



Smart Technologies in Tourism

Case study on the influence of iBeacons on customer experience
during the 2015 SAIL Amsterdam event



Research paper prepared for the International Tourism Student Conference

19-22 April 2016, Madrid, Spain

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Biographical Notes

I am Elena, 21 years old and from Germany. I have a passion for travelling and cultures. Concerning apps and technology I am convinced that it provides a lot of new possibilities, especially in relation to travelling. This can be extremely handy and enhancing, but for me, only if you make a limited and thoughtful use of it.



My name is Julia, I am also German and I am 23 years old. I like to devote my time to learning new languages, Salsa dancing or having coffee with some friends. Before I travel anywhere, I make sure to download an app with a map that I can use offline - that way I never lose my way.

Hi, this is Michelle, 21 years old, Dutch, culture explorer and always in to try on new desserts. I'm curious how new smart technologies will change our future. The app I frequently use is to check when the train is running. Being on the train I watch how people's faces are sticking to their phones. That's why I'd like to say, technology is awesome but let's continue to say hi in real-life.





I am Amelie, I am 26 years old and am also from Germany. Tourism and traveling have caught my interest years ago, but especially aviation fascinates me as it brings people and destinations together. I love to travel, but I always try to use my phone as less as possible when I am abroad. Due to this I don't use any touristic apps while traveling, but I do enjoy to read about current developments in touristic news apps.

Ciao, I am Elisa. For a couple of years I moved from country to country for the mere pleasure of living in a new country and discovering its beauty and culture. The courses at school about technology have made me aware of how much we give away without knowing it. Knowledge however, gives you the choice on what to do next.



Hello, I am Zada and I am 19 years old. I am from Hong Kong but I have been living in London for 9 years. I didn't realize that I enjoy travelling and experiencing after studying this course. I wouldn't say I am a heavy smartphone user but I do use it frequently for communicating with others (WhatsApp, messenger, WeChat etc.). I agree with technology how it helps to keep in touch with people far away, but I dislike the phenomenon of Smartphone Addicts and Phubbing because I do enjoy socializing - that means face to face!

ABSTRACT

Smart technologies reach into almost all aspects of life nowadays, although they are often not yet noticed by users and taken as a given in a lot of cases. This research project is concentrated on the iBeacon technology which is still rather new to the industry and there is consequently also not much existing research yet about the connection between these products and the degree to which they actually enhance the customer experience. In order to determine the actual consumer experience enhancement, the SAIL Amsterdam 2015 event is used as case study. The developers of the technology, event managers of SAIL Amsterdam 2015, visitors to this event, and users of the new technology as well as experts have been interviewed. The results show that smart tourism apps do enhance the visitor experiences. A major problem however is the shallow information visitors have of the possibilities.

Keywords: smart tourism, iBeacons, visitor experience, SAIL Amsterdam, crowd management

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Chapter 1 – Introduction

Smart technologies reach into almost all aspects of life nowadays, although they are often unnoticed by users and taken for granted. Recently, tourism destinations have also started to implement smart technologies with the intention to enhance the experience of incoming tourists in response to the new EU goals to limit the ongoing climate change (Endesa, 2008). The major goals of this initiative were to use energy more efficiently by implementing new technologies, to increase the usage of renewable energies and to reduce CO² emissions. Thus, the project mainly aims to “modernize and optimize the current electric distribution grid” (Endesa, 2008, pp. 25), but also to increase customer’s awareness. Relating this to tourism, reduced emissions and a more sustainable usage of energy in tourism destinations could result in cheaper prices for tourists, a better air quality and an overall higher customer satisfaction.

“Smart” has become a rather common term in marketing for all things which are enhanced by technology and technology has become essential to the tourism industry over the last years, not just regarding ways of communication, but also in terms of booking procedures and information search. Smartness is usually closely related to enhancing the usability of certain products by implementing technologies. In this regard, the so-called Information and Communication Technology (ICT) and the Internet of Things need to be mentioned as well which both refer to the combination of the internet usage and the provision of products and services. In addition, so-called iBeacons are increasingly implemented in various service industries as they allow companies to track their clients and to analyze their consumer behavior. These iBeacons work with Bluetooth and require the user to download and use an app.

However, one can also wonder that more and more companies and tourist destinations use this term for marketing purposes and to underline their technological development. It appears like implementing smart tools and tourism destinations has become a trend, but it always needs to be considered whether those destinations simply act smart regarding their use of new technologies or if they also think smart and from the perspective of a potential user. In this context, it is argued that smart destinations provide several benefits such as enhanced user-friendliness and a higher potential for future investments on the one hand, but research on the other hand also outlined various disadvantages, especially in terms of data protection and the loss of social interactions.

Furthermore, research showed that cities and touristic destinations often do not necessarily focus on the tourists’ experience, but rather on the enhancement of living standards of its stakeholders such as residents and local companies... This is also the case with the city of Amsterdam as the main intention to implement more smart technologies is to make the daily life more efficient (e.g. by saving energy and using new types of transportation) and not to increase the tourists’ experience. Thus, the enhancement of travel experiences is often still secondary for cities and destinations.

This research project is concentrated on the iBeacon technology which is still rather new to the industry and there is consequently also not much existing research yet about the connection between these products and the degree to which they actually enhance the customer experience. In order to determine the actual consumer enhancement, the SAIL Amsterdam event will be used as a practical example. The organizers have used this technology and the related app for the first time in 2015 and business contacts will help to find out about practical experiences.

On the one hand there is a positive association with the SAIL application as users are easily able to access information about ships, receive personalized deals and there is the possibility to track and

manage the crowd (crowd management). On the other hand however, users need to give up some of their privacy when sharing data or their location via the application. Besides, advertisements can become too commercial and lastly the SAIL app contains a lot of requirements as it can only be fully used when people download the app and are willing to use Bluetooth. Consequently it can be concluded that there are disadvantages as well as advantages of the location based service but the question remains how this will affect the user experience.

Chapter 2 – Literature review

Technology has a significant influence on people's lives due to its constant and rapid developments and hence can be considered as an unpredictable power of crucial importance people have to take note of (Hooijdonk, 2015). Basically, tourism and hospitality business are always confronted with new challenges and opportunities in terms of technology. The rapid rise of the importance of information and communication technology (ICT) and specifically e-business is a development that has to be taken seriously and turned into an advantage. Not only the Internet and the Web 1.0, but also Web 2.0 and the whole social media environment has had a huge impact and changed to tourism industries to a high extent (Law, Buhalis, & Cobanoglu, 2014).

ICT has a crucial role in the competition of tourism organizations and destinations. It “empowers consumers to identify, customize and purchase tourism products and supports the globalization of the industry by providing tools for developing, managing and distributing offerings worldwide” (Buhalis & O'Connor, 2005:7). Furthermore, it provides constantly new tools for marketing in tourism destinations and hence tourism organizations should recognize the necessity to use ICTs “to develop strategies that are customer centric, profitability driven and partnership enabled” (Buhalis & O'Connor, 2005:11).

Reacting to the strongly upcoming and already current trend of using smartphones, tablets and other mobile technologies in the hospitality and tourism industry, some studies have focused on evaluating and examining the effectiveness of taking these technologies to create a more satisfying tourist experience. Each technology offers an upside that makes traveling easier and better as for example smartphones have the ability to not only improve the planning of trips but also add the new component of meeting instant needs to traveling (Law, Buhalis & Cobanoglu, 2014)

2.1 Smart cities

Recently, a new expression evolved in research: “smart city”. Basically, this expression involves six different characteristics it focuses on: smart economy, smart people, smart governance, smart mobility, smart environment and smart living (Giffinger et al., 2007:11). A Smart City was defined as “a city well performing in a forward-looking way in these six characteristics, built on the ‘smart’ combination of endowments and activities of self-decisive, independent and aware citizens” (Giffinger et al., 2007:11).

It should be highlighted that a smart city is strongly connected to the use of communication and information technology. One of its main purposes is to respond to all different kind of needs related to a city in an intelligent and quick way (Su, Li, & Fu, 2011). Su, Li & Fu (2011) outline the importance of constructing smart application systems. There are different main applications identified, such as the construction of a “green city, smart medical treatment, smart transportation, wireless city, smart home, smart urban management, smart public services and smart tourism” (Su, Li & Fu, 2011:1029). Basically, a smart city should integrate human capital, infrastructure and information (Buhalis & Amaranggana, 2013).

It is also a question whether a city can be considered as smart. Buhalis and Amaranggana (2013) state that only when quality of life and a sustainable economic growth are achieved, a city can be called “smart”. However, the terms “smart” and “smart city” are not used in a consistent way use within the literature. Often smart is referred to intelligent, wired or digital and a main point of criticism focuses on the gap between image and reality as there is difference between a city just labelling and marketing itself smart or it actually being intelligent (Tranos & Gertner, 2012).

Another aspect of criticism is the narrow focus on the local-urban scale of the smart city concept. Not taking the global urban interdependencies into view raises the question how a true and whole learning and innovation environment can be created without having access to and focus on worldwide research sites and centers of production and consumption. Even more it is doubtful that the objectives of the smart city concept can be reached and put into action without taking a more global perspective (Tranos & Gertner, 2012)

2.2 Smart Tourism Destinations

Smart tourism destination can be defined as the following: “a platform, which is implementing ICTs such as Artificial Intelligence, Cloud Computing and Internet of Things to offer the tourist personalized information and enhanced services established by mobile end-user devices” (Boes, 2015). In order to make a tourism destination smart the dynamic connection of stakeholders through technological platforms is a key factor. The main objective of these platforms is to create a quick information exchange regarding all tourism related activities (Buhalis & Amaranggana, 2013).

Smart Tourism Destinations are able to turn the challenges of the 6A's as well as of the emerging technological revolution into advantages. They are able to take and use the positives of “(1) Technology embedded environments; (2) Responsive processes at micro and macro levels (3) End-user devices in multiple touch-points; and (4) Engaged stakeholders that use the platform dynamically as a neural system” (Buhalis & Amaranggana, 2013:556).

There are many ways to perform smartness as a tourism destination. Referring to the technological aspect smartness is also shown by the implementation of tourism related applications that can be used within Smart Cities' components. Smart Tourism Destinations should also empower a creative environment within the city. They should be able to provide their population with room and space for learning, innovation and knowledge creation. Moreover, they should ensure a functional digital infrastructure that allows an up to date communication and knowledge management. Another crucial aspect is the public and private relationship within the destination since these sectors need to cooperate for implementing smartness in the destination (Buhalis & Amaranggana, 2013).

Buhalis and Amaranggana (2013) identify three main components of the ICT necessary to enhance smartness in a tourism destination: “Cloud Computing, Internet of Things (IoT) and End-User Internet Service System”. Cloud Computing helps reducing fixed costs and sharing information. The Internet of Things the means that not just screens are connected via the Internet, but also other items and that they all illustrate one big network. The IoT generally supports “providing information and analysis as well as automation and control” while the End-User Internet Service System refers to different applications at different levels (Buhalis & Amaranggana, 2013).

2.3 Smart Tourism Tools

Different tools within smart tourism destinations can be outlined. Tools such as QR codes or NFC tags provide links between the physical and digital world, thus adding value to the tourist experience (Chillon, 2012). They enhance access to information about points of interest that are nearby (Buhalis & Amaranggana, 2013). In the case of apps, distance is of no interest. A smart tourism tool with augmented reality enables visitors to have an experience in a different place and a different time, thus allowing travel guides to come to life in real-time locations (Chillon, 2012). Using smart tourism tools involves benefits and risks. Smith (2015) stresses that a smart tourism destination has a better chance to be competitive compared with other destinations. Moreover, it could be attractive for foreign investment. Seen from the perspective of a tourist it can also have

benefits for this target since smart tourism tools can be convenient and user-friendly. In general those tools have the main benefit to enrich the tourist experience (Smith, 2015). Judge and Powles (2015) on the other hand, argue that by connecting so many items via the internet of things, users become trackable, vulnerable and can be easily manipulated. People are often already using portable devices a lot to stay connected with others and by introducing the 'Internet of Things', this phenomenon would even be further enhanced and more time would be spent online which can lead to a loss of social interaction in real life.

It is inevitable that technologies can overcome the issues with time and space. It is extremely useful to stay in touch with long distance relationships. However, technological advances can cause people to be distracted, overly stressed, and increasingly isolated (Human Kinetics, 2010). The more advanced technology develops, the more it appears to have control over users' lives. Recent developments in technology such as the internet also led to a decline in 'normal' social behaviors. This meaning the once used to be the normal communication, such as 'face to face conversation', is gradually decreasing. More time is spent online than ever before and this deteriorates the interaction between people. Next to the issue of social divide, the generation of indolence is also an issue (FutureofWorking, 2015). Technology helps greatly on searching and storing information; almost everything can be done with technology. A traditional map is no longer needed where Google Map has the world map included, along with up-to-date and additional information, such as attractions in cities. This convenience and dependency became a hindrance for ones to interact with the world.

Another risk which can be mentioned is the security risk. Weil (2013) outlines that hacking is not only limited to computers and smartphones. It is a risk which needs to be taken very seriously (Weil, 2013). Modern technologies can act like a double-edged sword, from safety to connectedness. Therefore, there needs to be a balance in order to utilize its benefits while keeping its threats to a minimum.

2.4 Enhancing Customer Experience

Customer Experience Management (CEM) is nowadays of great importance when it comes to satisfying the customer who seeks for positive experiences beyond a product or service. Taking this management approach into consideration has the potential to bring along both, great economic value for firms and added value for the customer (Verhoef et al., 2009).

There are three systems which basically are part of a customer experience: sensation, cognition and affect (Gentile, Spiller, & Noci, 2007). Verhoef et al. (2009) add to these three concepts that a customer experience can also be social and physical. In order to examine the components of customer experience further Gentile et al. (2007) identified the following ones:

- Sensorial Component (stimulates the senses)
- Emotional Component (stimulates different emotions)
- Cognitive Component (engages the customer to think or to be creative)
- Pragmatic Component (including the concept of simply using something; usability)
- Lifestyle Component (including the values and beliefs of the customer, in line with their lifestyles)
- Relational Component (refers to relation of the customer with others, with the product/service and beyond with his or her self)

The different factors involved in creating a customer experience are also crucial in order to understand this concept. According to Palmer (2010) the tangible and process quality, brand relationships and interpersonal relationships are the foundation of building a customer experience. Then different steps follow which can lead to the attitude of customer experience.

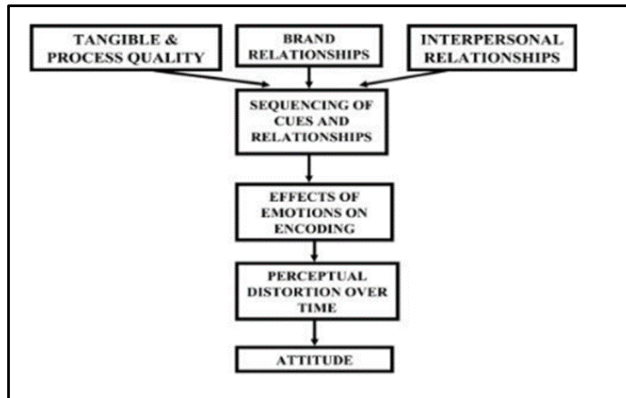


Fig. 1: A conceptual framework for the construct of customer experience (Palmer, 2010, p.199)

In order to research whether a customer experience is enhanced by, in this case, smart tourism tools, it is indispensable to determine how to measure customer experience. A successful measurement of the concept of customer experience must assess well the cognitive and emotional delivered values from the customer's point of view (Maklan & Klaus, 2011). The following aspects can be identified in terms of how to measure customer experience within a technological background:

- Interactivity
- Involvement
- Playfulness
- Positive affect
- Time distortion
- Telepresence
- and skills (Novak, Hoffman, & Yiu-Fai, 2000).

Moreover, Maklan and Klaus (2011) developed a model demonstrated in the following (Fig.2) showing more in-depth the factors which should be referred to when measuring the customer

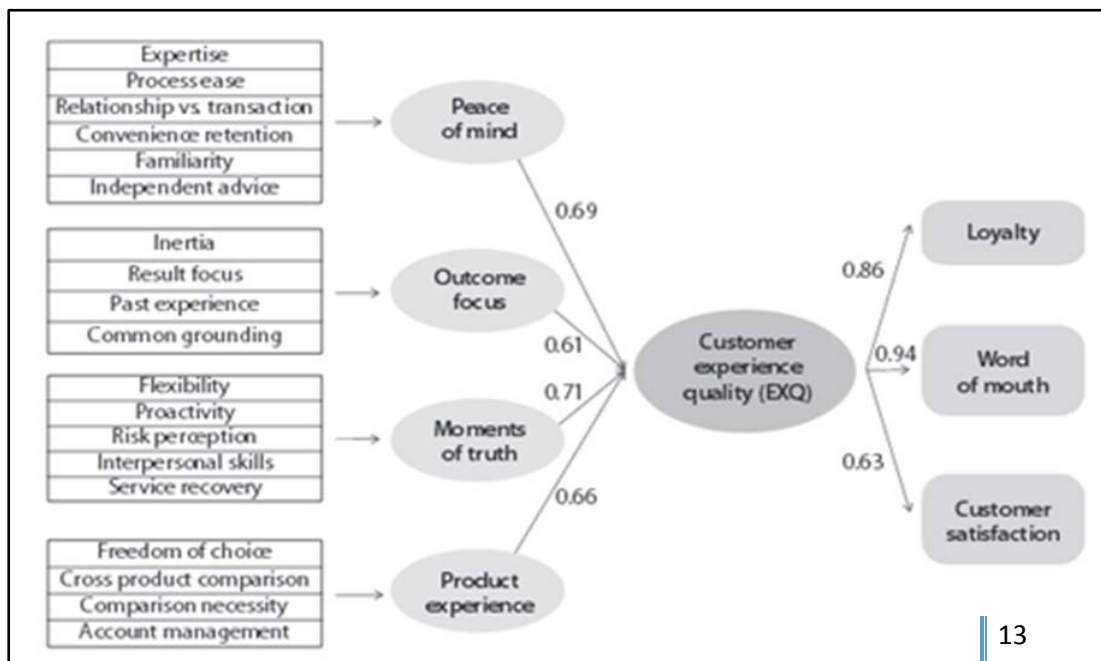


Fig. 2: Customer experience quality scale: dimensions, attributes and exogenous variables (Maklan & Klaus, 2011, page 782)

According to Wang, Park and Fesenmaier (2012) the touristic experience (Fig.3) is divided in three phases: the anticipatory phase where the tourists researches information, plans the trip/ visit, the experiential phase in which the experience happens and the reflective phase where the tourists reflects on his experience and produces a judgment. The usage of smartphones and therefore also apps, are considered to be a mediating source since they provide information not only during the anticipatory phase but also during the experience and reflective phase as they provide useful insight in the event/activity the tourist participates in, its location etc. Therefore, the smartphones and the technologies the user of the smartphone has access to such as apps, push messages via Beacons etc. creates a pleasurable experience and satisfies several functional and emotional needs such as information search, novelty etc.

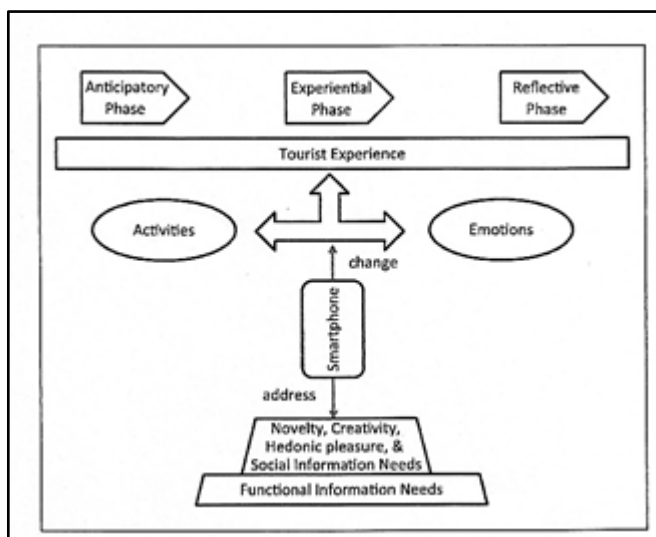


Fig. 3: Mediation mechanism of Smartphones in the touristic experience (Wang, Park, & Fesenmaier, 2012, page 373)

2.5 Conclusion

The literature review explains the main concepts and theories involved in this research project. It gives definitions for the most important aspects and it shows that there are risks and benefits involved in smart tourism. However, there is more to examine when it comes to enhancing the customer experience and this also leads to the research question and specific case study the research will deal with.

Chapter 3 – Research objectives and methodology

The literature review explains the main concepts and theories involved in this research project. It gives definitions for the most important aspects and it shows that there are risks and benefits involved in smart tourism. However, there is more to examine when it comes to enhancing the customer experience and this also leads to the research question and specific case study the research will deal with.

In order to understand the complex relationship between new technologies and the experience of an event, this research focused on the case of SAIL Amsterdam 2015.

The following research objective has been set: To analyze the effects and possibilities of smart technology (iBeacons) on visitors' experiences. The following sub-questions have been set in order to be able to draw conclusions.

RQ1. What are the benefits and the challenges for visitors when using this technology?

RQ2. What are reasons for implementing this technology?

RQ3. What are the experiences of visitors with this technology?

Drawing on data collected from experts, developers, event management and visitors to SAIL Amsterdam 2015 this paper aims to provide recommendations for the future of using iBeacon technology for tourism purposes. An embedded, single-case study approach was chosen. The findings are based on on-site experiences - using the Beacon Mile Explorer application (which an app based on a network of iBeacons along Amsterdam Central station and several other points of interest in Amsterdam, participant observation, analyzing consumer reviews and interviewing the developers and users.

The experts interviewed were purposively sampled, based on their knowledge and experience.

Richard Smith was asked to give the researchers a thorough introduction of smart tools in tourism, based on this award-winning bachelor thesis which focused on multiple technologies that are increasingly used to create smart cities. The developers of the iBeacon technology in the Netherlands (Paul Manwaring and Remco Bron) and involved in the SAIL Amsterdam app were interviewed on technology and content. The developer of an app to guide visitors to the 'best' bars' (Bardoggy) added to the discussion. Prof. Dr. Ir. Serge Hoogendoorn, senior researcher on pedestrian flows at Delft University of Technology shared his insights on crowd management, tourism and the use of apps and iBeacons. To analyze customer experiences, reviews on Google Play were used and several visitors to the event were interviewed.

Detailed information about the expert interviewees and the visitor interviewees can be found in Appendix 1 and 2.

Chapter 4 – Case study SAIL Amsterdam 2015

In the year of 2014, the Netherlands were visited by 13.9 million international tourists (NBTC, 2015). This represents an increase of over 40% in comparison with tourist numbers in the year of 2000. This number is fairly impressive considering that the Netherlands only has an area of just over 41,000 km² and is home to 16.5 million people (Holland.com, n.d.). According to the NBTC (2015), the sharp increase in tourist numbers can be traced back to various factors:

- the growing market for short-breaks in neighboring countries such as Germany and Belgium;
- increase in network coverage by low-cost carriers;
- economic growth in developing countries in Asia and Southern America;
- development of product offerings to inbound tourists (e.g. reopening of the Rijksmuseum)
- marketing activities.

About 80% of all tourists coming to the Netherlands originate from another European country. Here, primarily markets such as Germany, Great Britain and Belgium play a major role. The remaining 20% of international visitors mainly come from America, primarily from the United States, and Asia (which are mainly visitors from China) (NBTC, 2015).

Most of international visitors to the Netherlands reside in one of the Dutch four main cities, namely Amsterdam, Rotterdam, The Hague or Utrecht. The Dutch capital, Amsterdam, and its surroundings, which are referred to as the Amsterdam Metropolitan Area (MRA) is particularly popular among tourists, though. Amsterdam hosted over 5.3 million visitors in the year of 2014 and it is likely that the upwards trend is going to continue in the coming years. The following figure shows the trend in total tourist arrivals and bed nights in the Dutch capital in the years from 2000-2012 (Gemeente Amsterdam, 2014).

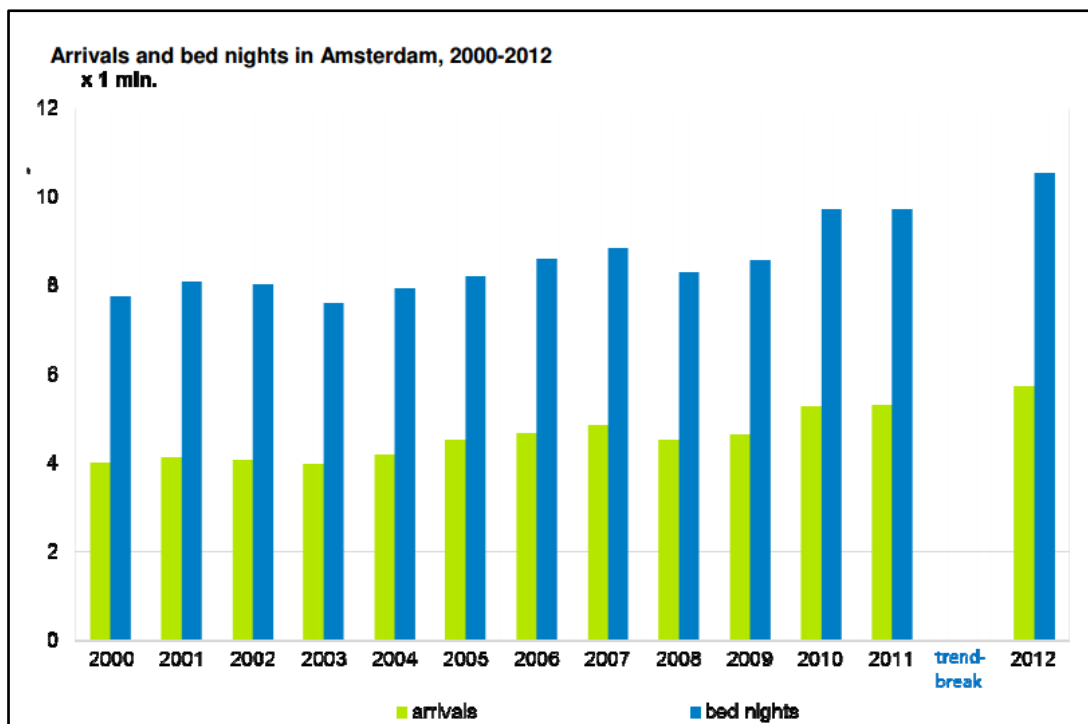


Fig.4: Arrivals and bed nights in Amsterdam (Gemeente Amsterdam, 2014)

Apart from the growing international inbound tourism, also the Dutch domestic tourism market towards the capital is rising. The domestic tourism market is slightly smaller than the Dutch

outbound market. In 2014, the Dutch undertook 17,200 trips within their own country (NBTC, 2015). Amsterdam saw a rise of 18% in domestic tourists in the year of 2013 while the national average increase in domestic tourism lay at only 1%. This increase of domestic tourists in the capital can be explained by the reopening of major museums, such as the Rijksmuseum, the king's coronation as well as other major events taking place in the city (Gemeente Amsterdam, 2014).

The sheer amount of Dutch tourists in conjunction with the positive trend in international inbound tourists will continue to put pressure on tourism officials to manage these numbers. Due to the fact that the Netherlands are quite a small country with narrow streets in most city centers, it is going to be more and more important to manage tourist flows. Especially during large events, such as SAIL Amsterdam, the ever increasing amount of people in the city center has to be managed not only in order to ensure safety but also in order to retain positive tourist experiences.

4.1 SAIL Amsterdam 2015

SAIL is the largest world-wide nautical event and takes place every five years in the harbors of the city of Amsterdam. SAIL was first introduced in the year 1975 and was a celebration of the 700th jubilee of Amsterdam. Since its first appearance, the event has taken place every five years and represents the Dutch rich history of seafaring and ports which are still an essential driving force for the Dutch economy (I Amsterdam, n.d.).

During the event, which lastly took place on five consecutive days in August 2015, around 600 ships navigate their way along the North Sea Canal towards the IJhaven in Amsterdam. Ships include not only modern ships but also tall ships and historic Dutch vessels. Apart from this spectacle, there are many cultural events and sporting activities taking place in the surroundings. With over 2.3 million visitors in the SAIL Amsterdam 2015 edition, the event represents the largest public event in the Netherlands (I Amsterdam, n.d.).

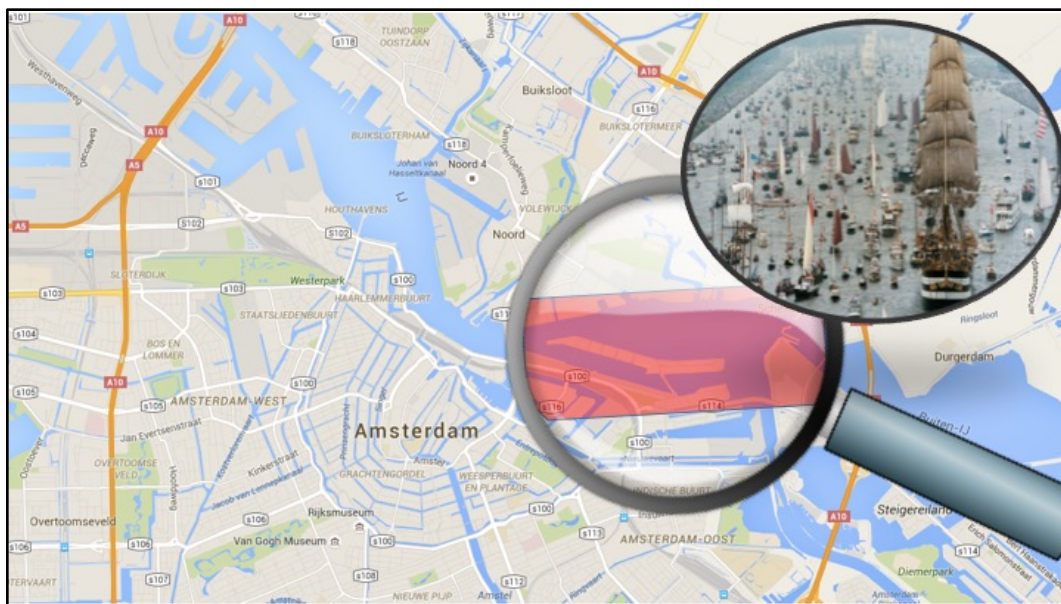


Figure 5: Location of the SAIL event in Amsterdam (Amsterdam.info, n.d.)

Of the 2.3 million total tourists visiting the SAIL Amsterdam event in 2015, 69% came to see the event on one of the five days. 16% represented two-day visitors and 14% visited the event on three or more days.

4.2 iBeacons

One new technology which might be able to assist in this challenging task is iBeacons which was employed during the SAIL Amsterdam 2015 event. iBeacons, also referred to as beacons, were first introduced by Apple in 2013 (CISCO, 2014). This new technology allows companies to receive important information from (potential) customers and send out valuable notifications to them based upon their exact location. The only prerequisites for this communication channel to work are that the customer has the company's iBeacon enabled app installed on his/her smartphone and that the customer has Bluetooth turned on.

In other words, iBeacon is "Apple's technology standard, which allows Mobile Apps [...] to listen for signals from beacons in the physical world and react accordingly" (iBeacon Insider, 1995). Therefore, iBeacons enable apps to grasp the users' position and deliver so-called hyper-contextual content to the users based on this information.

This communication is enabled through Bluetooth Low Energy (BLE) which is a communication technology used for transmitting data over short distances. As the energy consumption is very low and the cost is considerably lower than traditional Bluetooth (iBeacon Insider, 1995), this technology has the ideal prerequisites for the use idea behind iBeacons. Standard beacons allow a broadcasting range of up to 100 meters (iBeacon Insider, 1995).

With an iBeacon network, brands, retailers, apps or platforms are able to enhance their knowledge of where their customers are located which provides them with an opportunity to send out "highly contextual, hyper-local, meaningful messages and advertisements" (iBeacon Insider, 1995). The technology therefore has the power to change the way brands communicate with their customers. As iBeacon (1995) puts, "iBeacon provides a digital extension into the physical world".

4.3 iBeacon Implementation within SAIL Amsterdam 2015

In the 2015 SAIL Amsterdam edition, the new beacon technology was implemented for the first time on such a scale. With over 2.5 million expected visitors, this event was the biggest iBeacon showcase that has ever taken place world-wide (inBeacon, n.d.). During SAIL, visitors were provided with different iBeacon interactions which were based upon the individual visitor's location and his/her behavior during the previous days of the event. Notifications included ship information but also information about upcoming events, news and promotions which were available at the point in time (I Amsterdam, n.d.).

For the sake of the beacon implementation, 232 beacons were installed which created a total of five private and public beacon networks. These included the Amsterdam Beacon Mile, SOWIFI, Exterion Media, the SAIL long range ship network and the SAIL event network. With these five networks, the whole SAIL area as well as the city center of Amsterdam was covered (I Amsterdam, n.d.). Six different types of beacons were employed and 10 tall ships were equipped with long-range beacons which allow a transmission of up to 300 meters. This enabled visitors to receive a notification on their phone whenever one of these interesting ships was close-by (when using the app).

It was mentioned before that the SAIL app only provides its full potential in terms of the iBeacons, if the users have activated their Bluetooth function. Closely related to that, beacons require three main things in order to work, namely a hardware to "broadcast the Bluetooth signal" and a software to "receive and interpret the signal" (Remco Bron). This software enables companies to send messages or promotional offers to users at any time. Finally, an app is needed to actually reach the customers as the hardware and the software only work in the background, meaning they aren't visible to

customers. The tracking of customers would also be possible by using GPS (Global Positioning System), but this function requires an internet connection. Consequently, battery power is used and the connection might be disrupted, or not be available at all, due to the big amount of people attending such an event. Thus, a huge advantage of beacons is that they don't need internet in order to work which saves battery power and increases the availability and usability of the app. In addition to that, phones will automatically recognize beacons and push-notifications are sent by the beacons to the users, if the app is installed and Bluetooth is activated. However, beacons are still a comparably new technology and due to this many consumers are also not yet familiar with the functions and requirements (e.g. in terms of the battery power).

Regarding the content of the SAIL app, relevant information about the ships is provided, different events are mentioned and the up-to-date program is available. Besides that it enables sponsors to increase the brand awareness for their products and crowd control is possible, although this was not yet used at the SAIL event 2015 due to the unfamiliarity of the app. Another huge advantage of the applied beacon technology was the long distance range of the sensors with about 300 meters, which is not yet possible with other technologies.

Screenshots of the SAIL app can be found in Appendix 3.

The SAIL Amsterdam 2015 application was installed by approximately 69.000 people, which is 3 % of all SAIL visitors. Of these 69.000 people, only 47 % had their Bluetooth turned on, which allowed them to receive notifications (I Amsterdam, n.d.). In total there were more than 336.000 notification opportunities, but only 71.863 notifications were actually sent out. 65% of these represented the ship information notifications, 8% were notifications at info points and 27% were promotional notifications (I Amsterdam, n.d.). Additionally, more than 8.6 million interactions were counted which represents the success of the app creation and the first beacon implementation within the SAIL event. This did not only increase the information flow towards customers but it also allowed organizers to track visitors' behavior and manage visitor flows as the beacons could be used as a part of a crowd control system in the future. The following statistics show the overall distribution of visitors, visitors' distribution among the various areas and their location per hour, popular routes taken by the visitors as well as.

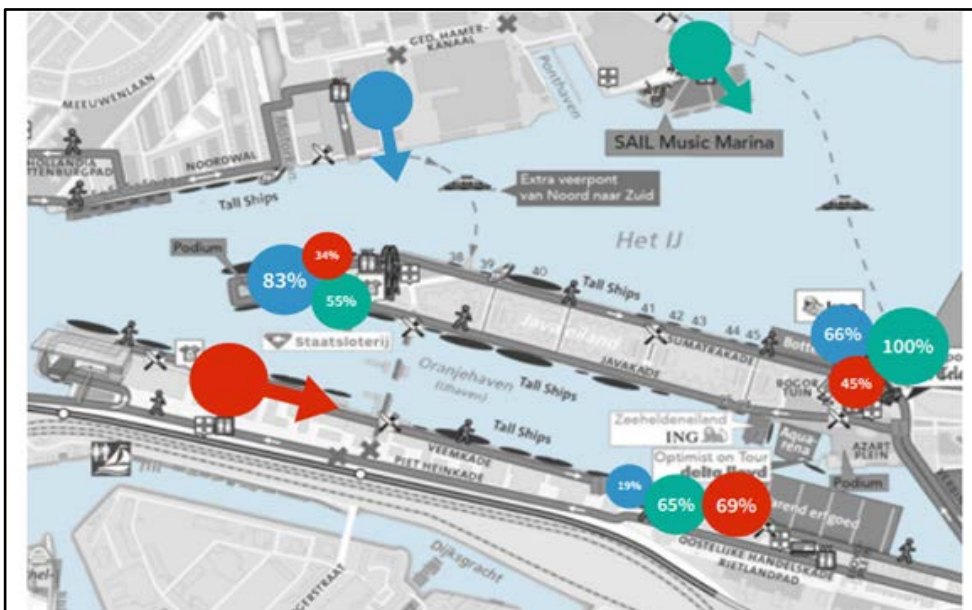


Figure 6: Visitor distribution at SAIL Amsterdam 2015 (I Amsterdam, n.d.)

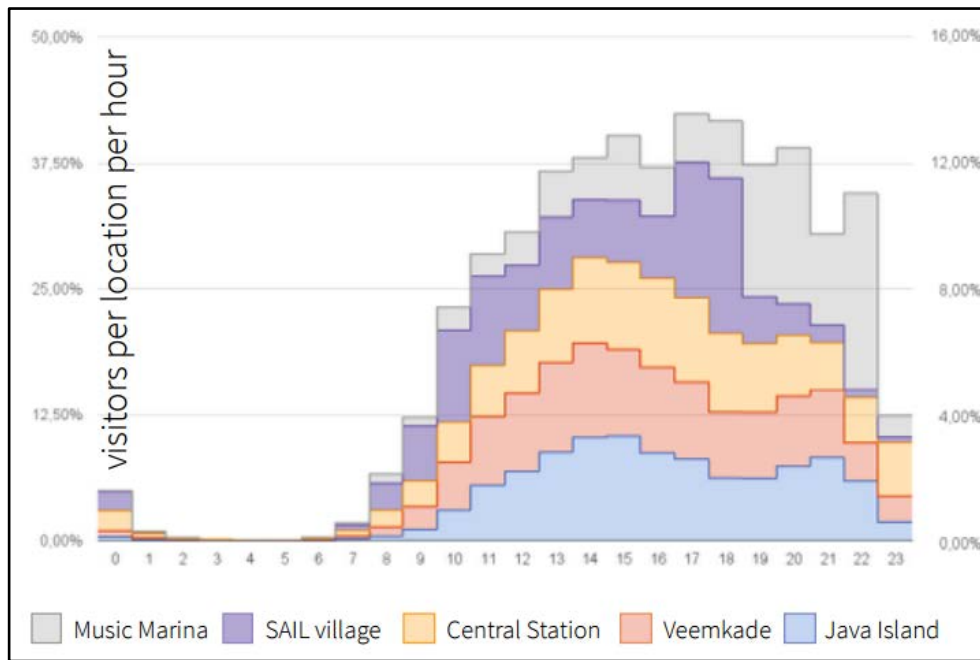


Figure 7: Visitors per location per hour at SAIL Amsterdam 2015 (I Amsterdam, n.d.)

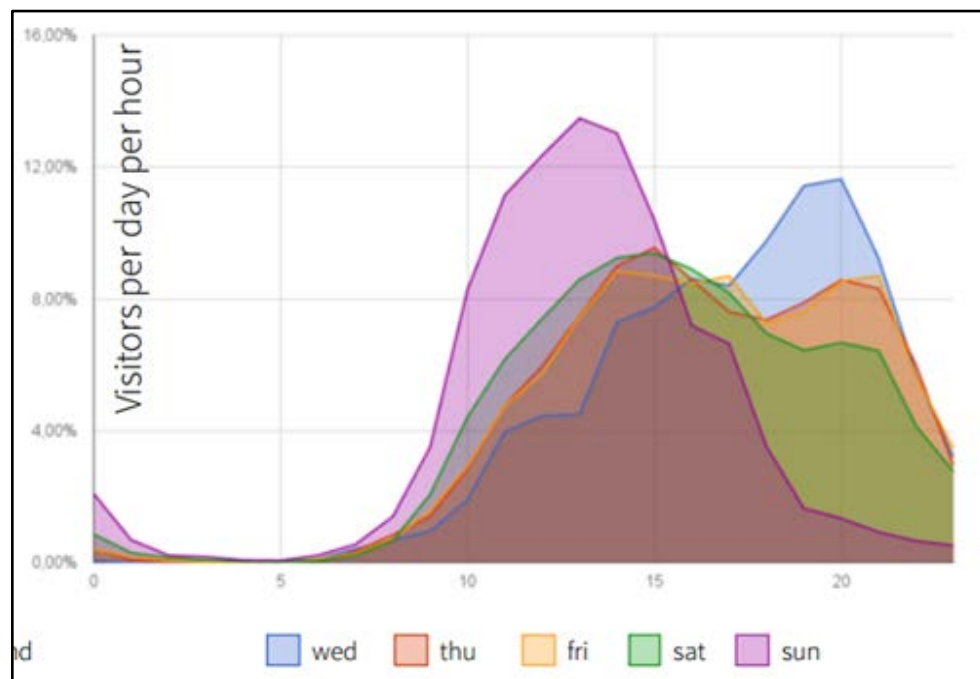


Figure 8: Visitors per day per hour at SAIL Amsterdam 2015 (I Amsterdam, n.d.)

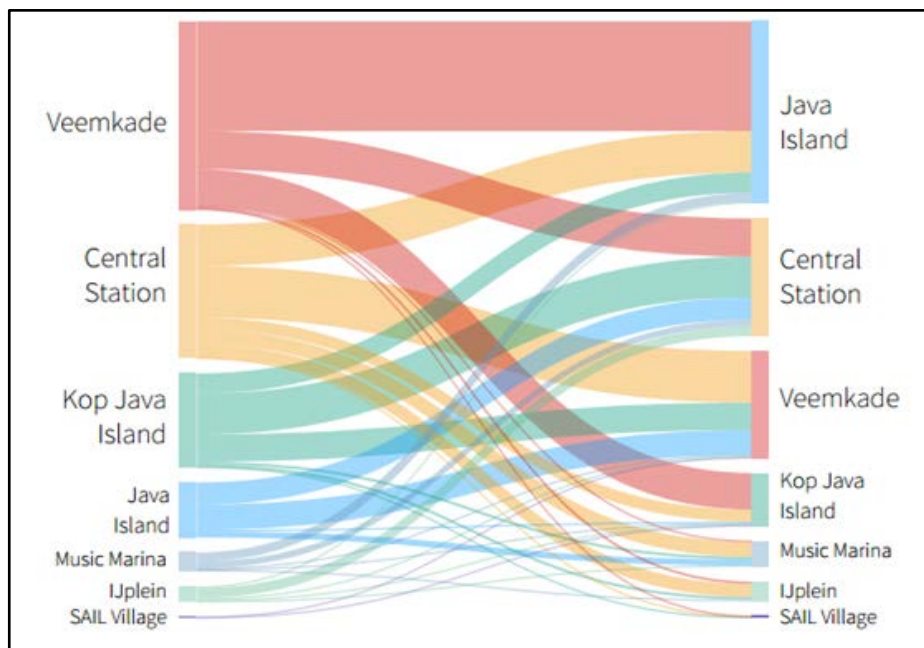


Figure 9: Popular visitor routes at SAIL Amsterdam 2015 (I Amsterdam, n.d.)

Chapter 5 – Analysis

5.1 Privacy

As it was mentioned in the literature review, the issue with privacy loss is that it is dependent on the users' knowledge and awareness of the application. According to P. Manwaring (personal communication, DATE, 2016), the beacon itself does not collect any data from the users, the beacon only detects and sends information. The same as Bluetooth, it only detects the nearby devices, the system itself does not share the users' information. However, visitors are concerned when downloading the SAIL app. One of the interviewed visitors felt a loss of privacy when agreeing to the terms and conditions as she was unsure of the reason for collecting her information and what the information will use for. This gave her a valid reason to delete the app since she does not want them to have access to her data. On the other hand, other users, did not have too much concern about privacy issue when downloading the app, either had to deal with push messages. Interviewee 2 would check the conditions first to see if she agrees and accept the general conditions. Remco Bron mentioned that it is an on/off technique. Users can always turn the Bluetooth off if they feel uncomfortable about their location being detected, so as the push messages. Overall, there were no complaints about loss of privacy during the SAIL event. Therefore, the issue of privacy loss is greatly dependent on the users' awareness as it is not always clear to the users that they have the authority to control their own privacy.

Bron added when visitors get a great experience, they did not mind to share their information, such as location, as long as they get something in return with their information. This is the case with Bardoggy app. Mr De Kraker stated that they created the game of wheel of fortune is to reward those who use the app and are willing to share their location. Hence, the time when people are willing to share their information is to trade for something in return. Yet, this issue will be reinvented. Furthermore, Bron (2016) highlighted that users of the app did not complain about privacy issues and he concluded, that based on his feedback they apparently perceived the provision of their location as a fair deal to receiving information.

5.2 Crowd Management

Another important aspect that technology can be used for is crowd management. SAIL Amsterdam is a huge event with nearly 2.3 million visitors at the 2015 edition. These amounts of people have to be managed and safety has to be ensured for all participants. The main goal of crowd management is to keep participant flows moving in order to prevent dangerous situations as have occurred in the past (Hoogendoorn, 2016). The most noted example of crowd management gone wrong was the Love Parade in Duisburg (Germany) in 2010 where people flowing into the event and people wanting to leave passed each other in a very narrow tunnel. This led to the death of 21 visitors and injured more than 500 (Spiegel Online, 2010).

During the SAIL 2015 event, researchers attempted to implement a new approach to crowd management. The new crowd monitoring system was set up as a pilot project during the event and was implemented in addition to the regular crowd management practices of SAIL events. The new approach made use of multiple technologies in order to win a clear picture of where visitors were and which way they were moving. Technologies employed included counting cameras, Wi-Fi/Bluetooth tracking, GPS sensors and social media analytics (Hoogendoorn, 2016).

The counting cameras which were placed at strategic spots were able to count the passing visitors in both directions, giving valuable information to the crowd management team. Those visitors who had their Wi-Fi or Bluetooth turned on could be tracked via the Wi-Fi network and gave information of which routes people walked and how long it took them to get to a certain point. With this technique, 3-5% of SAIL visitors could be tracked. Additionally, GPS trackers were handed out to volunteers,

effectively enabling the same tracking as with the Wi-Fi network. Last but not least, the new approach to crowd management also included analyzing social media activity which entailed not only location-based tracking (geo-locating) but also monitoring whether people talked about crowdedness on social media (Hoogendoorn, 2016).

The iBeacons, that were used to send out push notifications to SAIL visitors who had downloaded the app prior to the event, were not used in order to manage the crowd. In order to do so in the future, more research will have to be undertaken in the field of psychology and how people react to certain messages. The risk is that when sending out a push notification to people saying that it is particularly busy at a certain spot, they are inclined to go there as well as they assume that there is something spectacular to see there (Hoogendoorn, 2016). However, the potential of this new technology is high and it remains to be seen how iBeacons can be implemented on a day-to-day basis in order to improve the tourist experience.

Bron (2016) suggests the introduction of virtual waiting lines with the help of iBeacons. This way, a high number of tourists could be “virtually” waiting while doing other things instead of actually standing in a line. This way, the city of Amsterdam can make more profits but also ensures that tourists do not get frustrated as much by existing long lines which has a negative impact on the tourist experience.

Due to the fact that the new approach to crowd management was a pilot project during SAIL, it was not acted upon the data that was collected. However, the system proved to be successful in monitoring pedestrian flows and it is likely that the system is going to be employed at future events, such as the Gay Pride parade in Amsterdam (Hoogendoorn, 2016).

Furthermore, the city of Amsterdam is looking into employing the system on a day-to-day basis in order to manage tourist flows. Due to the fact that Amsterdam is one of the busiest tourist destinations within Europe and tourist numbers are still rapidly growing, the concern for crowd management is likely to gain in importance in the coming years. Therefore, the implication of a crowd monitoring system in the city would help in not only spreading the vast amount of tourists throughout the territory but also in enhancing the tourist experience (Hoogendoorn, 2016).

5.3 Stakeholders

Stakeholders have different interests in the use of iBeacons by means of a mobile application. According to the director of Glimworm, P. Manwaring, iBeacons can be a part of the Internet of Things network and increase its interactivity. In his view networks of iBeacons are an opportunity for cities, increasing the communication between people and giving objects a reason for people to communicate. The iBeacon will however only be of use when creating an application using the right software (personal conversation, R. Bron, 2016). As the technology is rather new, company InBeacon got established to assist businesses on how to make use of iBeacons when creating an app. They had therefore an important role in the development process of the SAIL application creation. It essential that, according to R. Bron, before creating an app, the developer needs to know the customers' expectations. In the case of SAIL, this was hard to establish as people didn't know what to expect of the SAIL event.

Besides InBeacon, sponsors and the SAIL organizers were involved in the creation of the app, while having different interests. The sponsors included amongst others: Staatsloterij, Delta Loyd, KPN, Telegraaf, ING. Some of them wanted to send out push notifications with special offers. The SAIL organizers on the other hand wanted to provide the visitor with information about the ships, program and route. The organizers wanted to attract sponsors as well with the SAIL application,

nevertheless they did not want them to send too many push messages as they were afraid for commercialization of the event (personal conversation, R. Bron, 2016).

5.4 Information (Knowledge)

For users, the information and also the relevant knowledge about the app are of great importance. This refers to the whole content of the app and how it is perceived by the user. It is crucial to state that the content of an app is always perceived differently by users due to differing interests. One target might be more interested in the ships, while the other target might be interested in the program as a whole. Nevertheless, when examining the reviews of the SAIL app, people appreciated the extra information about the ships.

Knowledge is also very significant because it can often be the case, that users are not really aware of the different functions of the app. An example can be the push messages. Some people might not be aware that Bluetooth has to be turned on their smart phone in order to receive the iBeacon push notifications containing valuable information. Other people however, who are might find incoming push notifications rather distressing, might not be aware that they can easily be avoided by turning off the Bluetooth function. When examining the iBeacons more specifically, it can be outlined that users might have a feeling of uncertainty because it is still a very new technology. It might scare them that they do not really know about the real functions of the iBeacons.

The above mentioned differing interests of the users definitely create a challenge for the app developers when it comes to meeting all the interests by relevant information. Another challenge for the developers is to increase the awareness of the different functions of the app, so that people know more about it and can use it more effectively.

However, as mentioned by Hoogendoorn (2016) the psychology behind push notifications sent out by iBeacons can also be an aspect scaring the developers, because there is no specific research done yet. The developers have to be really careful when sending out push notifications as psychology has a big influence on customers' reaction to them. Referring to crowd management, developers do not know if people might react to the crowd information in a way that they want to go to the crowd instead of avoiding it.

Chapter 6 – Discussion and Conclusion

6.1 Discussion

Customer management and commercial offers

There is a lot of data online and companies are trying hard to make sense of it in order to understand their customer. It appears that professionals have little knowledge on how to use the new technology which withdraws them in using iBeacons for promotional purpose. Yet, the online reputation for companies is expected to become more and more important to customers.

iBeacons were used for promotion purposes during SAIL by several partners/sponsors because they wanted to gather more attention on their brand name/product. This was as well an opportunity as a threat for the SAIL organizers as they wanted to attract more sponsors for the event, yet, they were afraid that it would get too commercialized.

The SAIL app as an information tool

The further development of apps working with iBeacons is encouraged by producers, app developers and users alike. Users of the SAIL app perceived the app as positive, providing them with instant information. With regard to push messages for promotional purposes during SAIL, some users find it disturbing whereas others see those offers as an advantage. Therefore, further research should be conducted on how users perceive push-messages on their phone during events.

Reinvent privacy

Through the rapid technological developments we need to ‘reinvent privacy’, as Tim de Kraker says (2016). People don’t know what happens to their data and that scares them. Therefore, the society needs to start to rethink where privacy is about. The fear of privacy loss is one of the main obstacles from the customer’s perspective for further development of the iBeacon technology.

A great customer experience of an app can only be created if there is trust. To build trust between the user and application provider is one of the biggest conditions for an enhanced experience.

Secondly the app developer should create value, when there is an added value, the customer is mostly willing to share some information in return.

Crowd management

During SAIL the possibilities of crowd management have been tested, amongst others by tracking visitors during the event. In the future this information can also be used to control the crowd by sending push messages out to visitors via a mobile application engaging with iBeacons. However, it should be said that more research should be conducted first as there is not much known yet of the effects of sending out those messages (for example: visitors might be attempted to go to the busy places when receiving a message because they assume there is something special to see). Another way to implement crowd management in the future is by reducing the waiting line for visitors by creating a virtual waiting line with a mobile app. By controlling the crowd and even managing the crowd, the safety of visitors coming to Amsterdam can be enhanced. There are however some limitations as mentioned below.

6.2 Limitations

Beacons can only be used in combination with a system such as Bluetooth. Whereas many people installed the SAIL app, not everyone used it accordingly because they didn’t use the Bluetooth function. In order to reach a significant group of people, some app developers focus on other methods as well such as Wi-Fi and location based technologies. For the purpose of crowd management it is vital that many people are being reached, therefore it’s a limitation that there are currently many different technologies and organizations involved.

6.3 Conclusions

Through the use of the case study of SAIL Amsterdam 2015, this paper has presented the current and future development of the iBeacon and its use within the tourism destination as a tool to enhance the tourist experience. Following the user's interviews and reviews of the SAIL app, it can be concluded that the iBeacon technology enhances the tourist experience, especially in the context of crowd management and app usage.

However, being a new technology, it faces the challenge of lack of extensive information and knowledge amongst the users and businesses. Users are often not aware of how to correctly use the app and consequently don't enable their Bluetooth function on their phone. It is therefore advised to provide extensive information about the technology and the proper usage of it in order to profit from the maximum services that the apps offer. Furthermore, businesses are willing to implement the iBeacon technology, but are often ignorant of the actual services and functions the technology offers and are consequently limiting themselves from taking advantage of the extensive services the technology offers. The iBeacon technology should be implemented in apps for future events, with however as a condition that both users and businesses will be informed on its usage.

At the same time it is necessary that information about events are widely available to people not only on apps but also through various sources such as official event websites, Facebook etc. this is due to the fact that some users are not familiar or feel comfortable in using apps or prefer the usage of other tools and sources.

Furthermore, some users are aware of giving up certain elements of their privacy by downloading the apps on their smartphones such as location etc, they are however less concerned about it when the services offered by the app are valuable. Nevertheless, users should always be conscious of the confidential elements that are being shared on apps.

Finally, the SAIL app could solely be used by turning on the Bluetooth on user's phone. However, due to the fact that many users weren't aware of this and kept it turned off, they didn't fully profit from the planned experience. Due to this complication, it may be advised that future apps that will be developed are easier to use for users and don't require different techniques and technology (such as Bluetooth) to successfully work.

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Appendices

Appendix 1: Expert interviewees

Remco Bron (2016) – Co-founder InBeacon - interviewed on January 26th, 2016

InBeacon is a platform which utilizes the beacon technology to enhance the services and functions of existing iOS and Android applications. The company provides services and assistance to businesses and events to develop apps through the use of beacon technology. Its Chief Compliance Officer is Mr. Remco Bron.

Paul Manwaring (2016) – Creative Director Glimworm – interviewed on February 12th, 2016

Glimworm is a business which produces Beacons, assists and cooperates with businesses to develop apps, websites, and beacon technologies. Paul Manwaring is the co-founder and Creative Director of Glimworm. InBeacon and Glimworm cooperated with the Sail organizers to implement the beacon technology in the event and the app.

Tim de Kraker (2016) - Founder of the BarDoggy App. – interviewed on February 4th, 2016

The app has 200 locations between bars, night clubs etc. the app offers an overview of all the bars and clubs etc. which are in a certain area (Amsterdam, Utrecht etc.) The app sends push messages or proximity messages to users who are in proximity of the locations of bars, clubs etc. This can however only occur when the user downloaded the app, have the Bluetooth signal and the GPS enabled. When the user approaches a Beacon, he receives a notification with information about open locations in his area. Other messages can contain discounts, promotions, event notifications etc.

Serge Hogendoorn – TU Delft – interviewed on February 24th, 2016

Prof.dr.ir. Serge Hoogendoorn has been researching theory, modelling, and simulation of multi-class traffic and transportation networks and is working on the development of methods for crowd management.

Appendix 2: Visitor interviewees

Interviewee 1

53 years old, works for a travel agency, Bunnik, the Netherlands.

Interviewee 2

21 years old, student in Delft, the Netherlands.

Interviewee 3

21 years old, student, the Netherlands.

Interviewee 4

28 years old, technician, Nijmegen, the Netherlands.

Appendix 3: Screenshots of the SAIL app

