options, reducing uncertainty in purchasing situation, increasing company awareness, providing ideas for traveling, helping others to avoid mistakes, visualizing images of the destination, enhancing probability of customer booking. (Ghazi, 2017)

2.2.2 Motivation and credibility of e-WOM

Needless to say, the contribution of online users plays a crucial role in expansion and development of a UGC platform such as TripAdvisor. Both volume and quality of online reviews create their credibility, and motivate other people to contribute more valuable information to the platform. Many studies have been conducted with various theoretical models to examine the connection between motives and review outcome. Yen and Tang (2015) perceive customer motives in economical (with specifics unities) and non-economic aspects (i.e. psychology based and social based). Hennig-Thurau et al (2004), on the other hand, built their framework based on a customer utility study (i.e. focus-related utility, consumption utility, approval utility, moderator-related utility, and homeostasis utility) and came up with eleven motives for giving e-WOM. Bronner and Hoog (2011) suggested eight classifications including personal benefits, social benefits, social concern, functional, quality assurance, economic incentives, entertainment and supporting the company. Basing on these reviews of academic studies, the present research summarized e-WOM motivations listed below (table 1).

Table 1: Summary of customer motives to contribute on UGC

	Motivation	Description	Previous studies
Positive	Helping the hotel	• want to return something for the good experience: customers want to support or reward the service providers when they are satisfied	Ghazi (2017), Gretzel & Kyung(2008), Hennig-Thurau et al, (2004), Bronner & Hoog (2011)
	Express positive feeling	• sharing a positive experience • ease a psychological tension when customer experiences strong positive feelings	Gretzel & Kyung(2008)
	Enjoyment or Hedonic motivation	• enjoy sharing their travel experiences and expertise with other travelers • relive the trip • expressing positive feeling and self-enhancement which focus on positive effects of communication and psychological benefits	Gretzel & Kyung(2008), Bronner & Hoog (2011)
Negative	Venting negative feeling	• emerges from dissatisfying consumer experiences • kind of punishment or revenge for bad services, • consumers seek ways to lessen their frustration and to reduce anxiety	Gretzel & Kyung(2008), Ghazi (2017), Hennig-Thurau et al, (2004)
	Warning other consumers	• a part of concern for other consumers with the aim to save others from a negative experience	Ghazi (2017)
	Exertion of collective power	• immense opportunity for consumers to organize themselves and collectively voice opinions for stronger impact on the service provider when they are unreachable	Gretzel & Kyung(2008)

Both	Concern for other; Helping other consumers; Altruism	• the act of doing something for others (either help or warn others) without anticipating any reward in return, i.e. enjoyment of helping • save others from potential negative experiences, • give others the opportunity to buy the right product • share similar positive experience • the benefit the consumer receives when adding value to the community	Gretzel & Kyung(2008), Hennig-Thurau et al, (2004) Ghazi (2017), Yen and Tang (2015)
	Social benefits	• driven by opportunities to associate with friends because posting e-WOM is a way to connect with others • the sense of belonging • maintaining a personal network	Yen and Tang (2015), Hennig-Thurau et al, (2004)
	Self-enhancement	• enhancing images and self-reputation among other consumers by projecting oneself as an intelligent shopper • enhance social interaction in online context, feeling good about helping other users to solve problems or answer questions • informal approval may come when another user either publicly praises one's contributions to the group or privately communicates to the individual regarding the usefulness • motivation of awareness and appreciation	Gretzel & Kyung(2008), Ghazi (2017), Yen and Tang (2015)
	Economic incentive or Economic reward	• seeking monetary rewards and non-monetary rewards such as reward points, discounts, or free upgrades incentives	Yen and Tang (2015), Hennig-Thurau et al, (2004), Bronner & Hoog (2011)
	Extraversion	• need to restore the equilibrium and balance from psychological tension when they have had strong positive or negative experience.	Yen and Tang (2015), Hennig-Thurau et al, (2004)
	Dissonance reduction	• ego-defensive, reduces cognitive dissonance (doubts) following a major purchase decision	Hennig-Thurau et al, (2004)
	Platform assistance	• online platform/e-WOM makes the complaint act easier • empowers consumers to negotiate with the product or service providers without direct chance to communication with companies	Yen and Tang (2015), Hennig-Thurau et al, (2004)
	Advice seeking	• hope to receive advice from others that helps them solve their problems • expecting to receive tips or support from other users.	Ghazi (2017), Hennig-Thurau et al, (2004)

Based on the above mentioned motivations, it is believable that customers gain benefits from leaving their words about services. As a result, they have a tendency to write truthful reviews to other customers, which brings credibility to their feedback (Chehimi, 2013). Schindler and

Bickart (2005) argued that the consumer's choice of UGC varies due to different consumer motivations. Hence, motivation of writing can decide the content of online reviews. In fact, the variety of customer motivations can lead to different review contents. Credibility of an online review site is decided by its content and popularity (Filieri, 2016). The network effect of such review platforms like Tripadvisor makes the reviews on these websites more reliable for both customers and service providers.

There are lots of argumentative studies about the reliability of customer reviews. Some stated that online reviews are biased and sometimes are over-exaggerated and embellished by either service providers or their competitors (Kim & Gupta, 2012). Conversely, many researchers believe this anonymous environment motivates people to express their true emotion. Hence, the contents of those reviews are a valuable source of information for other users to consult when selecting a hotel (Lee & Jeong, 2017).

In order to improve the credibility of online feedback systems and to encourage user interaction, many review websites (i.e. TripAdvisor and Expedia have designed peer evaluation functionality that allows people to vote on the helpfulness of significant feedback. The useful reviews, as a result, can support guest users in evaluating attributes of the service separately and effectively (Liu & Park, 2015). Generally, online reviews are a reliable source of information for indicating customer expectations. By understanding the topics, terms and most frequent words, we can understand what people really expect from the hotel business. The topics, terms and words will be explained more detail in later parts.

2.2.3 Importance of understanding positive and negative feedback

Existing studies show that behavior of giving reviews is diverse by demographic segments. In fact, significant difference in motivation were found for gender and income but no significant for age, education, marital status (Yen & Tang, 2015). In particular, females are more motivated by helping the hotel, enjoying sharing, and concerning others while males are more motivated to venting negative feelings. Besides, Yen and Tang (2015) also concluded that low-income people are more motivated to write than higher income people. These differences may affect the distribution of negative and positive feedback, especially when there is an imbalanced distribution of customer segmentations in specific review sites. Above all, there is a remarkable difference between motives behind positive feedback and motives behind negative feedback. To illustrate, only helping the hotel and social benefit motivations have an impact on guests writing positive reviews in Tripadvisor platform, while venting negative feelings, warning other consumers and social benefits influence them to write negatively (Ghazi, 2017).

Although the volume, variance and valence of reviews are all positively influenced by the behavior of online users (Xie, Zhang, & Zhang, 2014), there are many opposing discussions on the impact of review's valence on customer perception about review's reliability and helpfulness. This perception, at result, would direct customer behavior (Filieri, 2016). It is widely believed that both positive and negative feedback has crucial influence on customer intentions (Ladhari, 2009; G.Mauri & Minazzi, 2013). A study stated that positive reviews and higher review ratings can positively raise a hotel's booking (Lee & Jeong, 2017). Some statistics reported that positive e-WOM is more likely for reviewers than negative words to have effect on purchasing decision. A report by eMarketer on internet users in the United States points out that in 2010, 68% of people would change their intention on purchasing while reading negative information; that number increased to 80% in the year 2011 (eMarketer.com, 2011).

Nevertheless, other studies recognize negative feedback as more beneficial for customers than positive one (Berger et al, 2010) because negative reviews provide more sensitive, unique and credible information (Michael & Keltner, 2000). These rare and unexpected negative points of view can be utilized both by other customers and hotel owners (Hamilton et al. 2014). According to Lee and Jeong (2017), the existence of negative feedback should be comparable with the positive feedback in online review platform. If a significant hotel does not show any bad score in online feedback, the online users will be suspicious about its credibility (Ammon, 2015). Additionally, not all negative feedback will be perceived equally by online users. In fact, it is believed that reviews with intense negative emotional expressions will be considered less helpful and favorable for customers than a moderate one (Lee & Jeong, 2017). Although Hamilton, Vohs, and McGill (2014) agreed in their research about the advantageous value of negative review, they concluded that reviews written in a neutral way with more polite words will be more reliable for readers.

Unlike face-to-face WOM, online users cannot guess other's actual emotion by gesture, attitude, voice or body language. Relying on online feedback still seems risky for information receivers in the evaluation phase. Therefore, they would focus not only the content of the feedback, but also the emotional expression behind the words. Basically, online users consult ratings and online reviews to understand the emotional experience of previous users. In short, the online review and its valence directly affect the customer perspective about the service, and thus affect customer expectations and satisfaction. Therefore, it is necessary not only to understand customer feedback, but also to identify their emotional expression. For all reasons above, the goal of this research is digging into the emotional polarity of customers to understand their real concerns and expectations in the hotel industry.

2.3 Customer satisfaction and expectation

2.3.1 Customer expectation

In services, customer expectation is one of the most common and important concepts contributing to business success. This terminology has been investigated in a vast majority of researches together with the development of the service industry. Most researchers defined customer expectations closely to the idea of service quality and customer satisfaction (Shanka & Taylor, 2004). Felix (2015) defined customer expectations as the basis or standard for the judgment of product and service quality and is the antecedence to measure customer satisfaction. In other words, expectations reveal how the product and service figures are likely to be perceived and received by customers.

In the past, there are two most popular definitions for customer expectations in which expectations are seen as the prediction standard and as the ideal standard (Parasuraman, Berry, & Zeithaml, 1993). In the definition as prediction standard, customer expectations are viewed "*as predictions made by customers about what is likely to happen during impending transaction or exchange*" (Parasuraman et al., 1993, p.2). Oliver (1981) defined customer expectations as the "*probability of occurrence of positive and negative events if the consumers engage in some behavior*" (p.33). From the perspective of ideal standard, Miller (1977) defined it as "*the wished for level of performance*". Nowadays, these concepts have been developed to the idea of two levels in customer expectations which are "adequate expectation" and "desired expectation" (Bhattacherjee, 2001). Adequate (or predicted) service expectation is the level of service that is considered acceptable in customer perspective and desired service expectation is about how the customer thinks the service should be (Kelley & Davis, 1994). The gap from adequate level to desired level is the "zone of tolerance" for which the range is based on the flexibility of alternative suppliers. When there are fewer options for customers, their desired expectations are not necessary to be lower, but the tolerance level can be higher (Parasuraman et al. 1991)

Generally, customer expectations are diverse and can be clarified as the combination of tangible and intangible factors. For instance, Parasuraman et al. (1988, 1991, 1994) suggested the SERVQAL model of service quality that customers usually expect. These items include (1)reliability - ability to perform promised service; (2) tangible - appearance of facility, equipment and personnel; (3) responsiveness - willingness to help and solve customer problems;(4) assurance - knowledge of staff, their confidence to convey messages and ability to build trust; (5) empathy - caring and individual attention. Among these categories, only reliability focuses on service outcome while other factors focus on the service process.

There are many factors that influence customer expectations in service. Those factors divide into categories which are "explicit" promises from service providers, implicit characteristics of service such as price, hotel reputation or appearance of tangible value, word of mouth from other customers and personal past experience (Kelley & Davis, 1994; Parasuraman et al., 1993). The Figure 1 shows a process of development in customer expectations and how satisfaction affects these four factors. While explicit promises and implicit values are factors controlled by service providers, the WOM and past experiences depend on the previous satisfaction. Next part, we will present details about the relationship between expectation and satisfaction.

2.3.2 Relationship between customer expectation and satisfaction

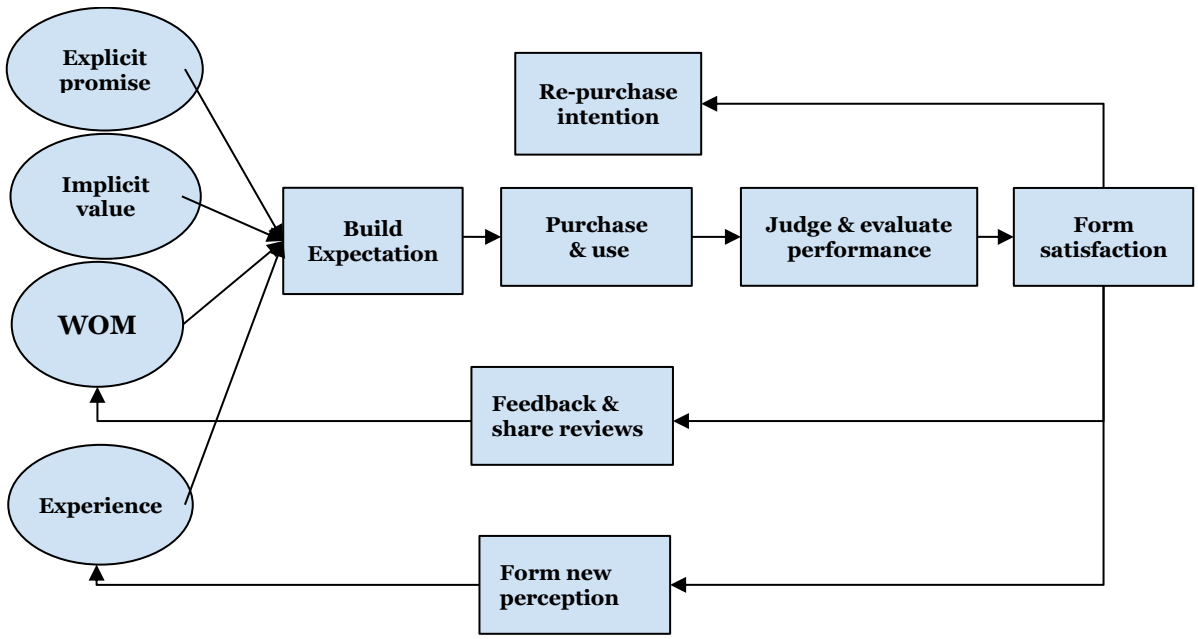


Figure 1. Relationship between customer expectations and satisfaction.
This figure is based on reviewing articles of Felix (2015), Parasuraman et al. (1991), Kelley & Davis (1994), Parasuraman et al.(1993), Bhattacherjee (2001).

Customer expectations have been investigated in many studies with a strong relationship to customer satisfaction. Service satisfaction has been defined as the result of comparing customer perception on service quality with company's service performance. Purchasing and using services is the period for customers to evaluate this comparing process and confirm their satisfaction. In simple words, "*satisfaction is the result of interaction between consumer pre-purchase expectation and post-purchase evaluation"* (Zheng, Gerdes Jr., Schwartz, & Uysal, 2015, p.121).

Customers achieve satisfaction when products or services, at least, meet the basic needs of customers. Egboro Felix (2015) suggested expectancy disconfirmation model (Oliver R. L., 1980) with three levels of customer experience, according to the fulfillment of their expectations: (1) "*Simple confirmation"* is defined as the situation when purchase performance

meets customer expectations, within a tolerance zone. (2) *"Positive disconfirmation"* is when performance is better than what is expected, leading to high levels of satisfaction. (3)Dissatisfaction is the result of shortcomings in their purchasing experience compared to original adequate expectations. It is called *"negative disconfirmation"*. This disconfirmation model has been widely applied in various industry to identify customer satisfaction and understand its antecedences. (Ryzin, 2004,2006)

In reality, it is challenging to measure customer satisfaction. Firstly, perceptions among customers about quality service are diverse (Young & Jang, 2008). The differences in the way customers evaluate quality of service depends upon personal experience. For example, some people can easily complain about "minor shortcomings" while others are more tolerant. Secondly, in some service markets, it takes time for customers to experience the whole process and make a judgement (Felix, 2015). The first impression would be changed for better or for worse over time. For example, the one-night-stand hotel guests can write good reviews about luxury room condition, but they might complain about unhelpful staff if stay for a longer period, or vice versa. Last, but not least, customers' needs and preferences can change from time to time (Felix, 2015)

As customer expectations determine service satisfaction, factors such as WOM recommendations, past experiences as well as explicit and implicit values also affect satisfaction level. The Figure 1 shows the relationship between customer expectation and satisfaction level. Throughout gathering information, customers build their expectations for both tangible quality and intangible value. These qualities will be judged at the moment the services are being purchased and continue to be evaluated during use of the services. This process will result in either satisfaction or dissatisfaction. At the end of the process, customers can either (or both) gain new experience to form a different perception or (or and) give feedback to contribute to a social network. As a result, initial factors keep changing and cause the difference in customer expectations. Due to the reciprocal relationship between expectations and satisfaction, it is necessary to identify customer concerns in different levels of satisfaction in order to deeply understand customer expectations and to predict the future trend of customer perception.

2.3.3 Evolution of customer expectation

Many studies have proven that customer needs and expectations are always changing with a tendency to increase with time (Felix, 2015). In fact, people always aim for higher quality of life, which leads to the evolution of customer expectations. Applying the Maslow's hierarchy of needs (Maslow & Lewis, 1987; McLeod, 2007) to customer expectations in hotel industry, customers not only look for basic needs such as room, catering and safe lodging, but also

require friendly staff, feel of belonging and need of a special connection. Specifically, majority of customers expect hoteliers to understand their special requirement. Moreover, some guests expect their service to be personalized to the extent that hostellers can remember their name, status and treat them with due respect (Ariffin & Maghzi, 2012). Majority of hotel consumers are willing to spend extra money for better quality, premium service and feeling of higher social class while staying in a hotel (Felix, 2015).

Nowadays, it is challenging for service providers to maintain customer satisfaction level at all times. Once customers have a good experience at the hotel, they will have a tendency to repeat their purchase and become committed to the service (Dimitriades, 2006; Bhattacherjee, 2001). Therefore, they would choose the same hotel when traveling to the same destination or choose a hotel of the chain when traveling to other places. It then indirectly leads to higher expectations, because customers would like to receive a similar positive experience. It is not necessary for the customer to ask for better service, but they expect to gain at least similar feeling of satisfaction. Since satisfaction is diverse among different groups of customers and ever changing with time, customer expectations will be difficult to clarify. Although there is a lack of evidence that higher satisfaction leads to higher desired expectation for customers, it is understandable that their tolerance zone will be narrower. Past positive experiences can make them more easily disappointed by minor mistakes. In a larger scale, the feeling of satisfaction is an intangible value which depends on the experience. Therefore, the more often customers have experienced high satisfaction, the higher is the perception of service quality standard, followed by higher general expectation through time.

There is complexity in customer responses toward negative service feedback. In one way, guests will not put too much expectations on the hotel with average or relatively low reviews. However, they will expect the service provider “to do something better”, if they think they give the company a second chance (Kelley & Davis, 1994). Felix (2015) mentioned the contrast effect, that the bigger the gap between expectations and actual performance will make customers magnify any bad experiences. Consequently, customers will require more focus from hoteliers for recovering any failure. In simple words, customer dissatisfaction will result in higher expectations for service recovery.

In conclusion, customer expectations have a tendency to increase following the development of high-quality standards. The more mature the industry, the more challenging for companies to fulfill customer requirements. In order to narrow the gap between customer expectations and customer experience, hoteliers need to understand customer perception of quality service in different periods of time to predict each distinct expectation.

2.4 Hotel attributes

There are several words have been used frequently by online users to evaluate hotel services. Since 1970, there is a large amount of studies investigating words and categorizing them into groups relating to different hotel attributes with the aim to understand the antecedence of guest satisfaction (Zheng et al., 2015; Mattila & O'Neill, 2003; Choi & Chu, 2001). These attributes are identified as hotel core products (i.e. hotel room, and lodging amenities such as bed, bathroom) and a set of related attributes (i.e. location, food & beverages, staff-related description, service encounter, value for price) (Dolnicar & Otter, 2003; Qu, Ryan, & Chu, 2000). Some other researchers categorized the words based on different stages of the customer experience (Gretzel & Kyung, 2008) and suggested other attributes such as the purpose of travel (i.e. leisure, business), travel party (i.e. family or single) or expression of possible action (return, recommend). In his research, Ghazi (2017) categorizes these attributes into six groups by factor analysis, including hybrid, deals, amenities, family friendliness, core products and staff. However, these factors are complicated to define. There are two distinct groups in "hybrid" factor which alternately relates to the maintenance-related aspects and experiential aspects of the hotel stay. The "deal" contains various free supported services such as breakfast, airport, shuttle, etc.

The importance of each attribute depends on different factors such as the purpose of traveling, destination, origin country, age or gender, etc. (Afthinos et al., 2005). As mentioned in part 2.2.3, customer concerns in positive feedback may be different from negative feedback. Among the most mentioned attributes from hotel guests, Ghazi (2017) proved that these components are all important in positive and negative reviews, but their priority concern is different. Specifically, components of cleanliness and room comfort were found to have the strongest impact in negative reviews while staff and services quality, location and room comfort have the strongest positive impact. Dining and hotel facilities are less important components while writing reviews. Therefore, the chosen model of important attributes is decided by the purpose of research as well as sample data. Adapting to these literature reviews, I would suggest the six factors as illustrated by table 2 below. From this part onward, these factors will be called as the topics which concern customers the most.

Table 2: Most concerned topics in hotel industry
This table is based on suggestion of articles (Ghazi, 2017; Shanka & Taylor, 2004; Choi & Chu, 2001; Atkinson, 1988; Zheng, Gerdes Jr., Schwartz, & Uysal, 2015)

Location	**Accommodation**	**Hotel amenity & service**	**Staff**	**Travel context**	**Value**
Words relating to physical location, transportation and ease of connection to other external services	Words relating to basic accommodation needs: room quality, condition and add-ins	Words relating to amenities and internal services of the hotel	Words relating to staff	Words relating to travel context, travel group or travel purpose	Words relating to value of the stay

The "location" topic includes words relating to physical location and transportation which provide convenience to connect with external services such as shopping centers or attractions. "Accommodation" is the topic for hotel core products which consist of basic lodging quality such as the room, the bed and bathroom. "Hotel amenity and service" is the topic that covers all added values and services during customer's stay such as bar, food & beverage, lobby activities, etc. The "staff" topic include nouns and adjectives relating to the connection between hotel personnel, such as reception, and guests. "Travel context" topic is adopted from the "customer experience model" of Ghazi (2017) that covers travel purpose and travel parties of customers. In customer evaluation, value for price or ratio of value over price is considered as a crucial attribute for customers. All of the words relating measuring value such as value, standard or quality will be then put into the "value" topic.

3 Research questions

This part will elucidate the aim of the study with detailed qualitative questions. Due to the literature review above, the aim is to improve understanding of the expectations of hotel customers who travel to Finland through online reviews. With the suggested attribute classification in mind (table 2), customer perspective toward these common topics is evaluated; whether or not they are satisfied with Finnish hotels. The constantly evolution of customer expectations has a crucial effect on customer satisfaction. On that account, it is important to understand the changes in customer concerns throughout the years.

Main research questions:

1. ***What are the main concerns of customers while staying in Finnish hotels?***
2. ***If and how customer concerns on hotel services evolve with time?***

To answer the first question, most frequent topics are extracted from customer feedback in both the title and full text reviews. Rating segmentation is considered to figure out the most relevant keywords in significant levels of satisfaction. Follow-up questions to be considered are:

1.1 What are the most important topics customers usually mention when giving feedback?

1.2 What are the common keywords relating to these topics usually used by online users?

1.3 What causes the differences in customer concerns when they have a positive or a negative feedback? *

(*) Positive and negative experiences are defined by customer rating and sentiment value which are explained in-depth in the next part.

In order to answer the second question, the weight and frequency of keywords are taken into account to compare among different groups of customers segmented by years. Moreover, the sentiment score of a customer review can be considered to understand customer satisfaction and expectations for hotel services. Supportive question for this are:

2.1 Is there any change in keywords used by users through the years?

2.2 Whether customer concern level toward hotel services change through time?

4 Research method

4.1 General method

This research applies natural language processing (NLP) technique in text mining as the main research method. The database is semi-structured data which is represented in a spreadsheet, and includes both numeric attributes as the rating and unstructured data as the text based review.

The data is then treated as unstructured data where the focus is on semantic and contextual understanding of the text rather than transforming it into numeric data for training or prediction. Data is analyzed using Python programming language with the Natural Language Toolkit (NLTK) package for mining text, as well as other packages such as Pandas and Numpy for data manipulation. The analysis will be organized in to five repeating steps (figure 2) which are explained more clearly in the following part of this chapter.

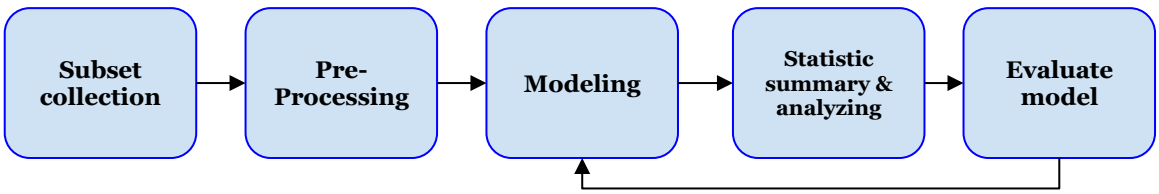


Figure 2.Data analyzing process

According to Weiss, Indurkhya and Zhang (2015), there are several suggested methods for analyzing unstructured data including information extraction (named entity recognition, relation extraction, reference resolution, etc.) which are wisely applied for information retrieval, entity recognition, measuring similarity, linguistic processing, web-based analysis, etc.

Keyword extraction method

In information retrieval, the keyword extraction is widely used task to enrich the document in the text (Mijic, Baši, & Šnajder, 2010), because keywords are simple to define, revise, remember and share (Rose, Engel, Crame, & Cowley, 2010). In short, it automatically identify the set of most representative terms that best describe the topic. (Beliga, Meštrović, & Martinčić-Ipšić, 2015)

In a research about keyword extraction methods, Beliga et al. (2015) suggest a systematization of keyword extraction methods which include statistical approach, linguistic approach,

machine learning approach, graph-based approach and vector space model (VSM). The summary of these approach and example techniques is presented in the figure 3 below

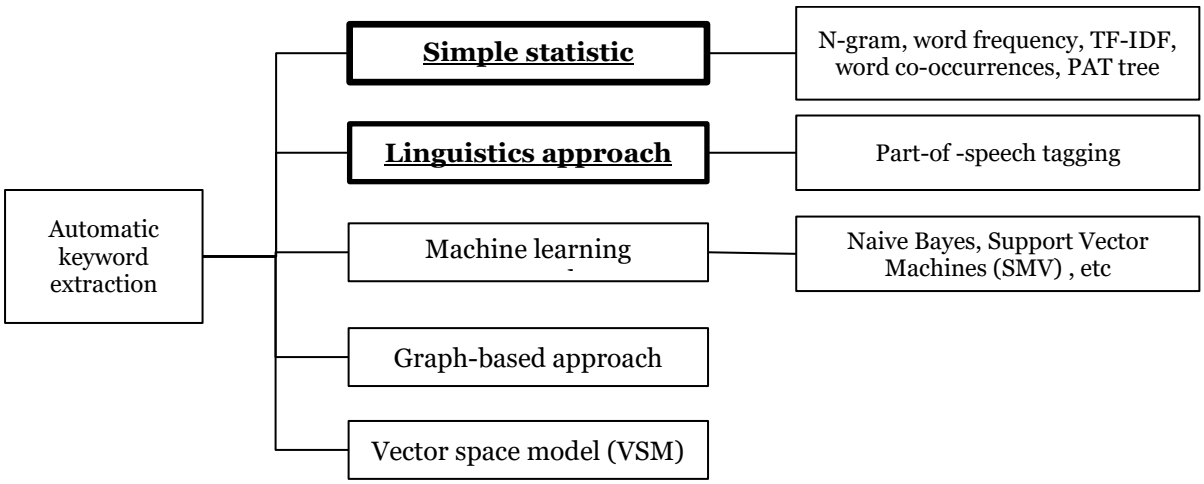


Figure 3. Example of keyword extraction methods
This figure is based on reviewing articles of (Hulth, 2003; Matsuo & Ishizuka, 2002,2004; Rose et al. 2010; Beliga et al., 2015; Ordenes, Theodoulidis, Jamie Burton, & Zaki, 2014)

In the scope of this study, keyword extraction is used to detect the topics and keywords for understanding customer concerns. It will be focus only on (1) a simple statistic approach which does not require training data and (2) linguistics approaches which use the linguistic properties of the words, sentences and documents. The advantage of these approaches compared to others is that the meaning and structure of a text can be expressed explicitly even though each word is represent separately.

Sentiment analysis

To understand customer perception more, sentiment analysis is used with the aim to capture the subjective opinions of online consumers about certain products (Zheng, Gerdes Jr., Schwartz, & Uysal, 2015; Pang & Lee, 2008). Weiss, Indurkhya and Zhang (2015) suggested sentiment analysis as the process of identifying human opinion polarity or attitude by their reviews to evaluate products or services (Younis, 2015). In general, there are two main techniques for sentiment analysis: lexicon approach and machine learning approach. Studies have confirmed that lexicon-based methods outperforms machine learning methods (Zhang, Hsu, Dekhil, & Liu, 2011; Mukhtara, Khana, & Chiraghb, 2018). This is because sentiment analysis by machine learning approach is a domain-specific task which causes the variety accuracies by different domains. Lexicon approach can perform better in terms of handling misspelling and translation errors. It overcomes the weakness of some machine learning methods that miss negated structures and the meaning of words in their context (Denecke, 2008). Mulkhtara et al. (2018) proved in their research that lexicon approach can outperform

machine learning in term of both accuracy and economic time consumption. For those reasons, lexicon approach will be used in this research.

The accuracy level of the analysis can be from 50-70% depending on the method (Denecke, 2008). The accuracy level of negative or positive also depends on the composition of the list of sentiment-bearing words in the dictionary. In some studies with a good hand-tagged lexicon collection, the accuracy can be above 80% for a single phrase (Annett & Kondrak, 2008). Liu and Zhang (2012) suggest that there are three main approaches in order to collect the sentiment dictionary including manual approach, dictionary-based approach, and corpus-based approach. In this research, the dictionary-based approach will be used and the outcome is of multiclass polarity which includes positive, negative and neutral. From that, it is possible to estimate customer attitudes or opinions about hotel services, based on their own words.

Research framework

In short, the analysis models will be organized as the framework in figure 4. To answer question one, the simple statistic approach and linguistic approach of keyword extraction are used with highlighting techniques including word frequency, n-gram statistic, co-occurrence and part-of- speech (POS) tagging. To answer question two, dictionary-based approach is used among lexicon sentiment analysis methods. Also, proportion z-test will be integrated to the result of keyword extraction (question 1) in order to see changes in customer concerns with time (question 2).

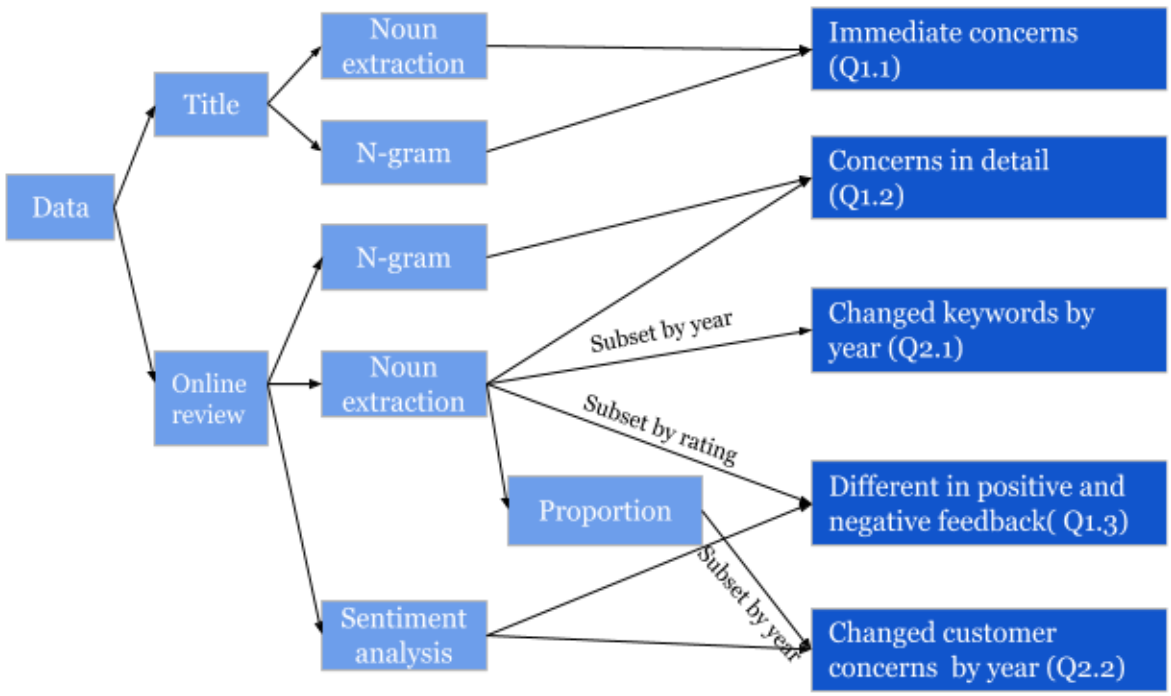


Figure 4. Research framework

Both manual method and POS tagging are used to extract nouns in the text. Results from the "title" column are used to answer question 1.1 for immediate concerns while results from "online review" are used to answer question 1.2 for customer concerns in detail (explanation is in part 4.3 – data collection). N-gram and co-occurrence of these top keywords will be analyzed to extract most related words of the attributes. To answer question 1.3, rating segmentation will be used. In order to answer question 2, year segmentation will be taken into consideration. Results from noun extraction by the manual method for "online review" are used to answer question 2.1. Proportion of keywords extracted from POS tagging method is used to answer question 2.2. Result from co-occurrence analysis become the reference for finding the list of words for sentiment analysis in question 2.2.

4.2 Data source and user profile

Data includes 16,870 reviews from Tripadvisor users, who gave a feedback questionnaire about their stay in 50 Helsinki hotels between 2002 and 2016. Figure 5 visualizes the involvement of hotels accumulated throughout the years as well as the rising amount of customer online reviews following within the time range. During the time from 2002 to 2006, there are few hotels in observed data with very low amounts of reviews each year (i.e. only 2 hotels reported in year 2002 with 3 reviews). The number of hotels increased rapidly after that with rapid increase of online reviews. After year 2009, the number of hotels rise slightly and remain within 48-50 hotels since 2012. Since 2011, the number of customer feedback increase by hundreds of reviews every year.

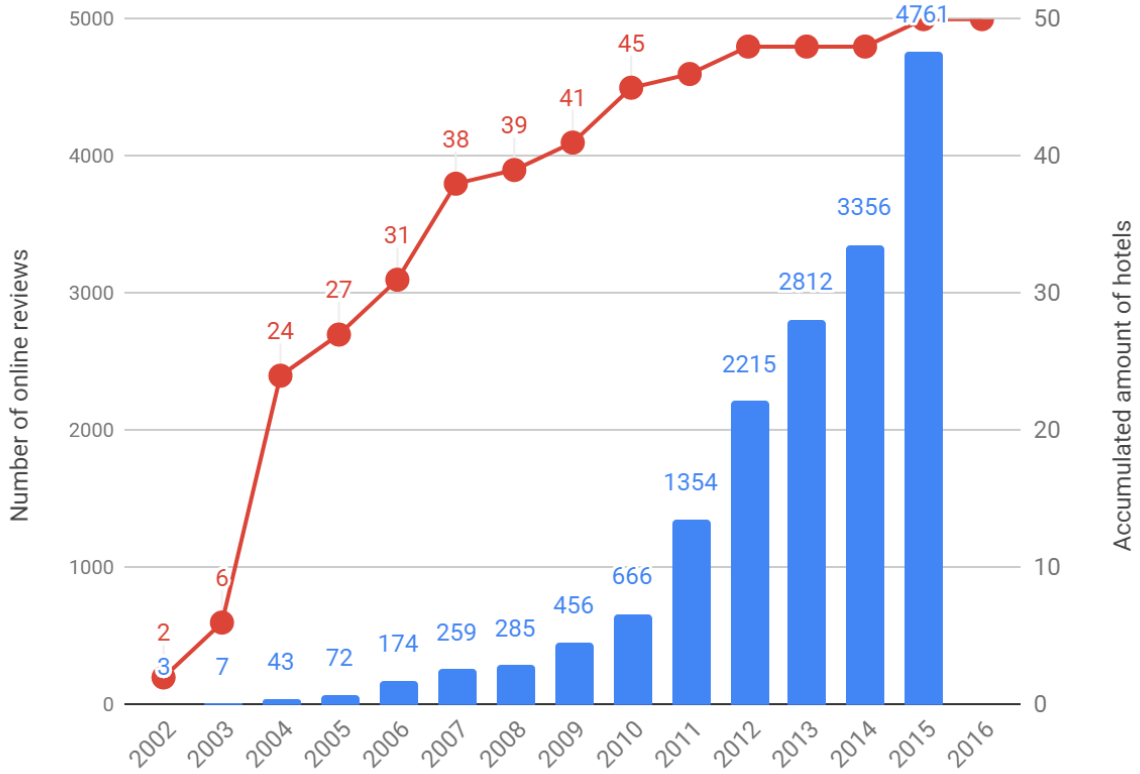


Figure 5. Distribution of amount of online reviews and accomodaded amount of hotel by year

The hotels are from lowest ranking 2.5 stars to highest 5 stars. In that, 58% of the hotels are above 4 stars while 38% of them are from 2.5 to 3.5 stars (Appendix A). At the quick glance, there is some similarity between the hotel ranking and overall user rating. The hotels with 4.5-star and 5-star rating class have average overall rating around 4.3 and 4.7, the hotels in 3.5- and 4-star class mostly have average overall rating from 3.5. to 4.5. There are also some special cases that some of the hotel in 2.5 and 3 stars class have high rating around 3.7 or above, a 3.5 stars hotel has 2.8 overall rating or a 4-star hotel has only 3.0 average score.

The scope of this research is narrowed to Helsinki expanded area (including 3 cities: Helsinki, Espoo and Vantaa), because this is the most developed area in Finland. This area have most international people as well as more dynamic services. Unlike travelers in parts of the country (e.g. Lapland) coming there for leisure and entertainment, travelers in Helsinki may come for different purposes such as ordinary city vacation, business, single adventure, etc. Therefore, the result can be more generic and unbiased. In this study, only English speaking reviews are taken into account in order to minimize errors in translation. Among these online reviews, majority of users have “business” and “couple” as their tourism purpose, which are 32.7% and 30%, respectively. There are fewer people who travel to Helsinki in with group of friends, family or solo (Appendix A).

In total, there are 14,497 unique user accounts who gave online feedback during the years for the observed hotels. That means 14% of them are repeat users in this platforms who gave more than 1 review. Among them, 29.8% are male, 18.8% are female and the rest are without gender information. Excluding 6467 uninformed age group, majority of unique users are millennial. Specifically, 26.4% of reviewers are in age range 25-34 and 45.8% are in age range 35-49 (Appendix A).

4.3 Data collection and subsets

Data collection

Texts used for analysis are represented in two columns which are distinguished by level of detail: the title of customer feedback and their online full text review. The reason to choose "title" text for finding the most important topics is that it is simple structured, short, focused and concrete (Liu, Teichert, Hu, & Li, 2016). Feedback title is believed to reveal the immediate impression from customer experience while they stay in the hotel. While the titles show a general picture of customer concerns, the detailed full review text will explain more about what they really mean in their feedback. Full text review can clearly unfold the whole context of significant experiences as well as the deeper concerns of customers.

Subset by year

The data source covers reviews from year 2002 to January 2016. Data is grouped into different year groups to see the changes through time. From 2002 to 2010 the number of reviews is low while the amount of hotels increases. In contrast, from 2011 to 2016 there are only 4 more hotels in the system, but thousands of reviews are added to the database. The reason for this can be that the customers didn't have strong motivation to write and give feedback on this travel platform or TripAdvisors didn't have much reputation before 2010. Hence, user expectations, perspective as well as the keywords they used during this time period could be different comparing to current time. Therefore, it is better to group those reviews from 2002 to 2009 into one segment. Besides, the available data in year 2016 only includes values in January, amounting to 446 reviews, and is therefore better to be grouped with the reviews from 2015. All other reviews from 2010 to 2015 will be divided yearly. In short, there are 6 one-year segments to analyses the changes in customer perspective: 2002-2009, 2010, 2011, 2012, 2013, 2014, 2015-(Jan) 2016.

Subset by rating

In order to identify positive and negative feedback, rating segmentation is taken into account. Overall rating is considered as one measurement for customer experience, in which

the rating from 3 represents for positive experience and lower than 3 represents negative experience. In fact, there is not much difference in result of reviews rating 3 comparing to rating 4-5. Therefore, it is not necessary to have the subset for neutral reviews. In general, the user ratings in these hotels are quite high: average overall rating is 4.07 among 16909 reviews. Only 5.8% of the reviews have overall rating lower than 3 while 94.2% people gave overall rating at or above 3, for which 41.6% rate above 4. Patterns of other ratings such as value rating, room rating, service rating, etc are similar. However, the proportion between high and low value in other ratings are quite different. Specifically, location has ratio of high rating over low rating of 52.6 while that value for cleanliness and service are 21.9 and 18.6, respectively. Room rating and value rating have a shorter gap since their high-low rating ratios are 13.4 and 12.7. That means that majority of people think the location of the hotels are good; many people have positive experiences of cleanliness and service while more people experience the room and value of service negatively. These observations can be understood more clearly by analyzing the text.

4.4 Data preprocessing

Cleaning data is a very important first phase before exploring the data further. There are several steps of data preprocessing and complexity in each step that are different depending on the data source. This dataset was gathered from TripAdvisor, in which the reviews and titles are plain text without much noise such as HTML tags, XML, URLs or hyperlinks. Because of that, we can skip cleaning them when preparing the data. Decoding the raw data is also done before any cleaning step to make sure text data is not subject to different forms of decoding. This is an optional step for programming. The standard encoding format UTF-8 is used to transform all complex symbols into understandable characters.

The raw data is cleaned with six steps: Lower case, word normalization, number removal and punctuation, removal of stopwords and common words, dealing with negation words and tokenization. However, the order and presence of these steps will be different in different analysis technique as the details below.

Lowercase

This is the first basic step to handle any kind of text. It is considered as text normalization where all upper case letters are transformed into lower case. Converting words to lowercase is necessary, as other normalization methods, because it reduces redundant words and capital misspelling such as “service”, “Service” and “SErvicE”.

Word normalization

There are Natural Language Processing (NLP) techniques used in most text preprocessing models such as stemming, converting a word into its root form, and lemming, transferring all word forms into one linguistic format whether noun, verb or adjective. However, these methods may cause inaccurate results for other analysis techniques such as POS tagging and sentiment analysis. Instead, the words are normalized manually with the “replace” function of Python. From that, words in plural form become singular; some common words in different lexicon forms such as “centre” or “central” become “center”; “staying”, “stayed” become “stay”, etc.

Remove punctuations and numbers

Obviously, numbers and nonsensical characters in hashtag or emojis do not contribute any value to the meaning of the text. Therefore, they are totally removed from the text. However, it is important to deal with dots, commas, semicolons or dashes. They are marks to separate clauses and sentences which are crucial to keep when doing sentiment analysis. Hence, those sentence-separation-marks are removed when extracting keywords, but are kept in place when doing sentiment analysis.

In POS tagging, the normalization step is not necessary to apply since punctuations and numbers are not counted as lexicon function words.

Tokenization

The raw text we get from these sources are unstructured data which can be recognized as simple string format. Therefore, we need to transfer them into structured form, in which we can find the regular, predictable patterns and relationships with other attributes in the data source. This transformation method is called tokenization, which, in short, splits long strings of text into small pieces, or tokens. Sometimes, tokenization can be understood as text segmentation or lexical analysis, which refers to the breakdown of large chunks of text into smaller parts such as paragraphs, sentences or phrases, but the outcomes are separated words.

In this research, two levels of tokenization are applied. For extracting keywords and other word analysis, each text row is segmented into singular words. For sentiment analysis, sentence tokenization is used to separate different sentences in one text row.

Stop words and Common words

Mostly, there is a majority of non-informative word in a text. They include stopwords, which are articles, prepositions and conjunctions as well as common words, proper names or most

frequent words used for a specific topic. For instance, “hotel” and “Helsinki” are most common words of this data source, which do not contribute value to the result. Hotel represented in almost all sentences since the customer feedback focuses on their accommodation. Helsinki is the target location of this research that makes this word appear in most of the comments as well. The stopword list (i.e a, the, I, me, whose, one, two, when, etc) is prebuilt in NLTK and is applied in the programming.

Negation word

In many cases, negative words such as “no” and “not” are considered stopwords. However, eliminating them can violate the interpretation of sentiment analysis. These words contribute to the tone and opinion of a sentence whether it is positive or negative. Good is a positive word while not-good has the opposite meaning. In addition, the level of sentiment is different when negation is added. In sentiment analysis, this step needs to be done before word tokenization, but after removing stopwords.

It does not make a difference to consider negation words while doing information retrieval since it does not affect the outcome of the keyword list. Even though some new words are created such as “notgood”, “nothave”, “notbad”, etc, their weight in the bag of words is not significant enough to influence the results.

4.5 Text mining model

Extraction term frequency from text

The main algorithm in this research is to calculate the frequency of words or groups of words that appear in the data set. Those words will be nouns or noun phrases, considered as the theme or keywords of significant topics mentioned in the findings part below. There are two methods used in order to extract the noun in the cleaned text. The first one is POS tagging and another one is doing it “manually” by observation.

Bag of words: As explained in preprocessing data part, every string after cleaning are tokenized into separate words for further analysis. Then, all of these words are added up into a dictionary which consist of all unique words appear in these strings. The frequency of words will be counted and recorded as the value while each word is considered a key in this dictionary. This model is called Bag-of-word.

In this research, the keywords used to extract information are mainly nouns. When the manual method is applied, other words such as adjectives, adverbs and verbs are kept for further analysis. In the manual method, preprocessing needs to be done carefully with all steps

explained above. After removing stopwords, it is important to select words to eliminate from the list. Although there are only descriptive adjectives left in the dictionary, each word has different contribution to the model depending on its meaning. The chosen list is subjective to the researcher. Basically, the adjectives express the level of satisfaction such as “great, good, nice, really, excellent, quite, little, bit, ok, bad” etc. are skipped when extracting the keywords. Another group of adjectives including “lovely, beautiful, decent, luxury, expensive” are considered carefully for further analysis, but are also eliminated when checking the top concerns of customers. Nevertheless, some adjective such as “clean, noisy, convenient, quiet, helpful, friendly” are kept, because they contribute in a meaningful way to the model as one of the most important attributes to customers. The appendix B and C contain the list of word that are removed in the manual method for the noun extraction model.

When using POS tagging method, preprocessing steps can be skipped and replaced by POS tagging algorithm as the antecedence in keyword extraction. In short, POS tagging is a method to identify a word based on lexicon categories, which consist of different grammatical properties such as noun, verb, adjective, determiner, article, conjunction etc. The words with similar functions within grammatical structure of the sentences will be tagged and categorized. In this research, a pre-built function in NLTK package of Python is used to extract the nouns. Specifically, the sentences are chunked into word level and words are identified which function of the sentence they belong to. This POS tagging algorithm of Python also considers words on phrase level to make sure it will not skip many nouns in one sentence. Then, it uses the tag set as a dictionary to compare with an existing tokenized collection from text source to find out the noun. The accuracy of this tagging method is about 95%. The pros of POS tagging are to shorten the list of words, hence make the programing run faster.

With the scope of this research, using either method can present comparable results. As the aim of focusing on the meaning of the text rather than generate the automated models, the programming code will be simplified for faster analysis. On one hand, POS tagging is used to cross-check the reliability of the manual method, and on the other hand, the manual method can be an easier way to initiate future mining steps such as n-gram or sentiment analysis. Adding words into Bag-of-noun by POS tagging will eliminate all sentiment words as well as related adjectives and verbs. Therefore, manual method is used to answer question 1.1 and POS tagging method to answer questions 1.2, 1.3 and 2.1

N-gram model

N-gram model is the process of finding n words which occur next to each other. For example, 2-gram or bigram is finding a list of words that pair to each other; 3-gram or trigram is finding a list of 3 words that stay together. Same logic as with the term frequency in bag of words, n-

gram set is a collection of unique phrases containing n-words together with their frequencies for each phrase. Or we can think bag of word is simply a collection of unigram/ 1-gram. N-gram method is used to better understand the context of words. Depending on the range of n-gram, results can show different related keywords. The optimal lengths are various depending on the application (Jain, 2018). Smaller n-grams can show more accurate related phrases while bigger ranges can show clearer context and meaning. However, bigger gram may show less accurate and less important phrase with small frequency. In the scope of this research, only bigram and trigram are used to maximize the accuracy.

Proportion and z-test

So far, it seems that the top ten keywords are similar each year. Some words are obviously changing their ranking or replaced by other words. Some other are difficult to recognize any evolution while they maintain the rank on keyword list. To solve that, the proportion of these top keywords will be calculated to identify the changing in customer concerns throughout the years.

In addition, the n-gram proportion is also taken into account with the same purpose in detailed context. There are many "phrases" mentioning the same thing such as "clean comfortable room" and "clean nice room" or "friendly staff" and "helpful staff". There are two ways to handle them. First, numbers of n-gram with same topic are combined in order to compare with other topics. Second, they can be treated separately to see specific concerns of customers toward those topics.

Notice: Unlike the n-gram probability used in most of machine learning model where it calculates the chance of a word occurring next to another word, the proportion simply calculates the ratio of a "pair" of words in the group of phrases. In short, the basic calculation of proportion equal to the number of observed words divided by the number of total of words.

$$p_A = \frac{nA}{n_{total}}$$

This value shows the likeliness of the observation appearing in the group to show the trend in concerns of customers. The two proportion z-test value is then calculated to measure significance level of each change from year to year as the formula:

$$Z = \frac{(\hat{p}_1 - \hat{p}_2) - 0}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$ (Stephanie, 2014)

Where

- *p1* is the proportion of observed keyword in year X with *n1* is total amount of words in year X ;
- *p2* is the proportion of observed keyword in year (X - 1) with *n2* is total amount of words in that year
- p are the overall proportions of that keyword.
- |z|<1.96| mean the difference is not significant at 5% while if |z|≥1.96| mean the difference is significant at 5%

Sentiment analysis

There are different levels to analyze in customer feedback. They can be performed "extracting the overall sentiment of an entire comment, on each sentence of the comment, or in reference to certain aspects or features of the service (e.g. price, design, employees)" (Ordenes, Theodoulidis, Jamie Burton, & Zaki, 2014).

This analysis will be done at sentence level to determine the opinion polarity score. Sentiment vader of NLTK for opinion mining is applied in this method. In particular, a set of positive and negative opinion words are composed as a dictionary and each sentence are applied to a prebuilt scoring function based on this dictionary (Denecke, 2008). As the result, a triple of polarity scores is assigned whether they are a positive, negative and neutral. These polarity scores will be transformed by score_valence function (Natural Language Toolkit, 2018; stackoverflow, 2016) and presented in the final sentiment result with the value from 0 to 1 (Table 3). The sum of these normalized scores (sentiment value) is always 1 (Annett & Kondrak, 2008).

Table 3: Example of sentiment values, measuring by sentence tokenization

Sentence	Compound	Negative	Neutral	Positive
Breakfast is absolutely delicious and offers a wide choice.	0.6115	0	0.637	0.363
Couldn't hear a beep from other rooms, traffic noise was down to minimum and air conditioning was just what I needed on warm summer days Shame the curtains in the room weren't darkening curtains, as the room became quite light very early in the morning - not a very comfortable thing for a light sleeper..	-0.8219	0.148	0.832	0.019

Breakfast was a real disappointment Sokos Hotels' brekkies are never that special anyway, but Presidentti's was poorer than usual.				
However, the breakfast is served a few steps away from the rest of the ground floor.	0	0	1	0
The breakfast was fine but not luxurious.	0.1027	0	0.811	0.189
The breakfast was fine but at 1/2 hour before it was to end they refused to refill the coffee urns and the hot water urn.	-0.34	0.103	0.846	0.051
the breakfast was still very good though, and i really like how they focus on special ingredients from finland, like seabuckthorn berry juice.	0.888	0	0.611	0.389

The compound value is calculated by the pre-built function in Python (Natural Language Toolkit, 2018). It is used as the main signal to decide the attitude of the review. Compound value will be decimals in the range of -1 to 1 (Table 3). Among three values negative, neutral and positive, the one with highest value is the main sentiment of the sentence(s). Consequently, it affects the value of compound column. In short, negative compound value means negative sentiment, positive value means positive and zero means neutral.

As explained in the tokenized part, customer feedback is tokenized by sentence which is separated with others by full-stop dot. Therefore, the data used in this analysis is not cleaned to make sure no sentimental word is eliminated. However, there are reviews which contain other punctuation marks such as commas, semicolons or colons, but not the dot. In such case, the “sentence” can be long and can include other topics that can affect the general score of the whole review.

5 Findings and Discussion

The first part of this section reveals the big picture about customer concerns by analyzing the titles of customer feedback. Analyzing the titles shows the most important topics for customers living in a hotel.

The next two parts of this section analyze deeper into customer expectations by using the full online review texts. Part two shows top keywords which are related to topics from part one with more detail. Part three focuses on the evolution of the keywords by comparing keyword's proportion and sentiment.

5.1 Overall top concerns of customers from feedback titles

At first, information from the title of customer review is extracted from the whole data set to understand the general concerns of customers. The reason to choose the title is because this is a concrete attribute and represents the first thoughts and highest priority issues of the customer. This can reveal the most important impression toward the received service (Liu, Teichert, Hu, & Li, 2016).

Appendix B shows top one-hundred keywords from both methods. The manual method is done by removing irrelevant words which are shown in Appendix B. Top ten keywords are similar in both methods. In POS tagging, the frequencies of words are somewhat smaller than in the manual method. There are some adjectives, such as "excellent, convenient, ok, bit", remaining in the list of nouns. This can be explained by the unclear structure of the titles which makes it difficult to recognize the noun in the text. However, the result is still comparable to another method. As explained previously, some important non-noun words are kept in the manual method such as "clean, comfortable, friendly", because they explains customer concerns more clearly. Therefore, many more words are included in the keyword list. Those reasons cause the difference in the order of keywords in following ranking.

Question 1.1: What are the most important topics customers usually mention when giving feedback?

Among the top ten keywords, "location" seems to be the most important thing for customers when they travel. The frequency of this word is around 3460, which is far higher than that of the following topics "stay, center, room, service" which are 1480, 1180, 963 and 617, respectively (Appendix B).

In the bigram model, the top ten pairs of words are mostly related to location with accompanying positive words such as "great, good, best, and convenient" (table 4). This can

easily be explained, because all of the hotels are located in the city center. Also, the Helsinki area is quite small and public transportation is convenient enough for traveling around.

Table 4: Top ten bigram keywords and their frequency from customer's feedback titles

great location 1315	good location 1011	excellent location 415	center location 325	location nice 318
great stay 279	center city 274	good value 254	place stay 245	location perfect 243

Following the word "location" are "center" and "city" which can be grouped in the same topic as "location". Co-occurrence analysis proves that the top words related to "location" are "center, convenient, centerly, city".

In top ten list, the rank two - "stay" and the rank seventh "place**"** are quite general keywords. Similar to "hotel" and "Helsinki" which exist in majority of the reviews. However, it is good to keep them in the list because it relates to customer experience. Mostly, "stay" will go together with "location" or "room" while "place" is more closely related to "room" or "service". Some phrases like "good place to stay" are mostly mentioned in the titles. Those keywords can be considered to belong in the "accommodation" topic which is about room quality and living conditions. Some references are made to the convenient location and other references to the condition of the rooms, which can be explained more clearly in the "online review" text.

The next concerns for the customers are "room", "service" and "staff" which are also in the top list among the low-rating feedbacks. For customers, the "value" of what they pay for is also important. The phrase "good value for money" is mostly mentioned in the title. Among the general keywords above, the tenth, "breakfast", is specific to the food and beverage topic. It seems that this is one of the most important concerns of travels.

Table 5 shows the top ten keywords in general, positive and negative feedback. It is interesting to see that the "room" and "service" are mostly mentioned in the feedback with overall ranking lower than 3. Even though the "location" ranks second in this list, it's obvious that 98% of keyword "location" mentioned in positive feedback. Similarly, the frequency of "staff" in general feedbacks or positive feedbacks is much higher than in negative feedback. Especially when bigram analysis is done for the negative feedback, "rude staff" is mentioned only six times compared to other attributes with negative responses such as 37 times for bad/poor service or 27 times of bad/dirty room. Therefore, it is reasonable to state that the room and the service cause most negative feedback.

Table 5: Frequency of top ten keywords from customer's feedback title

R	**General**	**Ranking >= 3**	**Ranking below 3**
1	location 3461	location 3392	room 96
2	stay 1027	stay 1007	location 69
3	center 1008	center 998	service 57
4	room 963	room 867	staff 30
5	service 614	service 557	dirty 28
6	city 563	city 556	experience 24
7	place 526	place 515	money 20
8	staff 520	value 496	stay 20
9	value 507	staff 490	breakfast 18
10	breakfast 474	breakfast 456	customer 12

Table 6: Frequency of top 20 bigram keywords with overal rating lower than 3 from customer's feedback title

good location 25	great location 18	poor service 14	bad service 13	customer service 10
bad room 10	noisy room 7	money value 6	bad location 6	money notworth 6
rude staff 6	dirty old 5	room small 5	location poor 5	dirty room 5
good room 5	best notthe 5	notworth price 4	dirty poor 4	good service 4

Discussion

The above findings show that the top four topics customers are most concerned about are "location", "accommodation", "service" and "staff". "Location" is considered as the most important attribute for travelers which is shown in both positive and negative feedback. Although complaints are made about bad service, bad staying, they still mention about great location. The "location" of observed hotels is somehow so good that mostly it goes together with positive sentiment words such as "good, great" even in the low ranking comments while other topics are accompanied by negative words. "Staff", on the other hand, is less important comparing to "room" or "service". It is mostly mentioned when people give feedback. Unlike "location", topic of "staff" may become irrelevant if there are other bad experiences for customers.

It can be quickly concluded that location and staff are given good feedback while the staying condition or room quality and the service are the cause of negative experiences for customers. In addition, the value for price is also a big concern of travelers while staying in a hotel. Keywords like "value" and "money" are always on top ten list of words. The keyword "business" is mentioned in the following rank.

5.2 Deeply understanding customer insight from customer text reviews

This part analyses deeper into the full feedback texts to prove the sentiment theory from part 5.1, and find out deeper insight as well as relating keywords from the topics that customers consider the most.

In this phase of analyzing, the main text of the review is used. The result of POS tagging is, hence, more accurate and closer to the manual method due to the complete structure of the sentences in the full text review. Notably there is always a big difference in the frequencies of the words “stay” and “location” between the two methods. This is caused by normalization of data where the verb “stayed” and “located” were transformed to noun form. This kind of mistaken adjective is not present in the noun-POS tagging list while the manual method can extract more important keywords including adjectives and verbs. Therefore, results of the manual method are reported in this paper with result from POS tagging as reference.

Question 1.2: What are the common keywords belonging to the topics usually used by online users

From the overall picture in question 1.1 and suggested attributes in literature review - section 2.4, keywords are summarized into seven topic categories as the table 2’. The third row in this table is formed from the first 200 keywords in the manual method. Those keywords include some important adjectives which have relevance and exclude irrelevant verbs and emotional adjectives (Appendix C). Keywords themselves are sometimes difficult to categorize into groups, because they can relate to various things. Therefore, those keywords need to be put into context before classifying them. For this, the co-occurrence analysis is used as the basis for this classification.

Table 2.1: Most concerned topics and related keywords in hotel industry

Location	Accommodation	Hotel amenities & service	Staff related	Travel context	Value	Other
location, center, city, walk, walking, distance, minute, station, area, close, bus, tram, airport, train, street, near, railway, nearby, convenient, shopping, harbor, sea , downtown , metro, restaurant, bar	room, bed, sleep, pleasant, clean, small, large, big comfortable, quiet, bathroom, water, shower, floor, modern, space, window, balcony, toilet, view, sauna, noise	breakfast, service, free, buffet, restaurant, bar, coffee, tea, wifi, lobby, tv, internet, food, facility ,gym, style, dinner, pool, elevator, parking, fruit	staff, helpful, friendly, reception, front, desk	Business, family	Value, quality, money, price, choice, standard	Night, time, nights, day, next, door, right, outside, trip, morning, building, experience, times, scandic, beautiful, top, recommend, stay, place,

From this analysis, the “reception”, “front desk” are classified in the staff related list, because they mostly occur together with keywords such as “helpful, friendly, staff”, etc. In some cases they can be considered as hotel services such as “24/7 reception”. However, words relating to experience with the staff are more diverse and frequent including “asked, polite, welcoming, and efficient”. In another context, “lobby” is more likely about hotel amenity since it usually occurs closer to other service-related-words such as “bar, breakfast ,entrance, lounge, small, free, wi-fi, restaurant”.

Although the “view” depends on location of hotel, it is decided by the condition of the room if it has windows open toward a nice view. Thus, it is considered added value for room condition.

Unlike the blurred meaning in the title, “stay” and “place” are keywords that mostly appear in positive sentences with keywords “great, nice, perfect” and “definitely, recommend”. Those words are grouped into the “other” group, because the keywords themselves are quite general. However, those expressions usually show signs of high satisfaction, which lead to the customer’s recommendation.

“Restaurant” and “bar” are tricky keywords that need to be carefully analyzed. They can be either amenities of hotel or service outside the hotel. In this database, majority of them co-occurs with “hotel” and internal resources such as “food, breakfast, room, dinner, menu, downstairs”. However, there are also fewer keywords relating to location such as “location, shop, area, and close”. Therefore, they should be considered in both categories for further findings.

The “value” column includes the keywords that can show the expectations as well as satisfaction of customers. Those words such as “value, quality, and standard” are used as the measurement for traveler to compare what they expected with what they receive. For example, people feel dissatisfied with a hotel in an international brand, but lower than its standard or they think the price is much higher than it is worth based on their previous experiences. The keywords in this group are not in high ranking positions, but it is important for hotel to look into.

From the frequency counted in full text reviews, there are some changes in the ranking of top keywords when comparing to the rankings of top keywords in the feedback titles. Unlike the keywords used in the titles, the most frequent keywords in the reviews are more specific.

Figure 6. Distribution of keywords from customer's online reivew in word cloud

From the word cloud above, it can be easily seen that the weight of the keyword "room" is much higher than the rest of other important keywords. Its proportion is double the proportion of the second most frequent word and triple the proportion of the third and fourth ranked keywords. Interestingly, the keyword "breakfast" was highlighted in customer comments. Between 2002 and 2009 "breakfast" remains as the third most frequent word, but from 2010 onwards, it is the second most frequent concern of customers. The word that most co-occurs with breakfast is "buffet". The following rankings, "location, staff, center, city" relate to the topic of "location". Words such as "city, center, walk" have a higher frequency, than words relating to public transportation (e.g. "station, bus, tram, train"). The high frequency of those keywords once again strengthens the importance of "location" for customers of hotels. "Staff" is ranked fifth. As the observation from the titles, this keyword usually goes together with positive keywords such as "friendly, helpful, nice, good, polite, etc." The next attributes in the top twenty are "restaurant, bed, service, and bathroom" which relate more to services, hotel amenities and room condition. As expected, words supporting those attributes are also on the top list, including "clean, friendly, comfortable, walk". It can be seen more clearly when applying n-gram analysis where more meaningful pairs of words are shown. In the analysis, "city center" and "walking distance" for the location as well as "friendly/helpful staff" are mostly mentioned as well as "good breakfast" - "breakfast buffet" and "clean room" - "comfortable bed".

Discussion

From the top one hundred keywords, it is possible to understand the highest priority concerns of customer relating to the topics found in question 1.1. It can be concluded that "location"

"accommodation" and "hotel service and amenities" are more important than "staff", "value" and "travel context", based on the diversity of words used and the frequency of these words.

In particular, room condition is always a top concern for travelers, especially the cleanliness of the room. The quality of the bed and bathroom are the next priorities in customer evaluation whether they are "clean" and "comfortable" enough. Based on trigram analysis, the room is considered comfortable when it is clean and/or the bed and bathroom are clean. The sizes of them are also considered if they are too small for the customer. However, that is not a key attribute.

In the hotel standard, especially three to five stars, "breakfast" becomes a mandatory service that concerns customers. In this case, it seems to be considered as a basic need; even more crucial than location and staff. Breakfast can be served by portion or by "buffet" and it affects customer experience of the hotel restaurant as a result.

There is no doubt about the importance of "location" even though it is ranked fourth. As in these comments, people still mention about good location no matter what experience they have. Although the public transportation in Helsinki is convenient, it seems that people prefer to walk. It is understandable, because majority of travelers in this dataset are business people who travel alone and have less time. In addition, family travelers may usually go by their travel agency who provide them transportation for morning activities; solo and couple travelers can choose hop-on hop-off. Therefore, the great location is in the walking distance to restaurants, bars and shopping centers for evening activities.

Question 1.3 What causes the difference in customer concerns when they have a positive or a negative experience?

Part1

Table 7 presents examples of the top keywords extracted from reviews with overall rating lower than 3, which are considered as negative feedback.

Table 7: Top keywords in customer's online reviews with overall rating <3

1	room 2617	6	night 413	11	time 328	16	shower 211	21	desk 171
2	breakfast 599	7	bathroom 360	12	service 315	17	restaurant 188	22	price 168
3	staff 504	8	stay 355	13	floor 302	18	people 178	23	dirty 168
4	location 454	9	small 347	14	center 277	19	city 176	24	food 150
5	bed 440	10	reception 336	15	day 226	20	place 174	25	morning 141

Although the result show familiar keywords, the weight of **room** is much higher than other keywords. In unigram, its frequency (2617) is 4.4 times higher than "breakfast", 5.2 times higher than "staff" and 5.8 times higher than "location". Other keywords belonging to the accommodation group also exist in the top list, such as "bathroom", "bed" and "floor".

In bigram analysis, it is shown that the size of the room, bed and bathroom appear in negative reviews of customer, if they are too small. Cleanliness and air conditioning of are also considered. The result is almost similar when we analyze the reviews of low rooms rating where people are bothered by "small room, tiny room, single bed or small bathroom". Below are some examples of negative room rating:

"On my recent business trip to Helsinki... Hotel was extremely crowded, families with children occupying every single corner of the hotel. Breakfast was a loudy mess with children running all over the place. I was not very impressed with the reception staffs helpfulness either... On top of everything my room was very hot and there was no air-conditioning in sight. I cannot recommend." (2013)

"...This hotel was over $200 a night, the bed was way too soft, the room had no ventilation and very warm and it was very small.Staff was nice and breakfast was good, but this hotel is significantly overpriced."(2012)

Even though **"breakfast"** is at the second rank of negative feedback, majority of its co-occurring words are positive. In bigram, there is a higher frequency of "good breakfast, breakfast included, and breakfast ok" than it of "poor breakfast" and "average breakfast". In most cases, good breakfast is a plus point for hotel services even when customers experience something bad (proven by examples). Other noun words that usually go together with "breakfast" are "buffet" and "selection".

"Ugly small rooms, old furniture and equipment. The smallest bathrooms I have ever seen in my entire life.Thin walls, poor sound isolation. Located near the street, so quite a lot of noise because of cars with winter-spike tires (beginning of april). The only good things I have found were tasty breakfast and shuttle to/from airport every half an hour. Use this hotel only if you really have no other choice.(2008)

"...disappointed with this Radisson, based at the edge of a working dockside not the seaside as described in the title, as a lone female traveller this was a little unnerving. corridors where a little smelly and the staff didn't go out of their way to be friendly.the radisson group has an unflexible policys over 'extras' which caused some upset at the beginning of my stay in Helsinki. however the eat as much as you like breakfast offers a good range of foods to choose from" (2009)

As expected in previous findings, **"location"** is a high priority regardless of customer emotion. Majority of customers' rate location as very good for hotels in Helsinki. By analyzing the subset of low location rating, it is clear that hotels receiving bad location reviews are located far away from the city center. In fact, there is a lot of feedback with low location rating altogether with

other ratings which means it was not the location that caused the bad experience. Reading through the reviews with low location rating with higher rating otherwise, offers insight as to why the location is ranked poorly.

"…. It's in the middle of the woods by the sea, but not very far from the nearest metro station and bus stop. The hotel has its own little beach and a great beach sauna. The fairly small single room was modern, comfortable and clean, and was wired with an internet connection. Breakfast was varied and extremely good, although I had too little time to sit down to really enjoy it. This hotel is not for the party-goer or someone who wants to be close to the city center, but wonderful for someone who enjoys being surrounded by nature…" (2007)

"...I had thought it would be in the city centre but it was quite a long way out, near the harbour, with no information provided as to how to get into the city or call a taxi. I eventuall asked a pedestrian who directed me to the number 4 tram stop which took me to the Central Sation, where I was able to find a taxi to my conference at Finlandia Hall. The whole journey took about forty minutes: a waste of time.The accommodation was spacious and clean ... I would only recommend it to someone on a tight budget who did not need to be centrally located or near shops, and for one or two nights maximum. (2015)

As in the report, **"staff"** mostly goes together with positive words in unigram, bigram and trigram. Results from co-occurrence analysis below also shows that majority of people consider "staff" as "helpful" and "friendly" more so than "rude". 0,1% of words adjacent to "staff" are "friendly", 0.056% are "helpful" and only 0.019% are "rude". "Reception" and "front desk" are used as alternative keywords for this topic which are used to explain the details of staff service, but do not co-occur with many descriptive adjectives.

Table 8: Example Co-occurrence analyse of "staff" from online reviews with overall rating <3

Keyword	Frequency	Proportion	K	F	P	K	F	P	K	F	P
friendly	**74**	**0.100%**	breakfast	27	0.037%	member	16	0.022%	really	12	0.016%
reception	41	0.056%	not	27	0.037%	**rude**	**14**	**0.019%**	check	11	0.015%
helpful	**41**	**0.056%**	good	25	0.034%	location	14	0.019%	great	11	0.015%
room	35	0.048%	desk	17	0.023%	restaurant	14	0.019%	cleaning	11	0.015%
nice	28	0.038%	front	16	0.022%	service	12	0.016%	center	11	0.015%

Below are examples of good experiences with staff among low rating reviews:

"...the room does get extremely warm, with no air conditioning the room get extremely stuffy and uncomfortable. The breakfast is disgusting, most hot food taste like soap, and the cold cut are not particualry fresh...The wifi connection is bad. Poorly furbished, bathroom furbished to really low standard, more like an hostel. Although the hotel is consdiered bad, there are some plus sides, they have a coffee bar that is open 24/7 which adds convience. The hotel is considerably cheaper then a lot of other hotels. The staff are friendly. However would not ever stay here again…" (2015)

"Whilst well located the Sokos Hotel Helsinki is not in the least like it represents itself. It is old, tired and worn. Beware of single rooms. My room was extraordinarily cramped. The bathroom was so tiny it was a joke. I cannot fathom how relevant authorities would have approved it. Given the price I paid, this was one of the most disappointing hotel stays I have experienced.The only positive aspects were the helpful woman on the reception and the free internet.(2012)

Checking a different subset of ratings, negative experiences with staff in combination with otherwise poor services cause a low overall rating. On the other hand if feedback mentions rude staff, but good service, overall rating is not affected. However, for example as in the review below, if the staff solve a customer's problem poorly, it will result in a low overall rating even with high rating for value, room and location:

"...During this last visit, unfortunately, and to our great disappointment, the staff on duty must have had really a bad morning, so unbelievably bad - even rude was the so-called service. We turned up 20 minutes before the end of breakfast time, telephoning in advance but already during the phone conversation, got an impression from the gentleman at the front desk that we would not really be welcome ...Despite this we were not allowed to go to the table at the restaurant proper with our little child, but we only permitted as "an exception" at that late hour to have a quick bite at low tables and chairs next to the reception... When we still wanted to express our disappointment how we were treated, the only comment the staff chose to give was something to the extend that "you should be greatful that we did allow you to have a breakfast in the first place... " Unbelievable bad and rude service .... (2014)

There are diverse aspects of service which can cause negative feedback. Most of them relate to the condition of the room. In particular, among reviews with negative service rating, 3.2% of words used are "room", 0.98% are "breakfast", 0.73 % are "staff", 0.58% are "bed", 0.59% are "service" in general, 0.41% are "bathroom" and 0.32% are "restaurant". For whatever reason, bad services can lead the customers to not recommend the hotel to other people in their review. Below is a review with service rating 2:

"Our room was very hot, despite that it was quite cold outside during our stay. There was no air conditioning, so we had to open the windows. None of us got any sleep here. Even with the windows open, the room was still way too hot, and the noise from the street outside and the nearby construction was considerable. The cleaning staff only made the bed - didn't change dirty towels that were on the floor, didn't replace empty toilet paper, didn't take dirty coffee mugs. We had to go to the front desk to get more toilet paper. The bathroom sink was leaking all over the floor, and the bathroom door not only wouldn't lock, but it wouldn't even latch shut because it was broken. The reception staff were rude when we asked where we can buy tram tickets. Calling this hotel "seaside" is a joke. It's located at the tip of the harbor, which is quite far from the sea. There is no sea view. The only good thing about the hotel was the breakfast buffet. I'd never stay here again. (2015)

Results of value rating are somewhat similar to overall rating and rooms rating.

Discussion

In summary, the general result is affected by results from positive feedback. It is understandable, because the amount of positive feedback is vastly higher than negative ones. However, it does not show a biased outcome since we can make consistent conclusions between positive and negative feedback.

Bad experience in one respect can negatively affect the rating of other aspects as well. For example, if the room is bad and service is poor, it will affect all other attributes. Room condition is the main reason for negative feedback and leads customers to think about the value of what they paid for, causing them to not recommend the hotel. In addition, room service seems to be one of the most important attribute: if it is good, it can make the general experience good, even can overcome a large distance from the city. However, if it is bad, people have a tendency to perceive other components worse, and with a higher possibility to complain about other services and to rate them negatively.

For travelers, the reason that makes them rate the location poorly is mostly the distance from the city center. If is easy to connect to attractions and convenient to get direction information, the problem can be overcome. Otherwise, customer experience becomes worse. Helsinki is not a tourist beach city. Therefore, staying close by the sea or harbor is not a plus for customers since they do not have enough guidance. All other bad experiences are based on personal preferences. Location with a view toward nature can be beneficial for travelers who want to enjoy peace and quiet, but are not suitable for those who want to enjoy city atmosphere and parties. Vice versa, the hotels close by Kamppi square with a lot of noise, for instance, can bother customers who come for business or a relaxing vacation.

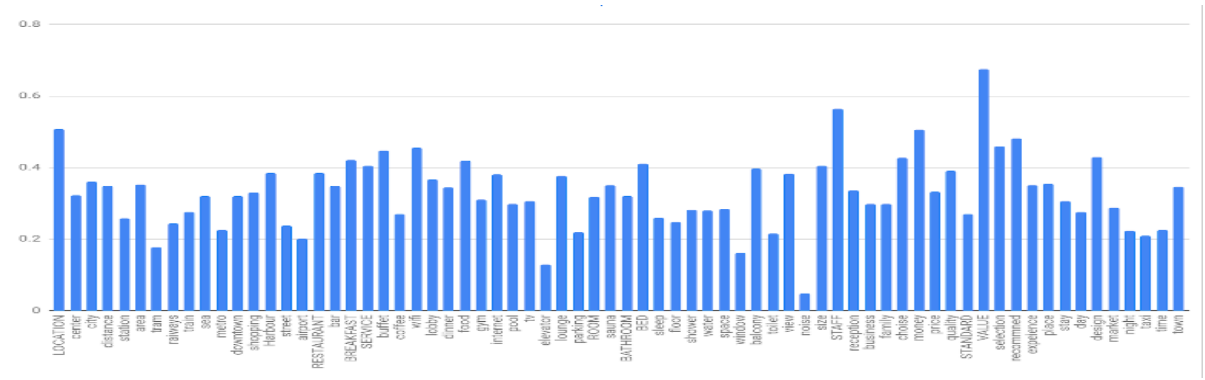
It seems that staff is not a key factor in deciding the experience of customers. Mostly people are satisfied with the staff and reception services in Helsinki. However, if they have bad experience of the room or breakfast, unhelpful staff can make things worse. In contrast, helpful staff does not make greatly change the overall feeling once customers received bad service such as warm room, uncomfortable bed, bad breakfast or (and) bad bathroom. “Rude staff” may cause bad ratings in service, but it does not change other ratings and overall rating, if the travelers have good previous experiences or know well about the standard of the hotel.

Question 1.3 – Part 2

As discussed above, extract keywords in positive and negative reviews by rating segment is incomplete. This part will mining clearer feeling and opinion of users when they write feedback by measuring the sentiment level from their writing.

The average sentiment score will be used and the compound value will be the main observed value to compare keywords. The values range from -1 to 1, where negative values correspond to negative opinions and positive values to positive opinions. Distance from 0 measures the strength of the sentiment.

Figure 7. Overall evaluation of different attributes of Helsinki hotel
This distribution based on the average compound value of each attribute



The figure 8 describes the overall evaluation of different attributes of Helsinki hotels. That is the distribution of average compound values from the 70 most concerned keywords. Those keywords are selected from table 2.1 and are believed to be the most relevant and important to customer experience. In general, the sentiment perspective toward these attributes are highly positive. As discussed earlier about the dominance of positive feedback, the average value of negative sentiment is quite low while average value of positive and neutral can be higher. This proves that there are more positive comments than negative comments (Appendix C). Consequently, it is impossible to use normal sentiment benchmarks to identify how high is good and how low is bad. In the scope of this research, only polarity scores are compared among keywords to know which ones are more important than the others. Therefore, the statistic values (i.e. mean, median, min and max) of these sentiment value will be used as the base of comparison. Table 9 is the statistic report of sentiment values from 70 keywords selected above. From that, values that have a high gap with the average should be noticed.

Table 9: Statistic report of sentiment value of different attributes

	Compound	**Negative**	**Neutral**	**Positive**
Mean	0.3307539059	0.03024664756	0.7980681767	0.1716829954
Median	0.326295847	0.02945085124	0.8088332045	0.1624534415
Min	0.0479967033	0.01128288288	0.5795473322	0.0789020979
Max	0.6752843373	0.07887312687	0.8858221437	0.3988166954
Standard Deviation	0.1010550697	0.01172995794	0.06343718951	0.06374525491

Among these keywords, there are some words which have more positive feedback than others. In that, the "value" has the highest compound value which is above 0.6. In detail, its positive score is 0.4, much higher than the average while neutral score is 0.58, much lower than average.

Following are "staff", "location" and "money", which have average compound value above 0.5 and are considered highly positive feedback. They all have highly positive score, low neutral and low negative score. Other keywords including "recommend, selection, wifi, buffet" are positive feedback, because they are above one standard deviation 0.43. "Breakfast, bed, service, food, restaurant, internet" seem to be less positive, because their compound scores are less than 0.43, but they are still above the average.

The keywords "bathroom, room, gym, tv, stay", on the other hand, contain more negative words since their compound scores are lower than the average. Their values are closer to the the mean. The lower the compound value, the lower positive values altogether with higher neutral or higher negative value. Relating to "bathroom", keywords "shower" and "water" are quite less likely positive when its compound value are lower than the average.

Unlike other keywords in the "value" category with highly positive feedback, the "standard" have much lower score. In fact, its positive value is much lower than average while the neutral value is higher and the negative value is about the average.

There are some keywords which have very low ranking, such as "parking, toilet, elevator, noise". Although their frequencies are low, they usually exist in a sentence with more negative words.

Discussion

The results in this part make consistent conclusions to the findings in part 1 when analyzing keyword frequency and ranking. Among the most frequent keywords, "location" and "staff" are mentioned with most positive experiences. "Location" appears in negative context when the hotel is located too far away from the city center, or when the neighborhood is too noisy. While "friendly" and "helpful" "staff" result in highly positive reviews, the "rude staff" causes an extremely negative experience for customers. "Breakfast" with plenty of "selection" or "buffet" can result in positive feedback. The conditions of the "room" and "bathroom" are crucial to customer feelings which have more negative expressions in the reviews than other keywords. In that, the cleanliness and noise level are key attributes that cause negative experiences.

This part also adds up some missing points from part 1 and make the meaning of some keywords clearer. In detail, people usually show their high satisfaction toward the service they

received when using the keyword “value”. The outstanding positive score from this word is the outcome of large amount of adjacent positive words; the most frequent term being “good value for money”. In contrast, the keyword “standard” is mostly used in neutral or negative sentences. If it is used simply to describe the service such as “breakfast is standard European style and elaborate” or “the room was quite large by Scandinavian standards”, the neutral score is 1 which is the maximum. However, if it is used to compare with customer experiences such as “this is your standard five-star hotel, but not any great luxury”, “breakfast was poor compared to normal Finnish standards” or “again, not acceptable by my standards”, the result is more negative.

Besides above familiar attributes, there are some other keywords which are less frequently mentioned, but they occur in mostly negative sentences. When people try to complain about the service, they go into detail. That is why the keywords such as “toilet, parking, elevator, window” have a very low average compound value.

5.3 The evolving of customer concern and expectation throughout the year

Question 2.1: The changing in keywords used by users through years?

The result from POS tagging is close to the manual method without the existence of some important adjectives. Therefore, the report of manual method is used to analyse this part. The appendix is the top one hundred keywords after removing irrelevant keywords by the manual method, divided by year. From that, it can be seen that the concerns of customers have been changing through the ranking of keywords. Some words become outdated and are replaced by others.

At the first glance, the top six keywords have remained the same throughout the years and are similar to the general list. Weights of these keywords seem to remain, where the frequency of “room” is quite far from the next keywords “breakfast, stay, location, staff, center”, which do have not have any large gaps between their frequencies.

The word “clean” increased its position since 2010, replacing the rank of “restaurant” from the year 2014. It used to be of less concern than the “bed”. However, it steadily increased from rank 11th to rank 7th within 7 years. From bigram analysis, it can be seen that mentions of “clean room” have increased, while mentions of “clean bathroom” have decreased so that it no longer appears in the top 150 keywords.

Similarly, “friendly” and “helpful” increased their positions in the list. In particular, “friendly” was below rank 15 before 2012, but it increased to rank 12 in 2012 and is in the top ten in 2015.

“Helpful” fluctuates between ranks 23 and 25 before 2011 and jumped to between ranks 16 and 19 after 2012. These keywords are about describing the staff with positive meaning. Despite these remarkable increases, the pairs of words such as “helpful staff”, “friendly staff” in bigram and “helpful friendly staff” in trigram have not had any significant change; they have remained in high rankings. This tendency is the sign that the perception about staff service has been increasing in the observed hotels. It can be proven by seeing the increasing tendency of “nice staff” “good staff” and “great staff”. Together with the “staff” topic, “reception” has increased its ranking as well. From being ranked 36th before 2010, it jumped to ranks between 22nd and 23rd since year 2014.

Fluctuation in the frequency of the keyword “comfortable” is not high, but it has a tendency to increase its frequency. Before the year 2010, it ranked quite low at 19, but after that its ranking rises to around 12th in the year 2012 and decreases slightly after 2014 to rank 14. Co-occurring with “comfortable” are “bed” and “room” where the “comfortable bed” in bigram analysis has similarly increasing trend while “comfortable room” has a rapid jump in its frequency.

While some keywords start appearing more frequently with time, other keywords have had remarkable down-ranking in their frequencies. For instance, “bathroom” seems to be less mentioned year by year. It used to be in the top ten keywords from 2002 to 2009, but then dropped to 14th in year 2010 and further dropped to rank 16 after year 2013. The keyword “free” has been less mentioned, together with some other hotel amenities and services such as “internet, tv”. “TV” has had large drops in mentions, from rank up to rank 47 down to 66th in 2014 and further down to rank 111 in 2015 and after. Similarly, “internet” is quite frequently mentioned, ranking 25th, before the year 2012 and steadily decreased its frequency in the following years. From 2015, this keyword does not even exist in top 150 keywords. Oppositely, “wifi” did not exist on top 150 before 2010. However, the ranking of this keyword jumped the most during the following years from rank 92nd to rank 43rd within 6 years.

Meanwhile, there are many other services which seem to be of less concern since their rankings are not very high and the changing is not remarkably big. Those words include “shower, water, restaurant, bar, food, coffee, sauna, shopping”, etc.

Another group of keywords needed to be observed is words about quality of service which include “standard, “price”, “value”, and “recommend”. Most of them have quite a low rank in the list, but have remarkable change with time. The word “standard” raised its rank rapidly between the years 2002 and 2012 from rank 67th to rank 48th. However, it dropped immediately to rank 65th in year 2013 and only slightly increased after that. This keyword is interesting to analyze, because it relates to customer satisfaction. There are two remarkable meanings of this word. People usually use “standard” in comparisons with purpose to connect

with their previous experience or recommendation, whether the facilities match the international star standard or hotel brand standard. In this sense, the "standard" is used to express their expectations. Hence, satisfaction can be either high or low.

"...Breakfast is normal Sokos hotel standard. There is not everyday bacon….As a summary I recommend this hotel, basic, a little bit boring but everything works. And the location is perfect."(2013)

""Ideal location in the Helsinki city center. Good standard of bedrooms with nice view over the square by the central train station.Breakfast quality is poor for this standard of hotel..." (2014)

"... The room was specious, clean and looked very nice. Extra plus for the big shower. The location was excellent, with a short walking distance to the center, and we found a free parking spot just around the corner.The staff was very polite and friendly. The only small disappointment was the breakfast, which I think was below the usual Finnish standard. Not that many choices, and hardly any fresh fruits.(2015)

In another context, this word has more descriptive meaning when customers explain about the services. With this meaning, "standard" shows an average or neutral level of satisfaction from customers.

"An old Hilton style hotel with most 4 star services but rough around the edges. Rooms are big and the bed is comfortable… Breakfast was standard 4 star, nothing too exciting but good space to be comfortable…".(2014)

"I spent 3 nights in Helsinki where I was attending an AGM. It was my first time in Scandinavia and I nearly froze to death. The hotel was basic and the food was mediocre. The staff were friendly by Nordic standards and spoke English. There was no lotion in the rooms and I had to request for a heater. Saving the environment I guess. Average hotel at best"(2012)

The rank of "value" fluctuates seemingly randomly between its highest rank of 64th and lowest rank 103rd, which means that it does not seem to be of much concern for customers. Keyword "price", on the other hand, stays in higher range between ranks 40 and 45 and has clear tendency decreasing mentions with time. The keyword "quality" was quite low before 2012 - below rank 69th, but it maintained its position later around 55th to 56th. The keyword "recommend" also increases its importance in customer reviews since it has a tendency to grow and the rank was quite high between 2015 and 2016 at rank 33rd. In the bigram analysis results, the pair "highly recommend" also has the same growing tendency.

Discussion

It is important to extract keywords by year, because the general result can be influenced by the result of a particular year with more reviews, in this case the year 2015. Analyzing the evolution of words can help in understanding the development of hotel services and customer expectations.

From the findings above, a positive observation can be made, that room conditions, hotel services and staff behavior seem to have improved year to year in the hotel industry in Helsinki. Keywords with positive sentiment have more mentions, and the bigram and trigram terms with positive sentiment are also more likely to appear in customer feedback. The explanation for this positive sign is that either the hotels improve themselves or travelers become more concern about these topics.

Other than keywords growing their importance, there are some keywords that have become less frequent for customers to mention, such as “bathroom”. It is mostly mentioned when there is something to complain about, that is, in negative context. This implies that bathroom condition is seen as less important, or bathroom condition is something that is expected to be at an adequate level, and therefore requires commenting only if those expectations were not met. This may be viewed as an improvement in general quality.

It is interesting to find out alternative pairs of keywords used in customer reviews, in which their evolving trends are in opposite directions. Particularly, while the “internet” becomes less and less mentioned, the word “wifi” exists more and more often in customer writing. That proves the necessity of analyzing keywords separately by year, because it shows more about the trend of keywords - the words used from customers are changing from time to time. Even comparing ranking of one word among different years, concerns about it from customers are diverse. Thus, choosing the correct topics that bother customers the most can be beneficial for hotel businesses. Besides, there are some words that should be considered as the key in evaluating customer satisfaction such as “standard, quality, value and price”, although their ranking can be low.

Analyzing the evolution of keywords is important, because it helps hotels to reflect their business and minimize the gaps between customer expectations and hotel perception. Comparing rankings can be one way to analyze the importance of significant keyword among others. Nevertheless, there are many top words which are important, but we cannot see changes when they maintain the top ranks. Therefore, checking the ranking does not show complete expectations of customers since the rank of words is somehow relative. Quantitative analysis is necessary to see the exact development of each keyword.

Question 2.2 Whether customer concern level toward hotel service change through time

Table 10: Evolution of customer's concerned attributes – The word's proportion in % and z-test of the changes by year

word	2002-2009	2010	2011	2012	2013	2014	2015-2016
room	3.44433	3.36247(*)	3.52838	3.60380	3.63151	3.84305	3.85072
z-value		-0.72117(**)	1.37847	0.83897	0.40334	2.99984	0.16132
breakfast	1.28472	1.68266	1.58607	1.59946	1.64754	1.70440	1.80345
z-value		5.26622	-1.21842	0.14806	1.01664	1.25812	2.29470
stay	1.63288	1.62267	1.53010	1.50630	1.60600	1.65068	1.60400
z-value		-0.09750	-1.11829	-0.49102	2.11854	0.96476	-1.05363
location	1.08944	1.15415	1.15884	1.28253	1.29103	1.33410	1.47835
z-value		0.93617	0.10324	2.32569	0.13714	1.06491	3.68073
staff	0.94684	0.94275	1.01142	1.02306	1.08474	1.19724	1.27984
z-value		-0.02552	0.95922	0.35744	1.56556	2.82135	2.25908
center	0.84149	0.92561	0.88448	0.98911	0.89369	0.97467	0.97529
z-value		1.45286	-0.76635	2.28043	-2.48409	2.39440	-0.05642

*proportion value in % of the word mentioned among all words. Calculated based on its frequency divided by total words used and multiplied by 100%
**z-test value of word proportion change compared to the previous year

In the findings of question 1.4, the top six keywords haven't changed throughout the years. Although these attributes remain the most crucial to customers, the concern level of each word does not stay constant, proven by their proportion among all words used in a year. There was some fluctuation before 2011 in the evolution of the keyword "room". However, there was a significant rise in customer concern toward this keyword. Its proportion keeps increasing year after year, especially remarkable was the increment from 2013 to 2014 with the z-test score 2.99.

Similarly, "breakfast" "location" and "staff" have the same development trend. For "breakfast", there was a big jump of proportion after year 2009 to year 2010 with z-test score 5.26, which is a significant change of 5%. From 2010 to 2011 there was a slight decrease in its proportion and an increase again with small increase from 2014 to 2015. "Location" has an upward trend in concern from customer each year, especially from year 2011 to 2012 and from year 2014 to 2015 with significant increments. For "staff", before 2013 only minor increases z-test score can be observed, but between 2014 and 2016 the keyword increased z-test score significantly.

word	2002-2009	2010	2011	2012	2013	2014	2015-2016
clean	0.55757	0.58850	0.59512	0.62777	0.63409	0.70606	0.77491
z-value		**0.72069**	**0.07415**	**0.84543**	**0.31690**	**2.29388**	2.40125
bed	0.39955	0.33139	0.39856	0.45886	0.47003	0.43298	0.47644
z-value		**-1.69507**	**1.65208**	**1.98470**	**0.33654**	**-1.43113**	1.91082
bathroom	0.59483	0.53137	0.56099	0.57205	0.48180	0.51548	0.51147
z-value		**-1.36455**	**0.61626**	**0.36736**	**-3.14139**	**1.26174**	-0.17791
noise	0.13875	0.11999	0.08326	0.08881	0.09345	0.10744	0.10603
z-value		**-0.74832**	**-1.83498**	**0.40018**	**0.21513**	**1.34231**	-0.20318
comfortable	0.43937	0.51708	0.50230	0.53722	0.54895	0.54490	0.55584
z-value		**1.80813**	**-0.35376**	**0.99193**	**0.44411**	**-0.26469**	0.52889
shower	0.26465	0.26568	0.27299	0.26817	0.27482	0.31466	0.29427
z-value		**0.06955**	**0.17373**	**-0.13842**	**0.32119**	**2.01215**	-1.24890

As with "staff", people concentrate more on cleanliness since year 2013, which is evident from the keyword "clean" growing significantly between 2013 and 2016. Relating to the accommodation topic, there are some keywords with significant changes such as "bed, bathroom, noise, comfortable, shower, etc." Of those, "bed" increased its importance for customers significantly from year 2011 to 2012, while "bathroom" has significant decrease from 2012 to 2013, and "shower" with significant growth in concern a year later.

word	2002-2009	2010	2011	2012	2013	2014	2015-2016
friendly	0.45993	0.44281	0.46408	0.53286	0.55379	0.60821	0.69410
z-value		**-0.39627**	**0.48205**	**2.05324**	**0.62271**	**2.06381**	**3.17271**
helpful	0.39055	0.37710	0.39720	0.43709	0.45134	0.48286	0.48017
z-value		**-0.41836**	**0.60225**	**1.29513**	**0.55404**	**1.32371**	**-0.12048**
reception	0.27108	0.32282	0.34397	0.34044	0.34543	0.39844	0.38442
z-value		**1.50206**	**0.52310**	**-0.13908**	**0.28947**	**2.32872**	**-0.61808**
rude	<0.003 %	<0.003 %	<0.003 %	<0.003 %	<0.003 %	<0.003 %	<0.003 %
z-value		**1.10069**	**-0.25588**	**-1.15541**	**-0.77632**	**2.15689**	**-1.41919**

For the staff relating factor, the period from 2013 to 2015 seems to be a remarkable time. Not only keyword "staff", but "friendly, reception and rude" also had significant changes. The keywords "friendly" and "rude" are mentioned more in parallel by users during the years 2013-2014. Although the proportion for "rude" is less than 0.003%, which is much less than for other

positive keywords, it has significant growth during this time. However, the keyword decreases significantly after 2014 while the keyword "friendly" increases at the same time.

It seems that customers are not really concerned about keywords relating to hotel services and amenities. Despite the significant z-test scores at some points, these changes are too fluctuating to conclude as an evolving trend.

word	2002-2009	2010	2011	2012	2013	2014	2015-2016
restaurant	0.65778	0.68278	0.68384	0.67653	0.72201	0.63124	0.76183
z-value		0.55165	-0.00981	-0.21691	1.33187	-2.99043	4.65022
bar	0.38285	0.41710	0.35215	0.35524	0.36827	0.34024	0.38582
z-value		0.88908	-1.48140	0.21266	0.05632	-1.10341	1.97805
buffet	0.28778	0.29425	0.27981	0.29604	0.26167	0.24303	0.24055
z-value		0.18656	-0.41987	0.60703	-1.64979	-0.98053	-0.18294
selection	0.10792	0.13998	0.12421	0.15150	0.13983	0.13622	0.15834
z-value		1.45187	-0.67736	1.54054	-0.82396	-0.21483	1.72185
service	0.49847	0.55708	0.43815	0.51806	0.50949	0.58199	0.56752
z-value		1.20857	-2.63301	2.44876	-0.34896	2.75125	-0.59225
free	0.43937	0.59136	0.52004	0.39704	0.35512	0.34344	0.31622
z-value		3.27166	-1.46945	-3.81237	-1.85276	-0.47171	-1.41083
internet	0.33531	0.36567	0.29073	0.15847	0.14952	0.09210	0.07240
z-value		0.87459	-2.06122	-6.15690	-0.52344	-4.60809	-2.02206
wifi	0.06038	0.13998	0.19655	0.20984	0.22013	0.24815	0.25316
z-value		4.11137	2.08279	0.71349	0.53344	1.66804	0.24298
sauna	0.2351	0.20855	0.26480	0.21245	0.24644	0.20530	0.24756
z-value		-0.74636	1.62523	-2.16338	1.73012	-2.30188	2.66521
tv	0.22611	0.17427	0.20747	0.20548	0.17029	0.16372	0.12565
z-value		-1.72022	1.10640	-0.02704	-2.11087	-0.39396	-3.04468

Among services and amenities, there is a group of words including "free, internet, wifi and TV" which are crucial to analyze. Keyword "free" has the tendency to drop its proportion year after year, most significantly from 2011 to 2012. In the same year, people also decrease their concern about keyword "internet" with very high absolute z-test value. On the other hand, people have been raising their concern about "wifi", especially from 2009 to 2011. Possibly this is the main reason of rapid growth in customer concerns about "free" from 2010 to 2011. This result is understandable with the development of technology where people need "wifi" for their own devices rather the general "internet". In other words, if the hotel provides free internet access by internal computer without good wifi connection, the customer would feel inconvenienced

by the hotel service. Similarly, “TV” losing its position in customer concern since its proportion drops significantly year after year. In addition, majority of observed users are young people and travel for business or as a couple. Therefore “TV” is no longer an option for entertainment in hotels. This service can be totally skipped in the future and replace by other amenities.

Discussion

In general, most services and amenities increase their appearance in customer reviews after 2009. There is significant change for the keywords “breakfast”, “location”, “staff”, “friendly”, “clean” and “restaurant” from 2014 onward that require focus in the future. For the keywords which decrease significantly in customer concerns, hotels should take them into account when adjusting their strategy. For other keywords which have fluctuating changes back and forth, the analysis should be understood in another way, because it does not show an evolving trend for the words. The reason for this fluctuation can be related to some specific experiences that motivate customers to write about them more. One possibility is that their satisfaction is changing compared to original expectations due to some irregular events happening during that time.

From this finding, it is evident that the concerns of customers toward different keywords are various. There are some trends with clear pattern while others do not show significant evolution. Therefore, it is important for analysts and the hotels to detect some rapid changes during the time in order to understand reason behind for better decision making.

6 Conclusion

6.1 Summary

In the nutshell, the most mentioned topics among hotel customers are “location”, “room”, “service” and “staff”. These topic are not much different than the familiar hotel attributes suggested by previous researches. However, the most concerned keywords used in Helsinki’s hotels and their priority are unique.

Generally, most concerned attributes are grouped into six categories, in which the topics of “location, “accommodation” and “hotel service and amenities” are proven to be more important than “staff”, “value” and “travel context”. Particularly, “room”, “breakfast”, “stay”, “location” and “staff” are the top concern attribute off all time. The room condition, together with cleanliness and comfort of bed and bathroom is always the most priority attributes for travelers, while the size of them seems to be less important. For guests in Helsinki’s hotels, food and beverage are important services since this business is not as dynamic as other travel destination. This demonstrates the importance of the attributes “breakfast”, “restaurant” and “bar”. The “breakfast” became a mandatory requirement for hotel customers when its rank is always in the top three most concerned keyword throughout the years.

Among the top concerned keywords, the “location”, “breakfast” and “staff” of hotels in Helsinki are mostly considered good by travelers. The “breakfast” that served with “plenty of selection” or “buffet” is most favorable. Customers experience “bad location” when the hotel is located too far away from the city center or in a noisy area. Mostly, guests evaluate the staffs “friendly” and “helpful”. Although the negative experience about staff is rare, it can cause strongly bad feedback when the staff performs rudely while solving the customer’s problem. The reasons for negative feedback are unexpected room condition and hotel amenities and services, especially the “bed” and “bathroom”. Above all, “cleanliness” and “noise” are the key attributes that people usually mention when evaluating. There are some keywords with much less frequent but they mostly exist in sentences with negative emotion. These keywords including “toilet, parking, elevator, window”, etc. explain the hotel services and amenities in detail because guests have the tendency to write specifically while complaining about services.

The findings in this research also prove the connection between different attributes and emotional experience. As “room” is the key attribute influencing customer experience, the sentiment of guests about this it will influence the way they perceive other attributes. In some cases, good room condition and services can moderate the disadvantage of far location. However, the bad room condition or accommodation services can lead to low satisfaction to other components. In this finding, it is also shown that the keyword “value” is usually

mentioned in positive review sentences. People usually evaluate the “good value for money” when they received good services. In addition, the keyword “standard” can be used as a sign to identify customer expectation because people use it when compared with their previous experience

From these findings, hotels in Helsinki have plenty of room to improve their managerial strategy. As an example, a hotel can highlight good location with its convenience to connect to public transport or city center in their commercial messages if that is the hotel’s advantage. In contrast, the hotel can provide some transporting supports if the airport, external services or tourist attractions are on within walking distance. The noise is one of most attributes cause guest’s negative experience. To solve that, hoteliers can find solutions such as better soundproof windows and walls. Obviously, the view and entertainment activities are not interesting values for customers in Helsinki’s hotels. Therefore, hotelier can take them out of priority strategy. It is recommended that hotel managers should focus on food and beverage services, especially breakfast with “buffet” option. The room condition is recommended to be focused and improved all the time and the staffs should maintain their friendliness and helpfulness.

The second research question of this research was also proven through the finding that customer concerns are unstable from time to time. The keywords that customer mention in online review as well as customer perception and satisfaction towards them are changing with time. Some attributes decrease their importance while other attributes become more essential after several years. One of the most remarkable evolutions is the replacement of “wifi” to “internet” and “tv”. Availability of wifi, nowadays, is weight more necessary than the accessibility of internet and TV channels. In addition, it is evident that the concerns of customer toward different attributes are various. There are some trends with clear pattern while others does not show significant evolving. Therefore, it is important for analysts and the hoteliers to detect some rapid changes in order to understand reasons behind for better decision making. The evolving of hotel attributes affirms requisite of understanding customer expectation yearly. The trendiest keywords provide up-to-date information about guests and bring idea for hoteliers to improve their business well- timed.

6.2 Business implication

This study has valuable managerial implication for tourism practitioners as well as other business.

At first, the finding of this research is up-to-date with the latest data is year 2016. Although it is proven that customer expectations are different by time, the overall picture of customer

concerns during the last ten year remains stable. They include the most important attributes customers who stay in Helsinki hotels, the current trendy keywords mentioned in online reviews, the attitude of guests toward these attributes and the reasons for positive and negative feedbacks. Generally, hotel owners, especially the hotelier in Finland or Nordic countries, can consult this finding to improve their business strategies.

Additionally, the mining framework in this research can easily apply by any hotel no matter which location it is in. Evidently, understanding customer expectation and satisfaction help the hotels improve business and service performance. For the international hotel chain, it is recommended to apply this data mining framework to understand local customer concern because customer expectations are diverse by age, gender, traveling purpose and travel destination. Hotels can cope with the change in customer expectations by analyzing customer concern in a different milestone of their business. Mining customer concern from social media database or company chat box can support the company to figure out real-time problem of customers and the reason behind negative feedback. From that hoteliers may respond better to their guests and recover the failure on time. In the broad competitive environment as hotel industry, hotel owners need to improve their service time after time to maintain the high standard and high position in order to compete with other growing lodging services. Understanding the trend of customer concern can help hotels navigate where the industry is going to adapt the business better.

This framework can be useful for other industries which have similar intangible and customer -oriented characteristics. Some business such as tourism, restaurant, online shopping or online game can utilize this text mining study since they have a vast amount of users and close interaction between customers and firm.

6.3 Limitation and future research

There are many directions to develop the present research.

Firstly, there are two methods that were used in this research for keywords extraction. It is easy to see that POS tagging is much faster than the manual method. However, noun- POS tagging not always has high accuracy and it skips many important adjectives. If the POS tagging is used, it is suggested that further research should focus on both noun-tagging and adjective-tagging for better understanding. In reality, the accuracy of POS tagging method depends not only on the optimization of programing but also on the clarity of text structure, which is decided by online users and difficult to be controlled. Therefore, another recommendation is to develop manual methods of the mining framework into a better automatic pipeline. Specifically, further research can utilize the keywords in this study to build up the complete

words list relating to hospitality industry. The stopword list is so general that cannot eliminate huge amount of words which occur less than 2% of total words. For that reason, extracting keywords within a short relevant list can make the mining process faster and easier.

The second direction for further research is to expand mining data to other area and for different purposes. The data in this research is limited in Helsinki and the observed group is users from an online platform - TripAdvisor. That means the result is lack of perceptions of guests from other areas. Moreover, this finding is more specific to popular hotels than general about the whole hospitality industry. The next research can expand data source to private accommodation sectors to have a better picture of the industry in Finland. Mining customer concern from social media database or company chat box can find out more real-time problem of people, hence, can find better solutions for a business.

Lastly, the present research does not show the quantitative correlation among different topics or hotel attributes. Wherefore, factor analysis and co-occurrence can be put forward to optimize the model. As an example, an expected result for future research could show that business guests prefer big bed, 24/7 reception or quiet room. As customer satisfaction can be changed when they experience the service longer (Felix, 2015), future study could dig into the detail of different guest concerns in different length of staying.

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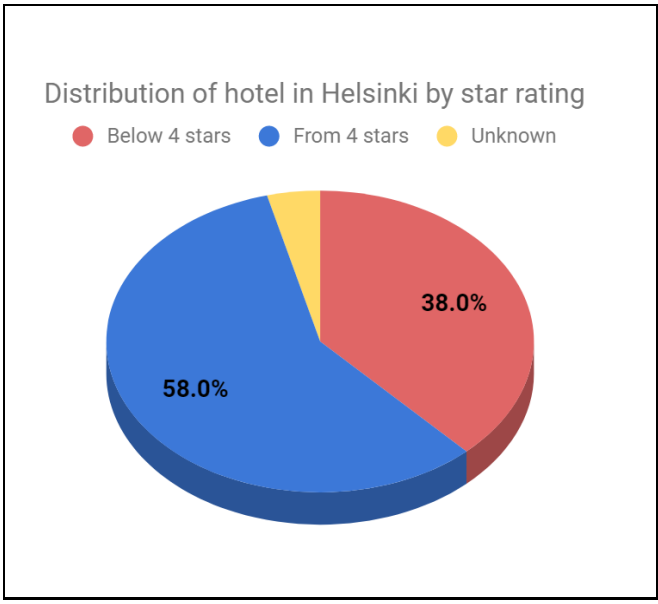
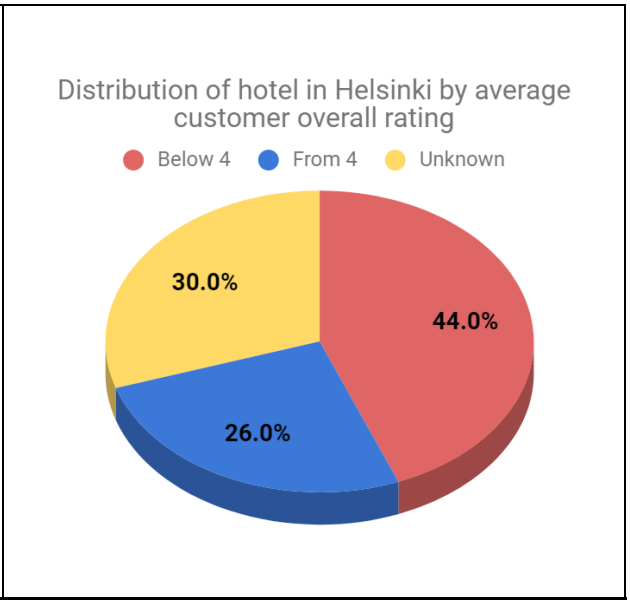
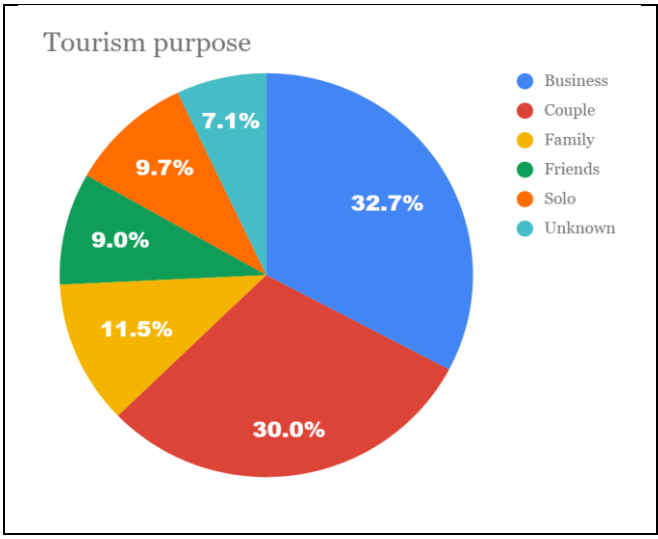
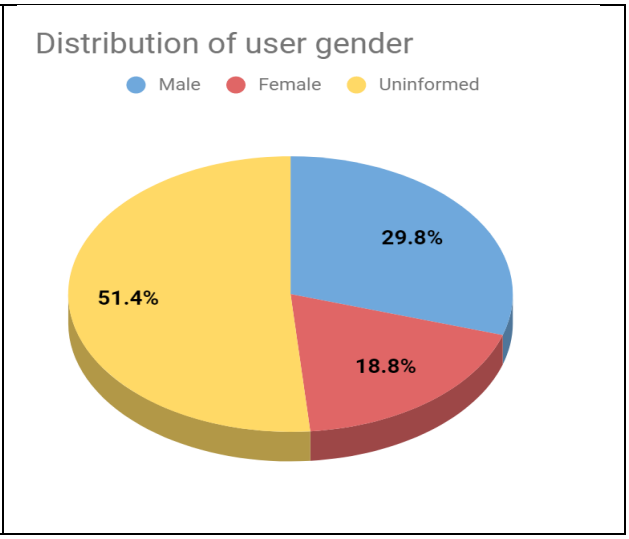
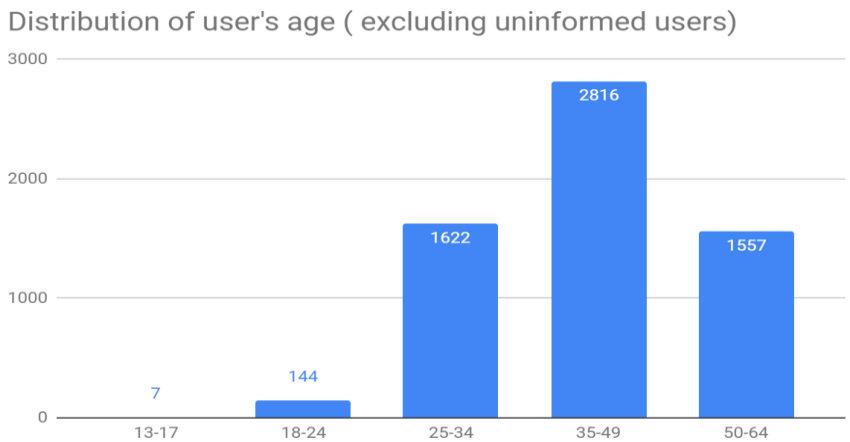
Appendix A: Hotel statistic distribution











Appendix B - Keyword extraction from customer feedback Title

Top 100 keywords extracted from customer's feedback title, done by both POS tagging and Manual cleaning method.

	POS tagging	Manual method		POS tagging	Manual		POS tagging	Manual method		POS tagging	Manual
1	location 3461	location 3465	26	boutique 130	quality 168	51	station 61	dated 66	76	bathroom 40	option 48
2	stay 1027	stay 1480	27	weekend 123	heart 158	52	budget 59	worth 65	77	pleasant 39	noisy 47
3	center 1008	center 1108	28	hilton 103	night 143	53	beautiful 59	food 65	78	nice 38	recommend 46
4	room 963	room 963	29	radisson 96	need 139	54	restaurant 57	family 63	79	art 37	expected 46
5	service 614	service 617	30	nothing 92	scandic 134	55	finland 56	finnish 63	80	day 36	fun 45
6	city 563	city 563	31	view 92	boutique 134	56	customer 56	far 63	81	haven 35	stars 45
7	place 526	place 526	32	visit 91	stylish 130	57	middle 56	station 61	82	position 35	outside 42
8	staff 520	staff 520	33	style 91	view 127	58	way 53	special 61	83	area 35	tired 42
9	value 507	value 507	34	everything 89	weekend 123	59	renovation 53	finland 61	84	cool 34	relaxing 42
10	breakfast 474	breakfast 477	35	luxury 88	visit 108	60	scandic 50	restaurant 61	85	charm 34	nights 41
11	business 449	comfortable 455	36	average 88	hilton 106	61	building 50	recommended 60	86	surprise 34	charming 41
12	excellent 349	business 449	37	home 85	radisson 99	62	sokos 49	budget 59	87	atmosphere 33	gem 41
13	experience 229	friendly 327	38	time 84	standard 98	63	base 49	warm 58	88	spot 33	dirty 40
14	money 225	clean 310	39	prison 83	style 91	64	option 48	big 58	89	jail 32	trendy 40
15	choice 216	modern 232	40	star 79	helpful 86	65	sauna 47	sleep 57	90	unique 32	gem 41
16	price 198	experience 231	41	clean 78	bed 86	66	cozy 47	customer 56	91	ideal 32	dirty 40
17	design 191	money 225	42	town 75	home 85	67	class 44	way 53	92	vaakuna 31	bathroom 40
18	trip 179	convenient 216	43	holiday 71	time 84	68	break 44	renovation 53	93	pleasure 31	functional 39
19	convenient 169	choice 216	44	standard 67	prison 84	69	wonderful 43	sauna 52	94	need 31	worn 38
20	quality 167	price 198	45	comfort 67	downtown 81	70	blu 42	sokos 52	95	bar 31	art 38
21	heart 158	design 191	46	superb 67	star 80	71	glo 42	building 52	96	decor 30	comfy 37
22	ok 147	trip 179	47	food 65	town 75	72	bed 42	atmosphere 51	97	dirty 30	peaceful 37
23	bit 143	beautiful 177	48	downtown 64	holiday 72	73	fun 41	base 50	98	welcome 30	day 36
24	night 143	small 172	49	family 63	right 69	74	gem 41	break 49	99	sea 30	efficient 35
25	perfect 141	quiet 169	50	decent 63	comfort 68	75	sleep 40	expectations 48	100	review 29	jail 35

Removed words from 200 most frequent words from customer's feedback title

good 2786	near 120	fine 72	still 48
great 2771	bad 118	first 65	pretty 46
nice 1643	basic 115	cozy 60	brilliant 46
excellent 1115	really 110	interesting 60	blu 45
perfect 485	short 107	love 60	get 45
best 465	poor 98	middle 60	easy 44
lovely 276	top 97	glo 60	much 44
average 263	nothing 92	high 60	class 44
ok 257	loved 92	ideal 59	every 44
fantastic 209	ever 91	super 58	overall 42
wonderful 208	new 90	awesome 57	enough 41
well 198	like 89	quite 53	notbad 40
old 185	everything 89	away 53	notthe 39
not 152	luxury 88	spacious 53	next 38
better 147	expensive 88	go 52	definitely 37
bit 145	cool 79	nota 51	notso 35
pleasant 151	superb 79	cosy 51	
close 147	back 76	quirky 50	
decent 134	reasonable 75	enjoyable 50	
little 133	fabulous 75	elegant 49	
amazing 130	unique 74	highly 49	

Appendix C: Keyword extraction from customer's online reviews

Top 100 keywords extracted from customer's online reviews, divided by year

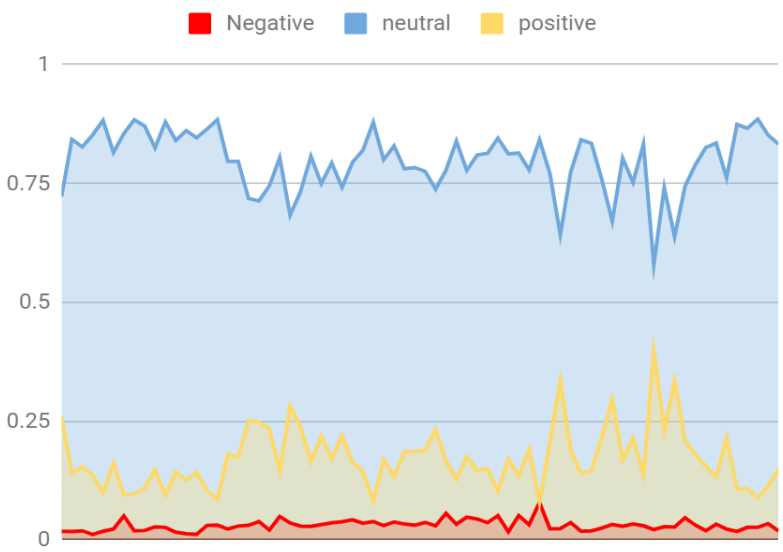
R	2015-2016	2014	2013	2012	2011	2010	2002-2010
1	room 8244	room 6009	room 5246	room 4139	room 2585	room 1177	room 2681
2	breakfast 3861	breakfast 2665	breakfast 2380	breakfast 1837	breakfast 1162	breakfast 589	stay 1271
3	stay 3434	stay 2581	stay 2320	stay 1730	stay 1121	stay 568	breakfast 999
4	location 3165	location 2086	location 1865	location 1473	location 849	location 404	location 848
5	staff 2740	staff 1872	staff 1567	staff 1175	staff 741	center 344	staff 737
6	center 2219	center 1618	center 1360	center 1131	center 681	staff 330	center 697
7	clean 1659	clean 1104	restaurant 1043	restaurant 777	restaurant 501	city 258	restaurant 512
8	restaurant 1631	city 1088	bed 953	city 758	city 478	restaurant 239	city 490
9	city 1576	bed 1014	clean 916	bed 754	bed 472	walk 217	bathroom 463
10	friendly 1486	restaurant 987	city 913	clean 721	clean 436	free 207	bed 446
11	bed 1486	friendly 951	walk 847	bathroom 657	bathroom 411	clean 206	clean 434
12	walk 1245	service 910	friendly 800	comfortable 617	walk 389	b**R**ed 200	walk 410
13	service 1215	walk 896	comfortable 793	friendly 612	free 381	service 195	night 395
14	comfortable 1190	small 878	small 789	walk 610	comfortable 368	bathroom 186	service 388
15	small 1151	comfortable 852	service 736	small 601	night 356	comfortable 181	small 384
16	bathroom 1095	bathroom 806	station 705	service 595	small 342	minute 172	day 377
17	station 1059	helpful 755	bathroom 696	day 511	friendly 340	day 165	minute 358
18	helpful 1028	night 748	time 688	station 503	time 324	night 163	friendly 358
19	time 1000	station 743	helpful 652	helpful 502	service 321	small 160	comfortable 342
20	night 939	time 720	night 646	time 484	day 313	station 159	free 342
21	minute 865	day 683	minute 613	night 462	station 297	area 155	station 325
22	day 861	reception 623	floor 518	free 456	minute 294	friendly 155	floor 308
23	reception 823	minute 623	free 513	minute 441	helpful 291	time 145	helpful 304
24	food 820	floor 568	reception 499	floor 414	floor 271	food 141	time 304
25	close 818	area 560	food 495	food 395	reception 252	helpful 132	internet 261
26	floor 789	free 537	area 480	reception 391	area 249	internet 128	food 260
27	area 752	close 533	nights 475	area 378	food 239	bar 123	business 259
28	quiet 729	business 518	place 472	place 367	place 237	place 117	nights 248
29	view 701	quiet 502	business 453	business 367	business 231	reception 113	bar 248
30	place 691	food 500	bus 451	bar 349	large 227	bus 112	large 248
31	bar 678	bus 492	close 445	large 348	quiet 222	close 106	modern 233

32	free 677	shower 492	bar 438	tram 344	nights 220	quiet 104	right 232
33	recommend 634	place 484	quiet 407	buffet 340	bar 219	price 103	area 228
34	shower 630	next 468	view 397	close 335	internet 213	buffet 103	buffet 224
35	business 606	nights 445	shower 397	quiet 335	bus 207	nights 101	view 215
36	next 606	bar 441	front 394	nights 335	buffet 205	big 94	reception 211
37	bus 596	tram 426	day 393	right 326	right 204	shower 93	place 208
38	tram 593	view 415	large 390	view 315	view 200	tram 93	shower 206
39	right 591	big 410	tram 387	big 314	shower 200	right 92	price 198
40	walking 589	walking 409	right 385	modern 313	next 199	business 92	tram 197
41	big 569	price 402	price 379	next 311	tram 198	recommend 92	desk 196
42	large 561	large 401	next 378	shower 308	close 194	floor 91	bus 193
43	wifi 542	recommend 396	buffet 378	bus 300	sauna 194	shopping 84	next 192
44	nights 531	front 393	recommend 377	front 293	front 194	next 83	big 185
45	sauna 530	wifi 388	big 374	price 290	price 192	large 82	sauna 183
46	price 529	modern 387	airport 368	walking 274	big 190	airport 82	recommend 182
47	buffet 515	right 384	modern 364	desk 270	walking 181	front 82	front 178
48	modern 512	buffet 380	sauna 356	recommend 259	recommend 179	outside 79	tv 176
49	near 506	airport 379	desk 355	standard 256	modern 168	walking 78	street 173
50	easy 504	desk 340	walking 355	train 248	choice 163	modern 77	airport 172
51	front 502	distance 325	wifi 318	sauna 244	desk 163	expensive 76	people 165
52	train 491	trip 322	train 310	wifi 241	street 157	included 76	quiet 162
53	airport 475	sauna 321	lobby 299	tv 236	airport 156	street 75	train 157
54	distance 474	quality 315	easy 291	street 234	outside 154	finland 74	shopping 157
55	shopping 468	shopping 313	distance 291	outside 232	tv 152	view 73	walking 155
56	quality 451	easy 313	quality 289	coffee 230	standard 151	train 73	close 150
57	street 431	choice 304	coffee 278	airport 226	quality 150	sauna 73	way 149
58	desk 408	train 302	shopping 275	lobby 225	trip 150	desk 72	booked 143
59	coffee 406	coffee 299	street 266	quality 219	distance 149	choice 69	finnish 141
60	outside 397	street 294	outside 264	people 219	coffee 145	easy 69	trip 140
61	standard 382	outside 290	near 264	shopping 218	wifi 144	etc 69	access 137
62	visit 365	standard 285	trip 261	choice 216	people 141	morning 67	lobby 136
63	building 362	near 283	choice 251	distance 210	shopping 137	standard 66	choice 135
64	choice 361	people 276	people 250	easy 202	booked 135	value 66	outside 134
65	made 361	way 269	standard 247	near 197	included 135	lobby 65	kamp 134
66	people 359	tv 256	tv 246	building 197	etc 134	made 65	rate 131
67	water 354	made 256	morning 242	morning 196	expensive 132	trip 65	expensive 131

68	short 349	experience 246	made 235	trip 195	morning 131	people 65	standard 130
69	lobby 348	lobby 244	within 235	nothing 194	near 130	quality 62	easy 129
70	lot 346	water 243	experience 233	finnish 188	finland 129	tv 61	pretty 128
71	trip 345	size 242	way 232	lot 184	access 128	distance 61	distance 128
72	scandic 343	nothing 240	lot 231	expensive 183	train 128	coffee 60	town 127
73	selection 339	short 238	available 229	internet 182	lobby 126	hot 59	included 127
74	morning 334	morning 237	finnish 226	size 179	way 125	fine 58	coffee 126
75	way 332	railway 236	expensive 226	experience 175	easy 121	finnish 58	euros 126
76	booked 330	lot 234	finland 223	selection 174	finnish 119	experience 57	glo 123
77	nothing 330	available 233	hot 222	made 174	every 119	euros 57	finland 123
78	railway 328	see 230	size 221	available 172	nothing 118	times 57	size 121
79	see 320	hot 230	nothing 221	think 171	times 117	access 56	building 120
80	cold 315	expensive 228	building 221	every 168	fine 111	visit 56	see 120
81	within 311	etc 226	booked 220	short 168	think 110	huge 55	within 118
82	every 305	finnish 226	see 218	see 167	open 110	near 54	available 117
83	finnish 303	visit 225	visit 216	cold 167	available 109	market 53	scandic 116
84	size 298	sleep 224	internet 216	way 166	hot 108	size 53	high 116
85	new 296	finland 223	short 215	finland 166	stop 108	guests 53	value 115
86	enjoyed 294	long 223	times 215	thing 165	visit 107	way 51	new 115
87	door 294	building 223	railway 215	high 163	pretty 104	cold 51	quality 113
88	finland 294	door 222	etc 210	times 163	made 104	nothing 51	made 113
89	beautiful 292	thing 221	side 210	etc 163	beautiful 103	booked 51	morning 112
90	value 292	things 219	sleep 209	things 163	rate 103	say 51	etc 112
91	times 291	town 215	included 206	included 162	water 102	beautiful 49	every 111
92	long 290	selection 213	high 206	within 161	cold 101	wifi 49	visit 110
93	experience 290	fine 212	door 206	side 159	experience 101	early 49	far 109
94	available 290	say 211	market 205	booked 158	within 101	selection 49	noise 108
95	early 285	space 211	selection 202	say 157	short 101	every 49	ever 106
96	sleep 283	scandic 210	water 200	pretty 154	high 100	glo 49	nothing 105
97	included 282	every 210	think 199	water 154	market 98	water 48	think 105
98	high 281	another 210	new 196	visit 154	door 98	available 48	beautiful 105
99	expensive 281	high 208	every 196	new 153	size 97	pleasant 48	stop 103
100	gym 281	side 207	value 195	door 153	thing 97	used 48	times 103

Removed words from 200 most frequent words from customer's online review

good 14088	though 1853	find 1355	included 1183	especially 884
nice 8471	go 1826	lovely 1355	within 1174	feel 870
great 6957	spacious 1799	still 1353	every 1158	extremely 869
well 4844	old 1787	check 1335	make 1055	different 868
really 4139	first 1752	want 1326	open 1045	plenty 859
excellent 3832	got 1738	way 1324	think 1032	euros 858
get 3584	away 1726	made 1308	long 1031	part 853
like 3308	better 1692	design 1301	pretty 1020	last 846
bit 3142	however 1673	nothing 1259	early 1013	nearby 861
quite 3013	perfect 1637	expensive 1257	fine 1009	
even 2606	easy 1629	booked 1239	say 996	
everything 2420	people 1475	visit 1233	enjoyed 989	
best 2341	although 1474	finland 1232	fresh 973	
little 2310	enough 1472	lot 1231	arrived 960	
around 2091	use 1456	short 1219	rather 915	
need 2056	ok 1448	size 1211	lots 913	
much 2021	found 1411	finnish 1261	extra 911	
main 2001	overall 1398	available 1198	work 901	
back 1954	take 1362	etc 1194	used 896	
many 1944	definitely 1359	see 1191	another 889	



Overall distribution of average sentiment score from different attributes