Tampere University

Alisa Burova

INTERACTIVE STORYTELLING IN THE CONTEXT OF LARGE PUBLIC SPACES
A case study at the Helsinki airport

ABSTRACT

Alisa Burova: INTERACTIVE STORYTELLING IN THE CONTEXT OF LARGE PUBLIC SPACES
Master of Science Thesis
Tampere University
Master's Degree Programme in Information Technology
April 2020

Storytelling is a universal method to present information, which has been widely used throughout human history. It has been evolving into different forms, adapting to rapidly changing people's needs and emerging visual representation possibilities. The latest trend of digitalization brought the use of computer- and multimedia-assisted tools for telling stories, defined as digital storytelling. It has shown its potential and became a trendy topic in marketing and tourism industries. In addition, storytelling can be further advanced to adapt to the user personality and the context of use, e.g., become *interactive*. However, the concept of interactive storytelling is still unexplored in the field of Human-Technology Interaction, and there is no clear understanding of interactive storytelling benefits and in what forms it can be applied in a context of large public spaces.

This work demonstrates an example of applying the concept of interactive storytelling in the context of a small-scale airport to facilitate entertaining time-spending by enabling cultural learning adventure and enhanced shopping experience. The scope of this thesis includes the design, development, and evaluation of a gamified storytelling application following the research through the design approach. The final application, *The Finnish You*, generates a personalised story of an imaginative person, a Finnish version of the user, and guides users through shops at the airport while presenting culture-related information. The application was developed iteratively within the research group and tested in two steps. First, the study in a controlled environment, simulating airport terminal area, was conducted with a focus on storytelling content and user experience. Nine student-participants used the application and provided feedback via interview and questionnaire. Next, a field study at the Helsinki airport terminal area was conducted with actual travellers. Three researchers managed to recruit 15 participants of different nationalities and collected their opinions with interviews, questionnaire and observation forms.

The results demonstrated the potential of applying interactive storytelling to enable entertaining time-spending in the context of the large public spaces. A personalised interactive storyline was found to be an appealing way to present culture related information and promote local products. Via gamification elements and the effect of narration transportation it triggers curiosity and persuades to explore local brands while learning new facts about the culture of the destination. In a current iteration, *The Finnish You* application cater to a narrow group of users, who are looking for time-killing activities at the airport and may be engaged with a reading process. To make the application appealing for a wider public, a storytelling content should be modified and enhanced to be more visually pleasing for the users. Additionally, it should address other users' needs, for instance, efficient shopping.

The main contribution of this study lies in the set of design implications for an interactive storytelling application, which were developed based on the insight from both studies. These implications outline the ways to increase the quality of the application from the content point of view and from context-related factors. By formulating these guidelines, this thesis intends to promote the research on the concept of interactive storytelling in the context of large public spaces.

Keywords: Interactive Storytelling, Airport Experience, Gamification, Field Study

PREFACE

VIRJOX was my first academic project and I am grateful for this opportunity. It helped me to grow as a professional and develop my UX design vision and creative-thinking skills. This all would never be possible without a team of excellent researchers, who supported me all the way.

I would like to thank my closest colleagues, *Tuuli Keskinen* and *Chelsea Kelling*, who always were there, encouraged me to move forward and supported my paper-writing process and all these ups and downs during this journey. I would like to thank all research team, who contributed to VIRJOX project and "The Finnish You" application development: *Jaakko Hakulinen, Sunita Dash, Pekka Kallioniemi, Katariina Tiitinen* and *Heli Väätäja*. Special thanks to my thesis supervisor and research team leader *Professor Markku Turunen* for giving a chance and space for my contribution. I would like to thank separately my second thesis supervisor and a good friend – doctoral researcher *Ekaterina Olshannikova* for being honest and supportive. And finally, I would like to thank *Professor Kaisa Väänänen* for being responsive and supportive in thesis practicalities.

Tampere, 19 April 2020

Alisa Burova

CONTENTS

1. INTRODUCTION

This thesis describes the process of applying an interactive storytelling approach by facilitating a cultural-learning and enhanced shopping experiences at the airport. The thesis scope includes the design, development, and evaluation of a storytelling application implemented based on the company's needs and values. The results of the study are framed to provide an understanding of how to beneficially implement storytelling solutions from the perspective of content design and context of use.

This chapter provides the background of this thesis study, including the description of the associated project, and the motivation behind exploring the concept of interactive storytelling for an airport environment. It also describes the goal, raised research questions and approach of the study, followed by the structure of the thesis itself.

1.1 VIRJOX Project

This thesis work was conducted in cooperation with *Finavia*[1] company as one of the research directions of the *VIRJOX* project[2]. The project addressed designing, creating and evaluating innovative service concepts and environments together with journalistic storytelling concepts for the virtual, augmented and mixed realities (VR, AR, and MR) environments. The focus was to design and investigate experiential solutions and content in an iterative manner to deliver the end values for the users in various contexts.

The research branch in cooperation with *Finavia* had been primarily aiming to develop an innovative solution for an airport environment, utilizing virtual or augmented realities. However, the research showed that these technologies are still not mature enough to be successfully implemented for use in large public spaces. Hence, the research direction was changed towards exploring the concept of interactive storytelling in the context of large public space. This final stage of the VIRJOX project - *applying an interactive storytelling approach to address the needs of air travellers and airport stakeholders* - is presented in this thesis work. The team of researchers from TAUCHI research group from Tampere University was working on this stage of the project in different roles. More detailed information on how the work was divided between the team members is presented in chapter **4.1 Design and Development Process.**

1.2 Background and Motivation

Air travelling is becoming more popular and accessible among people worldwide. Various research in HTI contributed to understanding the characteristics of airports as physical spaces and service providers. Airports are no longer seen as a means of mobility,

---

[1] Finavia Airports https://www.finavia.fi/en
[2] VIRJOX project – Engaging services in virtual reality http://virjox.hti-tampere.fi/

they have evolved into massive *experiencescapes* [36] or *"landscapes of experience"* [31, p.15], which consists of various activities to support passengers time-spending at the airport [5]. All the activities that passengers perform at the airport compose *an airport experience*, which is an integral part of being a tourist experience. An airport experience consists of all the necessary procedures, such as check-in and security control, and discretionary activities, in other words, activities to fill in waiting time [22].

With a growing air traffic passenger demand, airports all over the world are looking for ways to facilitate positive and meaningful experiences and enhance airport experience for passengers. The procedural, yet chaotic airport environment and constant waiting may negatively influence airport experience [46], which in turn affects the overall tourist experience and the image of the country in a negative way [22]. Thus, it is critical to facilitate positive airport experience from two perspectives: business and touristic. From the touristic perspective, airports play a role of the "nation ambassador", as the first impression of the nation is formed by experiencing airport physical surroundings [4]. Hence, facilitating positive cultural experiences at the airport is crucial to promote the destination, spark interest in local culture and potentially attract passengers to visit the country in the future.

From a business perspective, about half of the airport revenue comes from commercial activities, like shopping, food, and beverages [5]. Hence, filling passengers' waiting time with an activity that not only would positively affect their airport experience but also invite them to partake in commercial activities is between the main goals of airport officials. Shopping, for instance, is the major commercial activity at the airport and multiple research was done to analyse shopping motivation [17]. Besides being a leading source of companies' revenues, it is also a known activity to reduce stress and anxiety [28].

Recently, mobile applications are being used to assist travellers with necessary and discretionary activities. The recent study [32] reported that airport applications are efficient in supporting passengers against challenges by filling waiting time with meaningful time spending. Furthermore, using gamification in such an application increases the positive effect and motivation towards using these applications. The Helsinki airport, for instance, provides the passengers with a standalone mobile application – *Helsinki airport*[3]. The application is advertised as an essential tool for a relaxing trip, which assists with time management and parking. Among other functions, users may browse the information on shopping offers and restaurants. Nevertheless, the information is simply presented in the form of a list without any additional marketing content. It provides no further information about the uniqueness of local shopping offers and does not persuade travellers to visit the shop. Neither it provides the content to promote local culture.

Based on the research done on the airport environment and the conceptualization process in cooperation with Finavia, *the concept of airport journey experience* was identified as a potential way to fulfil waiting time at the airport. By facilitating the activity of exploring airport surrounding while engaging the users into cultural exploration, airport stakeholders may contribute to creating novel and positive experiences for air passengers. This may further affect travellers' perception of local brands and local culture and influence positively the promotion of the destination country and its culture. Thus, this

---

[3] https://www.finavia.fi/fi/lentoasemat/helsinki-vantaa/mobiilisovellus

thesis aims to research how a concept of interactive storytelling may be applied to support free time-spending at the airport and positively affect the overall airport experience. This research contributes to an understanding of airport experience, investigating the link between airport experience and the image of a destination, linked to the culture of the destination [45].

Storytelling, the technique of presenting information in the form of stories, has proven to be an efficient tool to convey the message in the way to arose emotions and facilitate experiences [7, 30]. Digital interactive storytelling is a promising approach to address the needs and requirements of airport stakeholders. Via the elements of storytelling and narrations, it is possible to generate a context for shopping exploration and navigate passengers thought airport shops while advertising products. Moreover, stories may demonstrate the Finnish culture in easy-to-receive and remember form [47]. Designing the interactive story (e.g. adaptive to changing conditions) and personalise it would produce unique experiences for each user and increase the engagement with the content. Supported with gamification elements, which are widely known for rising motivation and adding fun to the activity, such a storytelling solution may indeed increase the motivation towards commercial activities. With a growing possibility of portable personal devices and the trend to rely on them in everyday life, it became possible to support airport experience via developing applications.

1.3   Research Goal, Questions, and Approach

In this thesis, the concept of interactive storytelling was explored in the context of the airport environment. The objective of the study was to provide a better understanding of the principles of digital storytelling on personal devices from the perspective of User Experience (UX) and content design (e.g., elements of storytelling). The **research goal** of the study was to explore the ways in which interactive storytelling can be applied to generate immersive cultural experiences for large touristic public spaces such as airports. Two research questions were further set to clarify the scope of the research and point out to the two major topics explored in the study: storytelling content and application design, and contextual factors affecting it.

RQ 1 *How to design an **engaging and entertaining storytelling application** to promote local culture and personally connect users to retailing options at the airport?* The question relates to the content of the storytelling, e.g. how to design the elements of storytelling and what would be the most engaging way to represent culture-related and marketing information. To address the question, this thesis provides a list of guidelines on how to enhance the storytelling component in Chapter 6.2.

RQ 2 *How can **contextual factors** inform the design considerations for an interactive storytelling application?* This question addresses the aspects of the airport context of use, which would affect the use of the application. This question also relates to how to utilize the contextual factors in design to increase the effectiveness of the application and extend a target group of users. The answer to the question results in a list of design implications to adapt the application to the airport contextual factors in Chapter 6.3.

To address the study goal and questions, this research had been approached by following *the research thought design* framework [51] via conducting the iterative human-centred design and development process in cooperation with Finavia. The ideation of how to apply storytelling was based on the conceptualization process (held outside the scope of this research) including the needs of the stakeholders and target users. In addition, the literature review method was performed to get a clear understanding of the end-users (air travellers) and airport experience, including free-time spending and shopping activities. Related work was also required to discover an existing solution in tourism for determining the design decisions, such as story plot or gamification elements. In order to design an appropriate storytelling application and adapt it to the airport environment, two user studies were arranged: one in the controlled environment and another in the real context of use, Helsinki airport. The data from the studies was further analysed to reveal insights for design implications and guidelines.

Hence, this thesis work contributed to the field of HTI by demonstrating a realistic human-centred design and development process based on cooperation with the industry as well as by formulating findings of the study in the form of guidelines. With this research, the author of this thesis hopes to promote future research on the concept of interactive storytelling in the context of large public spaces.

1.4   Structure of the Thesis

This thesis is organised as follows: the chapter 2 - *Theoretical Background*, provides an overview of the context of use (airport environment) and its specifics and limitations and reviews the existing solutions in tourism based on storytelling and gamification. Chapter 3 – *Methodology*, describes the design approach, methods, and details on user studies. Chapter 4 - *The Finnish You Application*, describes the application development process and design solutions in detail, including the components of storytelling and gamification elements. Chapter 5 - *Research Studies*, uncover detailed methodology and outcome of two conducted user studies, including interviews, questionnaires and observation results. Chapter 6 – *Discussion*, summarises the key findings of the study and presents the lists of guidelines, regarding the content of the storytelling and the contextual factors. It further reports the limitations of the study and points to the possible future research directions. Chapter 7 – *Conclusion*, summarises the insight from the study, addressing the impact to the HTI filed and shows how the study results may scale to other cases for touristic large spaces.

2. THEORETICAL BACKGROUND

This chapter presents the theoretical basis for this thesis. First, the role of airports in the tourism industry as well as passenger experience at the airport is discussed to draw the understanding of the context. Next, previous work related to the use of storytelling and gamification in the field of tourism is reviewed to gain the overall picture of the digital solutions and its effect on users.

2.1 Airport Environment

Airports, which were first seen as just "*spaces of the transaction*", nowadays had gained an important role in the tourism industry [18]. Back in 2003, Lloyd [29] defined airports as places where urban travellers are invited "*to use transit time to accumulate experiences instead of wasting waiting time*". In harmony with Lloyd's definition, airports act as massive experiencescapes, consisting of commercial or non-commercial activities to support passengers' time spending, such as shopping areas, cafes and restaurants, lounge zones and other activities. The term *experiencescape* was originally introduced by O'Dell [36] and refers to a "*landscape of experience*" – "*space of pleasure, enjoyment, and entertainment, as well as the meeting ground in which diverse groups move about and come in contact with each other*". In early 2000, another term was used to describe the airport infrastructure – *servicescape*, which refers to a mix of environmental features in which services are provided. Facilitating a pleasant experience in the airport servicescape was found to be critical for destination development, as the first impression of the nation may be formed by experiencing the airport's physical surroundings [3]. Later in 2007, Mossberg [34] suggested replacing the term servicescape with the term experiencescape in tourist settings, placing the focus on tourists' consumption, not on service production. This goes in line with the fact, that tourism is experiential in nature and the value of provided services in touristic settings lies in resulting novel positive experiences [50].

2.1.1 Airport Experience

All activities and interactions, that airport passengers go through at the airport form an *airport experience* [22]. The key activities at the airport are classified as *necessary* (compulsory activities that the passengers need to go thought in order to board their flight, such as check-in, security control), and *discretionary* (optional activities that passengers perform in between of necessary activities). A book chapter by Wattanocharoensil (2009) [45], presented a more detailed description of the airport experience, reviewing it from three dimensions of airport experience:

1) *Experience as a process* consists of three key activities: functional, which correlates with necessary activities by Harrison et al. (2012); servicescape, which refers to physical surroundings and functional design of the airport; and personal service, which refers to the interactions between customers and airport stuff.

2) *Experience as a phenomenon*, which refers to leisure activities at the airport, aimed to advance the passengers hedonic and aesthetic experiences

3) *Experience as an outcome*, which forms four experiential aspects as a result of being at the airport (perception, memory, emotion, and fairness)

It was also confirmed by Wattanocharoensil (2019) that experience as a process is associated with the memory and emotional outcomes of passengers. Unsatisfactory experience may further result in a negative perception of the airport and negatively influence the decision to come back. Experience as a phenomenon is also strongly influencing the emotional outcome, however, a negative experience would not affect the perception of the airport on the same scale, as negative procedural experience. Moreover, it was found that the hedonic and aesthetic services of the airport would be appreciated if only the process dimension is above a satisfactory level.

This thesis work addresses the facilitation of discretionary time spending with a focus on two dimensions: experience as a phenomenon and as an outcome, while leaving the necessary activities and the process dimension out of the scope of this research. Hence, the following information on airport experience is presented in regard to spending waiting time and time-killing.

One of the studies [24] applied the theory of liminality to analyze airport experience, and introduced the airport as a liminal space, categorising airport experience based on how passengers utilize the airport environment. In addition to the traditional understanding of airports as *a tourism space* and *a social space*, this study included airports as *a personal space* and explained that time-spending at the airport depends on the familiarity with airport facilities. These authors also confirmed that after entering a liminal zone (terminal area after all security procedures are completed), air passengers feel more relaxed and ready to spend time waiting.

Discretionary activities at the airport are typically performed to fill in the waiting time at the terminal area, which on average takes 90 minutes [43]. The study by Kirik et al. (2012) [27] summarised the overall activities at the airport and defined eight taxonomic groups. Four defined groups (e.g., consumptive, social, entertainment and passive) are related to discretionary time spending. Consumptive activities include browsing through provided services (mainly shops) in order to kill time and/or purchase/consume. This group of activities is very important for both travellers and airport officials: for travellers, it plays one of the major roles in reducing the perceived waiting time, while for airport officials it is a major source of revenue. The social group of activities is based on interaction with another person/group of people. Communication or being involved in social activities is another way for passengers to positively spend their waiting time. The Entertainment group of activities refers to spending time being involved in some entertainment activity. It might take up to 73% of discretionary time and mostly refers to "interacting with own technology" for various purposes. Passive activities include waiting and doing nothing. Despite some passengers might enjoy it, for others such a time spending is associated with negative emotions. According to the study, the lack of consumptive and entertainment activities at the airport is reviewed as the most negative aspect influencing overall airport experience.

Hence, the goal of this study was to enhance airport experience by supporting the consumptive activity by entertaining travellers via interacting with own technology. The

end goal was to minimize passive time spending. As for consumptive activity, this study applied two activities: shopping and learning a new fact about local culture. As for entertainment, an interactive storytelling approach supported with gamification were selected to guide travellers thought shopping options while telling stories on products as well as promoting the culture and lifestyle of the destination.

2.1.2 Shopping at the Airport

With the shift of the airport's operations towards the business-oriented model, travellers are perceived as direct customers of the airports, rather than customers of operating airlines. The revenues from commercial activities at airports, including traditional shopping, the sale of food, beverages, and entertainment, often account for about half of the total airport revenue [5]. Hence, airport stakeholders are constantly developing new strategies to attract travellers to partake in consumer experiences and encourage money spending. The airport would take advantage of a service, that could somehow positively affect consumers' behaviour and influence the decision-making towards commercial activities, e.g. shopping.

Shopping and, in particular airport shopping, is a widely studied topic in various fields of science: from economics to HTI. Numerous researches explored how air passengers perceive shopping and what influences their motivation towards money spending. The study by Geuens et al. (2004) [17] presented the shopping motivation factors and further defined groups of airport shoppers and dimensions, which affect their decisions while shopping. The study identified three major shopping motivations: functional (e.g., any practical factor, affecting the decision such as the price and quality of the product), social (when shopping happen in the circumstances of communication) and experiential or hedonic (e.g., shopping, which brings joyful and novel experiences). The study utilized questionnaires to collect information on airport-shopping motivation, which resulted in formulating four dimensions:

1) An *airport-infrastructure dimension*, which combines functional and social motivations and is based on the level of service at the shop, multilingualism in communication and the opportunity to pay with own currency.
2) An *airport-atmosphere dimension*, which is determined by impulse or influenced by surroundings purchases.
3) An *experiential dimension*, which correlates with experiential motivation and is based on promotions and buying for enjoyment.
4) A *functional dimension*, which correlates with functional motivation and is based on a good price and quality of presented products.

Based on how the respondent answered the statements linked to different dimensions, three types of shoppers were formulated: *Shopping Lovers,* who enjoy shopping in general and value motivators from the airport-infrastructure, the experiential and the functional dimensions; *Mood Shoppers*, who highly value motivators from the airport-atmosphere dimension and the experiential dimension; and *Indifferent Shoppers,* who would perceive all shopping motivators from various dimensions negatively. Hence, this study demonstrated, that in addition to traditional shopping needs (arisen from functional

and experiential dimensions), travel-related needs also influence the motivation towards shopping at the airport [17].

Research by Lin and Chen (2013) [28] on shopping motivation revealed travellers' leisure activities are influenced by environment and communication motivation as well as by culture and atmosphere motivation. It also showed that favourable price and quality motivation influence the shopping of luxury and travel products. It means that airport revenues from retailing and commercial activities may be increased by facilitating an atmosphere and environment to persuade shopping motivation.

Another study by Chung (2015) [11] explored an airport shopping motivation from the perspective of utilitarian and hedonic values. Air passengers with utilitarian values would purchase efficiently with minimal irritation, while air passengers with hedonic values would prefer to be immersed in a shopping environment and enjoy positive emotions from the process. The study suggested providing products that maximize shopper's values because a shopping environment that facilitates meaningful experiences is more valuable for travellers than an environment that only fits their shopping tasks.

2.1.3 Culture-related Aspects

Being exposed to novel experiences – this is what travelling is all about. Airports worldwide play the role of a *gateway to nations* or a *nation ambassador*, as they accumulate the first experiences when arriving at a touristic destination. It is a well-known fact that the first impression of the nation may be formed by experiencing the airport's physical surroundings [4]. This is especially true for newcomers and passengers in transfer, who experience the airport atmosphere in the same manner as visiting a tourist destination [24]. All the activities at the airport (the combination of experiences as a process and experience as a phenomenon) determine how air passengers would perceive the image of the destination, which affects their perception of a host country in general. Hence, forming and pleasant experiences at an airport is critical not only to enhance airport experience but also for supporting of touristic destination development. Exposing air travellers to cultural experiences at airports might potentially affect future travel plans and persuade travellers to return to the country.

As Wattanacharoensil et al. (2016) [46] pointed, the airports act as experience providers and facilitators. The work highlighted, that overall airport experience may be enhanced by reinforcing the environment of an airport terminal. This can be achieved, for instance, by presenting cultural activities and artefacts, thus, connecting travellers with the culture of the destination. The idea is based on the "sense of place" concept, which, in accordance to Stedman's definition [40], consists of three elements, combined to generate the place's meaning and attachment: physical surroundings, human behaviours, and social/psychological processes. Further, the study [46] suggested enhancing airport experience by engaging travellers into meaningful activities, based on social interactions and co-creation processes, for instance, via posting on social media.

Thus, airports worldwide are aiming to facilitate engaging time spending while promoting local culture and its values to passengers. For example, in Incheon International Airport, travellers have a unique opportunity to experience Korean history and culture in a museum where they can observe the cultural heritage, watch Korean performances

and make traditional crafts [26]. Changi airport in Singapore used the same strategy, but instead of creating a cultural experience, they recreated the experience of being "in nature" with five gardens throughout the airport [38]. These services provide unique and remarkable airport experiences, but examples like these require a large investment in maintenance and upkeep.

The existing research related to airport environment demonstrated the value of providing air travellers with novel experiences (e.g., cultural or commercial-based), however, it lacks the knowledge of how to implement it. The book chapter by Wattanacharoensil (2019) pointed out, that the research direction on how to enhance the image of tourism destinations via airport experience is potentially interesting [45].

2.2   Digital Solutions in Tourism

Considering the increasing capabilities of mobile technology, both touristic and airport experiences may be facilitated and improved by utilizing personal devices. Nowadays, people tend to rely on their devices while travelling in contrast to the past. The developed infrastructure, for instance, availability of internet (public WI-FI) and power sockets in public spaces, made it possible to deliver unique experiences straight into the hands of travellers – to their personal devices. Mantouka et al. (2018) [32] pointed out that mobile applications are a viable solution to positively support air travellers' experiences at the airport. Such applications are helpful for both navigating through the airport and accomplishing all required procedures (experience as a process) and for facilitating productive time spending (experience as a phenomenon).

Almost every large-scale airport provides its passengers with an application that gives information about airport facilities. The Helsinki airport application[4] aids passengers with parking, pre-orders and time planning. Vienna airport's app[5] uses push-notifications to keep users updated about their flight; and the airport app of Tel-Aviv provides guidance for planning flights, pre-flight, and after arrival[6]. Additionally, there are many applications not tied to any airport, for example, the application App in the Air[7]. It offers support for the airport experience by splitting it into four categories (check-in, boarding, take-off, and landing) and keeps the user informed about his/her status and time constraints, providing useful tips and tracking all flight history. Although these applications do affect airport experience positively, they support the only experience as a process and do not provide any means of filling the waiting time. This identifies the gap in terms of providing engaging and interesting experiences at the airport.

Among other strategies, *digital storytelling* and *gamification* have shown its potential in the tourism industry for entertainment purposes. It has been widely utilised to engage travellers in a destination exploration, cultural heritage exploration as well as marketing

---

[4] Helsinki Airport mobile app | Finavia. - https://www.finavia.fi/en/airports/helsinki-airport/mobile-app
[5] Viennaairport - Vienna Airport app - http://www.viennaairport.com/en/passengers/arrival__departure/vienna_airport_app
[6] Tel Aviv International Airport - https://play.google.com/store/apps/details?id=com.iaa.mobile&hl=en
[7] App in the Air - https://www.appintheair.mobi/

promotion. Next sub-chapters describe the concepts of digital storytelling and gamification as well as demonstrate the previous work in the field.

2.2.1 Storytelling

Storytelling is universal and genuinely one of the most fundamental communication methods. Stories can be stored in human memory in various ways (i.e. emotionally, factually or visually), and for this reason, are more likely to be remembered [33,49]. In addition, stories activate emotions and, as a cause, increase the receptiveness of information [7].

In the tourism industry, the concept of digital storytelling may be utilized **to intensify the journey experience** [49]. The facilitation of a co-creation process via storytelling can be reached by developing a relationship between the destination, the consumer and the story itself. The study by Youssef et al. (2018) further clarified that storytelling in a context of destination development and promotion can be viewed as a holistic approach to communicate destination attributes and identity, by using multiple communication channels and involving all stakeholders to partake in the co-creation process.

The effects of storytelling in destination development are further discussed in the study by Mossberg et al. (2010) [35] on the example of five Nordic cases, where storytelling was utilized in various forms for branding purposes. The study points out, that stories in such context stories can be utilized as a framework to coordinate touristic activities, e.g., transportation, accommodation, and dining. Despite the potential of a storytelling approach, the author pointed out that benefits do not come automatically. Moreover, such stories would make meaning and visualise "*total offering*" if only they encode the core values and attributes of a destination in a clear manner, which would require close cooperation of all stakeholders in the process.

Various commercial and academic applications and use cases also demonstrated the potential of utilizing a digital storytelling approach in touristic context. A great example of using the storytelling approach in tourist settings is a commercial location-based storytelling app "Tripventure"[8] [37], designed to engage the users into an exploration of the city of Berlin (and lately other European cities). The game includes various scenarios to support different tourist segments. Using augmented reality, it provides hints and items to help tourists open the mystery of the game and in that way, persuade them to walk around the city and explore it.

Another example from the academy [30] demonstrated the usage of digital storytelling on mobile devices to provide guidance at the cultural heritage sites. In this study, the storytelling for mobile devices was explored from the following perspectives: character and plot, location-awareness, interactivity and, lastly, the paradigms of virtual agents. The findings of the study showed the potential of a character-based storyline to guide tourists and emotionally engage them into the culture exploration process. Further, the study showed positive outcomes of a storytelling technique, such as improved communication strategy of the touristic site and positive emotional response to the story.

The role of storytelling for marketing purposes is similarly important. The study by Akgun et al. (2015) [1] explored the storytelling approach from a marketing perspective

---

[8] sprylab technologies GmbH: Tripventure: https://www.deutschertourismuspreis.de/innovationsfinder/sprylab-technologies-gmbh-tripventure.html

to identify the relations among storytelling travel writings, empathy, and behavioural intentions. The study uncovered, that the effects of aesthetics, narrative structure, and relevance of the travel story to the reader are key factors to evoke empathy, which in turn enables positive emotional response and behavioural intentions regarding the travel destination. They concluded, that the storytelling can be used as a marketing tool to evoke positive emotions towards products and services in addition to affecting behaviour intention, e.g. visit intentions or word-of-mouth experience.

The study by Escalas (2004) [15] explored how mental simulation, defined as an imitative mental representation of some event, or series of events [42], persuades customers based on the narrative transportation theory. This phenomenon of narrative transportation refers to which extent readers become "lost" in the text, or in other words, the level of their "immersion into the text". [19] The results of the study demonstrated that designing for mental simulation in product advertisements increases the evaluation of the product. That means that putting the consumer into the mentally simulated environment and asking to "feel the experience" with a product is an effective way to advertise it.

Stories help people to understand and keep the meaning better than raw data. The study by Solja et al. (2018) [39] explored the persuasiveness of stories and their contribution to the marketing field. The study showed that even short stories on brands resulted in higher levels of narrative transportation, brand attitude, perceived value, and purchase intentions than the same information in a list format.

2.2.2 Gamification

Gamification is defined as, "*the use of game design elements in non-gaming context*" in order to motivate and increase user activity [13]. Gamification is a trending topic due to the positive effects on user motivation towards a specific desired behaviour [48] and engagement in relation to service use [20]. Huotari and Hamari explored gamification in relation to a service marketing theory and provided a new definition with a focus on the experiential nature of games:

 "Gamification is a process of enhancing a service with affordances for gameful experience in order to support the user's overall value creation." [25]

In this study, they draw connections between service marketing theory and games and reported that game elements can be seen as services and, consequently, games as service systems. They also identified gamification as a next-generation method for marketing, clarifying that the potential of gamification may be fully expressed when the use of service leads to gameful experience.

The study by Xu et al., (2013) [48] explored gamification in relation to tourism and highlighted the potential of game-based marketing. It may positively influence brand awareness and tourists' interest towards a touristic destination because gaming as a process facilitates fun and fantasy experience creation. The study also reported related to tourism benefits of gamification, including entertainment, education, and co-creation by immersing tourists in personalised and contextualised experiences.

The paper by Hamari et al., (2014) [20] conceptualised gamification based on extensive literature review and determined three major elements: 1) the implemented motivational affordances, 2) psychological outcome, 3) behavioural outcome. The term affordances refer to any qualities of the service, which promote the emergence of gameful experience – meaning game elements. The paper tested following motivational affordances to identify possible psychological and behavioural outcomes: points, leaderboards achievements and badges, levels, story/theme, clear goals, feedback, rewards, progress, and challenges. As a result, this paper confirmed the positive effect of affordances on implemented solutions, although this effect may be short-term due to the novelty factor. Nevertheless, it is important to realize that gamification does not imply the success of users' engagement in the experience. With the help of the gamification organizations present value proposition, while travellers perceive the value of the app subjectively, based on their previous experiences, state of mind and personal attitudes.

Giving out rewards or points to the users is not enough to motivate them [48]. Motivation can be subdivided into two categories: intrinsic motivation, defined as an inner motivation to do the activity for the pure enjoyment and extrinsic motivation, which relates to accomplishing an activity for a specific desired outcome [14]. While game elements (such as rewards and leaderboards) are used to raise extrinsic motivation, the *game-thinking approach* should be applied to stimulate intrinsic motivation and persuade people for further actions. The game-thinking approach refers to the idea that in every daily activity there is a playful potential, through which the activity can be designed so that it is interesting to the users [41].

Multiple examples in academia and in the commercial industry demonstrated the effectiveness of applying the game-thinking approach in combination with motivational affordances over touristic activity for destination exploration. The classic example of applying the game-thinking is the Foursquare app [16], that transforms ordinary activity into a gamified experience by adding a playful layer over physical places. Another commercial example is the application Stray Boots [52] – a hunting adventure in the heart of Manhattan (and in dozen other cities all over the globe), is a gamified application where the users get points by answering correctly to trivia questions about locations and doing small "dare" tasks.

Another concept of applying gamification was presented by the game Brazil Quest, presented in the paper by Correa and Kitano. Inspired by the host cities of the 2014 FIFA World Cup, the game was developed with a goal to alter the marketing promotion of a country during the World Cup. The game is designed around an alien creature Yep and utilized motivational affordances (levels, leaderboards, and missions) to persuade tourists to explore the host cities and Brazil culture. the goal of the game is to make Yep a happy creature, thus, encoding the idea that Brazil is a country of happiness [12].

Another example of using gamification to persuade people is a "treasure hunt" game, [44] for a shopping mall environment targeting families with kids. The goal of the game was to influence consumer's behaviour and change standard routes by placing treasures all over the shopping mall. The study showed a positive outcome of using gamification as a motivational factor to explore the shopping mall infrastructure while looking for a treasure. Based on related work above, applying gamification to the exploring activity at the airport might accumulate gameful experience and affect routes at the airport.

3. METHODOLOGY

This section presents the overview of how the research on interactive storytelling for large public spaces was approached and what phases were passed in order to make conclusions. The selected methods are described on the general level, including the reasons and practicalities of using these. A more detailed description of the methods, utilised in the user studies, is presented in **Chapter 5** to draw a better understanding of iterative development and evaluation process.

3.1   Research Approach and Iterations

This thesis work is based on *research through design* framework [51], which major benefit is establishing a link between academic knowledge in HCI and practice community. This framework addresses a problem via applying the real skill of the design process, thus, creating a contribution to the HTI field in a form of practical insight. Another benefit is further motivating the members of the community to discuss the effects of the insight and iterate it further.

To address the goal of the study and research questions (presented in **Chapter 1.3**) the research was approached by conducting the design and development process, based on two leading frameworks: *design thinking* and *human-centred design*. Design thinking framework was popularised by The Hasso Plattner Institute of Design at Stanford, commonly known as Standord's d.school[9]. It is defined as a non-linear and iterative process of designing a solution, which will be solving real users' problems in accordance with their needs. The process consists of 5 steps, which were designed to study and understand the end-users, identify their needs, requirements and pain points and coherently use this knowledge to further ideate and prototype in order to create the real solution. Human-centred design (HCD), promoted by IDEO.org[10] is reviewed as a mindset above the design-thinking to ensure the usability and relevance of the solution on the long-term bases. Figure 1 demonstrates how these two frameworks are aligned with each other.

ISO standard for Ergonomics of Human-System Interaction[11] has been developed to promote and standardise the use of the HCD approach on a massive scale. The ISO defined the approach as follows:

"Human-centred design is an approach to interactive systems development that aims to make systems usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, and usability knowledge and techniques."
(ISO 9241-210:2019(E))

---

[9] https://dschool.stanford.edu/
[10] https://www.ideo.org/
[11] https://www.iso.org/obp/ui/#iso:std:iso:9241:-210:ed-1:v1:en
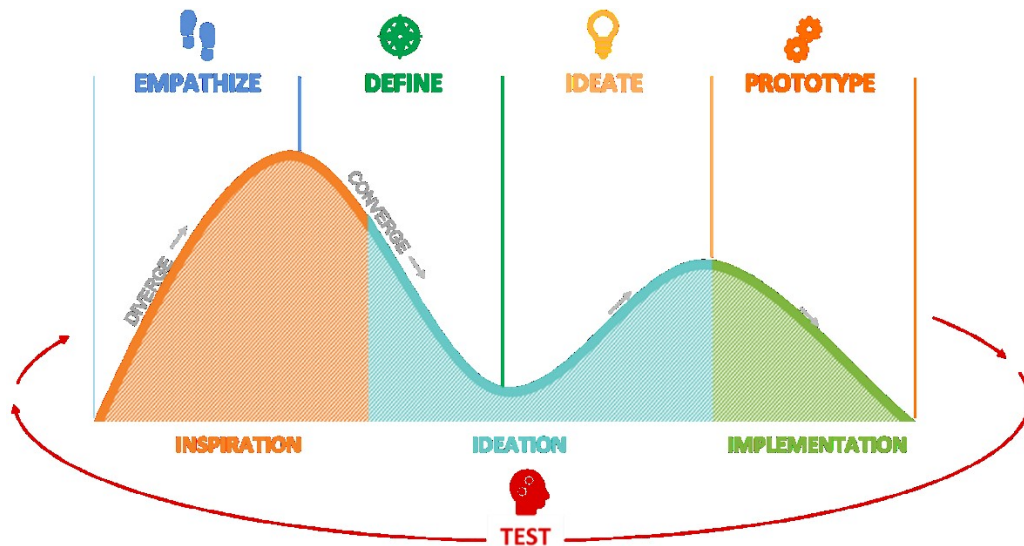
Figure 1. *Using Human-Centred Design with Design Thinking, retrieved from a blog post by Cole Hoover* [12]

This thesis illustrates the case study of applying storytelling to entertain air passengers, enrich their airport experience and promote a local culture based on the concept of the airport journey experience. The author of the thesis had not participated in the initial steps of the design cycle, where the user's needs were identified and the mentioned above concept was ideated. These steps in this thesis work are defined as Phase 0 - Conceptualisation, while the gained knowledge was used as a base for the research on interactive storytelling. All the phases of the research are demonstrated in Figure 2.
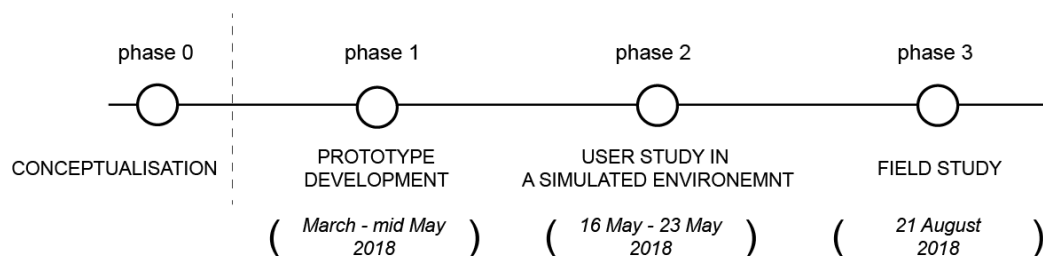
Figure 2. *Project timeline*

The first research question (on how to design engaging storytelling content) is addressed in all three phases of the study. A literature review and a short ideation session were conducted while the *prototype development* – Phase 1. The literature review was done with a goal to better understand the context and to explore existing solutions and their outcomes. Based on gained knowledge, a short ideation session was held within the research group to formulise the final idea of the application. Further in this phase, the InVision prototype was created and tested before the actual implementation. When the web-application was deployed, it was tested within the research group prior to conducting an actual user study. Further, Phase 2 - *the user study in a controlled environ-*

ment, simulating an airport terminal, was conducted. The identified usability and navigational problems were fixed during the study iteratively. After the study, the gained data was analysed and formulated in a list of guidelines. However, these guidelines were not implemented to the application due to limited resources. The application was modified in terms of usability and storytelling content to be further tested in the real airport context of use.

Phase 3 addressed both research questions via conducting the field study at the Helsinki terminal area. Field study helped to identify how real target users perceive the storytelling content and how related contextual factors affect the experience with the application. The data was further analysed to create a list of guidelines on how to design a storytelling application for an airport environment.

3.2   Data Gathering and Analysis Methods

Both user study iterations were designed with respect to the goal of an iteration and considering the context. The first study in a controlled environment was designed as piloting before going to the field; it targeted an in-depth evaluation of user experience, usability and the storytelling content of the application. The filed study was designed to observe the use of the application by actual air passengers in a real context and analyse its possible effects. In both studies, a written consent form participation was collected from each participant. Both studies are based on similar mixed data gathering methods (quantitative – *questionnaire*; qualitative – *interview*), which were adopted to better suit the nature of the studies.

As for the first study in a controlled environment, the data was collected via *online pre-* and *post-questionnaires* and *semi-structured interviews*. To get a deeper understanding of the user experience with the application, all the participants were instructed to follow the think aloud-protocol [13] and verbalise their thoughts while experiencing the application. The overall procedure, including interviews, was audio-recorded and further transcribed. The descriptive statistical analysis was performed over quantitative data in Excel. For analysis purposes, a 5-point scale was encoded into three reactions: positive (scores 4-5), neutral (3) and negative (1-2). Further, the median, min, max and interquartile range were calculated for each statement. The detailed description of the methods and the procedure can be found in Chapter **5.1**.

The field study was designed based on the previous study; few modifications were made to address airport terminal context. Firstly, due to the noisy and busy atmosphere of the airport, the procedure was shorter, the think-aloud protocol was not used and thus, only interviews were audio-recorded. Further, to systematically observe the behaviour of travellers, the observation form (filled by a researcher) was used as a method to collect information. The communication with travellers happened in English, Chinese and Russian languages. All interviews were translated into English and transcribed. Instead of a long online survey, a brief paper-based questionnaire was selected for the field study. The results were further prompted to Excel file and analysed using the same descriptive statistical analysis (median, min, max and interquartile range). The detailed description of the field study methods and the procedure can be found in Chapter **5.2**.

---

[13] https://www.nngroup.com/articles/thinking-aloud-the-1-usability-tool/

4.   THE FINNISH YOU APPLICATION

The Finnish You application generates a unique and interactive story of Finnish representation of a user, e.g. their Finnish version, based on the information that the user provides. This representation, further referred as Finnish persona, guides the user through the shops at the airport in random order while advertising local shops and demonstrating local products.

Figure 1. *Alternative views of The Finnish You application: (a) story view; (b) map view*

The application is assessable by the link finavia.uta.fi from any portable device. If you open the link from a tablet or PC, the application will illustrate the icons of airport shops and asks to open the link from a portable device. The application is not responsive, and thus, may work differently with different screen sizes and ratios.

4.1   Design and Development Process

The design and development process was held iteratively with a human-centred design approach in mind. Phase 0 – conceptualisation, was done by another researcher, *Chelsea Kelling* in the previous stage of VIRJOX project. This process contributed to defining the needs and requirements for the application in cooperation with the company's representatives. The end values identified during this phase are described in the next section and further used as a base for the research on storytelling applications in large spaces.

The application was designed within the project-research group and more than one person contributed to the design and development process. Four developers were involved in the implementation of the application: *Pekka Kallioniemi* (backend), *Katariina Tiitinen* (backend/frontend), *Sunita Dash* (frontend) and *Jaakko Hakulinen (*storytelling logic and grammar*)*. The author of this thesis was responsible for exploring and applying the concept of interactive storytelling based on the results of the conceptualisation phase. These included defining and planning the functionality of the application (e.g., navigation, flow, UX/UI and visual design in Adobe Illustrator) and demonstrating it to the team and developers by making an interactive prototype in InVision. The cultural content of storytelling was also designed by the author and was further extended and verified by the research team. The iterative study was designed together with *Tuuli Keskinen* and *Chelsea Kelling*. All design solutions have been discussed and iterated further within the research group, including project leaders: *Markku Turunen* and *Heli Väätäjä*. Based on the scope of work of the author, the thesis provides a description of the application development from the perspective of the UX/UI design and the content development of the interactive storytelling feature.

4.1.1 Conceptualisation Process

GIFT OF TIME

I have more time to do things I love.

CONFIDENCE

I feel confident and in control.

REFRESH ME

I feel better in mind, body, and soul.

FINNISH EXPERIENCES

I feel like I've experienced a little bit of Finland.
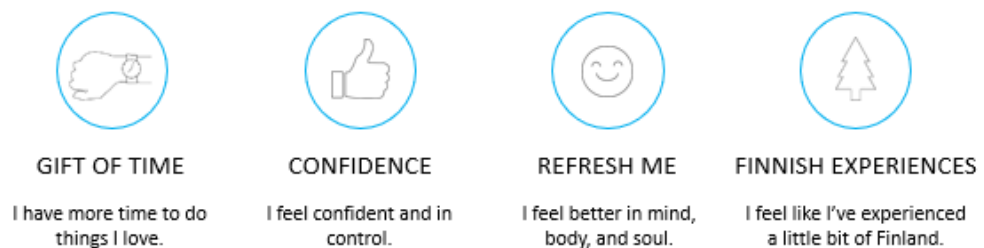
Figure 2. *Finavia's Principles of Excellence*

The conceptualisation process took 6 months and was defined through the series of cooperative workshops and sessions. The cooperation between the team of multidisciplinary researches and the airport project team contributed to creating a shared knowledge of the context of use and target users. Several brainstorming sessions were held with about 10 participants, who divided into teams to generated, sort ideas into categories and further rank them based on relevance to positively supporting the brand image of the airport and addressing passengers' pain points. From over 30 ideas, the concept of **airport experience journey** was created. In practice, it means enjoying the airport facilities by filling waiting time with a meaningful adventure, or in other words, following a route to discover purely Finnish products in local shops and most importantly, having fun while the process. The Finavia's Principles of Excellence, shown in Figure 2, were utilised to review components of traveller's airport experience, including their gain and pain points*.*

In addition to the concept creation, the cooperation between researchers and airport officials resulted in defined passenger and business core values, shown in Table 1. Another valuable outcome of the conceptualisation phase was the list of shops, which can be advertised in the application: *Marimekko, Moomin, FineFood, Iittaala, Lindroos, Finspiration, Arctic World of Santa and Duty-Free.*

Table 1. *Passenger and Business values, defined during conceptualisation*

Passenger Values	Business values
1) More enjoyment and less stress 2) Learning about a new culture 3) Filling waiting time with something meaningful 4) Increased purchase confidence	1) More time (and money) spent at the airport 2) Provide a great customer experience 3) Potential for airport shops to advertisement 4) The first airport to provide technologically -advanced shopping solution

4.1.2 Design Decisions

Next, based on the concept of **airport experience journey** and given passenger and business values, the idea of an airport application was iterated further considering the research agenda.

The interactive storytelling approach was found to be relevant technology to support airport experience journey and correspond to the defined values. With storytelling, it is possible to guide the users between the shops while providing culture-related and advertising information. In order to differentiate from the rest of the touristic storytelling solutions, we conclude with an idea of a personalised storyline, where the story is built around a character. To make the shopping journey more game-alike meanwhile raising intrinsic and extrinsic motivation, the trending gamification elements were selected as supportive techniques.

Considering the context of use, the application should be web-based to simplify the use and provide quick access to it without the need to download a standalone application. Thus, the structure and design of the application were implemented using HTML and CSS, and the logic and interactions were made with JavaScript. The storytelling feature was also coded using context-free grammar with JavaScript. Prior to the coding, a prototype in InVision was created to visualise the flow of the application and collect feedback from people involved in the project

4.1.3 The Finnish You - Structure and Functionality

The application, from the structural perspective, may be divided into four parts, each designed to address a specific purpose. The draft schema of the application navigation may be found in *Appendix A (1)* and the final version of navigation flow is shown in *Appendix A (2).*

The first part of the application introduces the application functionality via on-boarding pages and collects the information (required for story generation) via input form (*Appendix B).*

The second part of the application is an introduction story by the generated Finnish character. It narrates about the character's lifestyle and further, invites the user to partake in a virtual shopping adventure. This part, as well as other storytelling components, are further described in detail in Chapter **4.2 Storytelling Content and Generation**.

The next part is a virtual shopping adventure. The user is being guided by their Finnish version thought eight Finnish brands at the airport terminal in random order. The application presents the shop to visit (together with a narration about that shop) and suggests

a product to buy (virtually, as a part of a story for a virtual event). This screen is called thought-out the paper as "story view" and is shown in Figure 1 (a). The user decides to visit the recommended shop or skip it and move to the next shop (and product) description. Another alternative for the user is to select the shop manually, from the "map view", shown in Figure 1 (b). Once the user selects the shop from a map view, he or she would be redirected to the "story view" of that shop.

The switch between two views was primarily designed via clicking a map icon in the right top corner, which was further changed to the menu icon, while the "map view" became one of the options of the menu.

When the user selects to find a shop, proposed by the application, the challenge of locating the shop starts. The application displays a floor and gate number; no other guidance is provided. This design solution was implemented for a simple reason: we wanted the users to explore the facilities of the airport instead of looking at their phones while searching. When the user thinks the shop is found, she or he needs to go through a verification process. The verification simply means selecting one product from two alternatives, which better represents the content of the shop. The verification is successful if the user clicks on the correct product. If the users select the wrong option, he or she is asked a question *"Are you sure you are at the correct shop?"* If the user selects "*yes*", the verification is successful also.

The verification process was designed with an intent to persuade the users to move around and explore the shopping offers at the airport. However, an easy option to continue using the application was also added in case of any difficulties with the verification process. When the verification is successful, the application displays a reward for visiting the shop. The full process of finding the shop is illustrated in Figure 3.

Figure 3. The process of finding the shop from the story view to the reward page

The last part of the application is the final story, which combines the overview of the virtual shopping adventure and more facts on the Finnish lifestyle. The final story is displayed automatically when all eight shops are visited or may be opened manually. In the first version of the design, the users may open the final story by clicking the icon of the airplane on the map view, however, in the latest design, it was relocated to the menu.
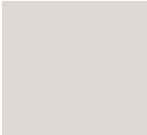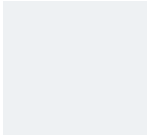
The final story content and generation is described in depth further. The drop-down was added while piloting the application with students, because the concept of the menu was found to be easier to understand, than the concept of self-designed buttons. It consists of five option: 1) to map view 2) to the final story, 3) help, 4) restart 5) about.

4.1.4 The Finnish You - Application Design

The pleasant visual design of a gamified application may contribute to the increased immersion and thus, the application was designed focusing on creativity of design and on expressing the Finnish attributes in design elements.

Hence, the application was composed in trending *flat design* style to create the feeling of being in a fairy-tale. To make the design unique, all visual elements, including windows, buttons, icons and illustrations, were designed in Adobe Illustrator in the united style. The designed materials can be found in *Appendix C: Design Elements*. The main UI components utilized one colour scheme (Table 2) and a rectangular shape with 2 round corners.

Table 2.   *Colour scheme for the application*

#0C2544	#E1D8D2	#EEF1F3	#069DD7	#8FC789	#D86642

The colour scheme was adopted from official Finavia colours (tones of dark blue, black, white, light grey and beige) to be consistent with the company's image. The combination of black text on a beige window over white background was selected for framing the storytelling component (text and visuals). In addition, light blue and green colours represented the colours of Finnish nature and were used in the design, for instance of header and footer. The mild dark orange colour was further added to attract attention to smaller or important elements, like ticks and rewards.

4.1.5 Gamification Elements

To make the application more engaging, the following gamification elements were selected to be used in the application:

- *avatars* – to enrich the character representation,
- *the challenge of finding the shops* – to challenge the user and accumulate the feeling of adventure,
- *rewards* – to add extrinsic motivation to the shopping process,
- *two progress indicators* – to constantly keep the users informed about their progress with the application.

Avatars – visual representations of the generated Finnish versions, were created in Adobe Illustrator, following the flat design style. In total, four males, four female and one avatar of neutral gender were utilized in the application. An avatar is firstly presented to the user during an Introduction story and, after, on the map view. If the user visits all

eight shops, the avatar is displayed (on the map view and in a final story) with the Finnish flag in hands, symbolizing achievement to know the Finnish culture.

A gamified design solution to providing hints about the location of the shop instead of full guidance provides many benefits. The ideas of guiding users via interactive maps or in-door location-tracking were discussed during the development process. However, due to the facts that Helsinki airport is quite small and in-door tracking is not yet accurate to bring positive usage experience, these ideas were dropped off. The application is designed to make the users navigate on their own for two reasons: 1) to positively influence the development of adventurous emotions, 2) to persuade them to explore the airport terminal area. The second reason would positively affect marketing by making them to check the logos and names of Finnish brands as well as their visual look and to notice discounts or special offers. Verification part and resulting rewards are other factors contributing to the feel of challenge and positively influencing the feeling of adventure and, in general, making the users actually move around the airport instead of sitting at one place all game.

Rewards – an additional motivational factor to visit all shops and collect eight Finnish products. In practice, the rewards represent the products, which the user successfully purchased as a part of the story.
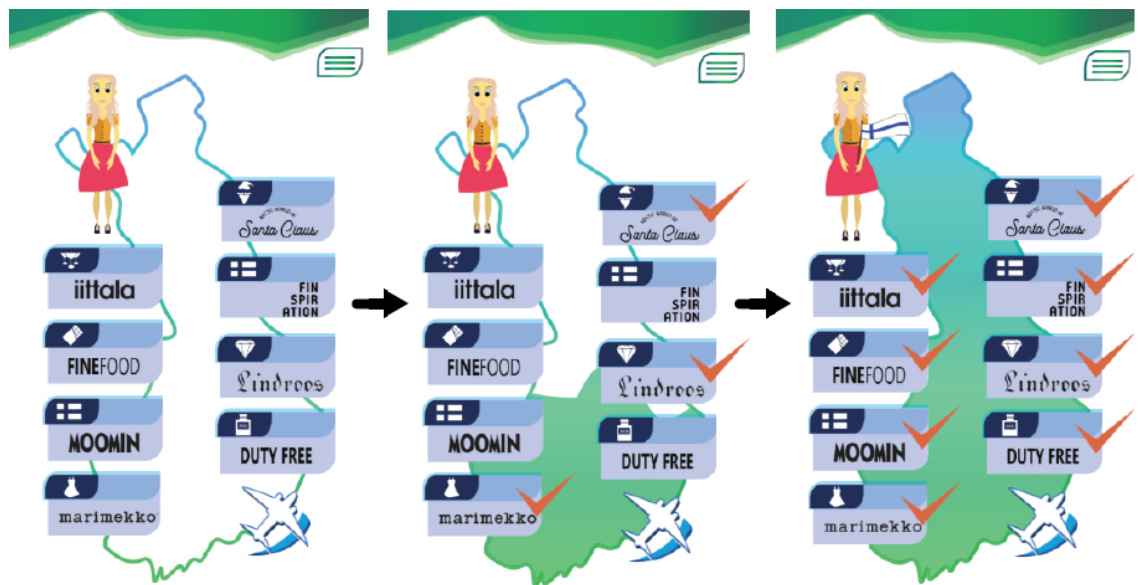
Figure 4. Finnish map as a progress indicator

Two progress indicators were implemented to constantly provide feedback on the user's progress in both views of the application – in a story view and in a map view. In a story view, the indicator of progress is represented as a shop counter. It displays that the user is at the "x" shop out of eight (see Figure 1 (a)). In the map view, the progress is displayed by manipulating the background image – map, shown in Figure 4. As the user visits the shops – the map is filled with colour, while visited shops are marked with the orange tik.

4.2 Storytelling Content and Generation

The storytelling component consisted of two elements, each addressing its own goal: advertising and promotion of local products and culture exploration. A unique personalised storyline brings culture-related information (e.g., facts on Finnish lifestyle and traditions), while the virtual shopping adventure narrations create the context for walking around the airport and provide a sophisticated description of the shops and products.

A character for a personalised storyline is generated with context-free grammar. The content of it is based on the user's gender and age (collected via input form), and personal preferences (climate – warm or cold, lifestyle – active or calm, place of living – city or countryside), shown on Figure 5.

Figure 5. *Personal preferences visuals: climate, lifestyle, and place of living*

4.2.1 Character-related Storytelling

The virtual character includes the following characteristics: age, gender, name, avatar, place of living, place of work, and some information on free-time spending, e.g. pets, hobbies and life events. Based on these characteristics, the introduction story and the final story are generated.

The **introduction story** consists of five elements for each user, described in the following list with examples of code:

1) *Finnish name* and it's *meaning* - The name is assigned to the character based on the selected gender. Three pools of traditional Finnish names were created. Each pool contains three names and an explanation of its meaning. The examples of building the intro story, its first sentence in addition to the example of neutral name names are shown in Figure 6.

{name: "bio", children: ["bioIntro", "nameDescription", "homeDescription", "activityDescription", "petDescription", "hobbyDescription"]},

{name: "bioIntro", children: ["HiNameIs", "name", "genderNode", "period", "likeYou"]},
{name: "HiNameIs", literal: "Hi! My name is "},
{name: "likeYou", literal: "I am just like you, but born in Finland. "},
{name: "likeYou", literal: "I am your Finnish version. "},
        |
{name: "name1", features: {nameID: "Helmi", gender: "neutral"}, literal: "Helmi"}
{name: "nameDetails", features: {nameID: "Helmi"}, literal: " translates from Finnish as 'pearl'. "},

Figure 6. Character generation and story generation - name

2) *Place of living (city or village)* – The character's place of living is randomly assigned from two pools of Finnish cities and villages. In each pool, there are three names of the place of living with an interesting description that provides some culture-related information (Figure 7).

{name: "homeDescription", features: {cityVillage: "city"}, children: ["liveIn", "city", "townDetails"]},
{name: "homeDescription", features: {cityVillage: "village"}, children: ["liveIn", "village", "villageDetails"]},
{name: "liveIn", literal: "I live in "},

{name: "city", features: {townID: "Tampere"}, literal: "Tampere"},
{name: "townDetails", features: {townID: "Tampere"}, literal: ", a town of 200 000 people with history of large factories. It is also the home of Muumin museum. "},

{name: "village", features: {villageID: "Suonenjoki"}, literal: "Suonenjoki"},
{name: "villageDetails", features: {villageID: "Suonenjoki"}, literal: ", a village know from its strawberry farms. "},

Figure 7. Story generation – a place of living

3) Workplace – The workplace is determined based on the age of the user. The users under 20 are reviewed as young and their story has one option – to study at university. The users over 20 are assigned with a working place, which is selected from a pool of 5 professions, including the literal to highlight the Finnish aspects (Figure 8).

{name: "activityDescription", features: {age: "adult"}, children: ["workDescription", "adult"]},
{name: "activityDescription", features: {age: "young"}, children: ["studyDescription", "young"]},

{name: "studyDescription", children: ["studyIn", "university"]},
{name: "studyIn", literal: "
I study in "},
{name: "university", literal: "university, like many others. "},

{name: "workDescription", children: ["workFor", "work", "period", "workDetails"]},
{name: "work", features: {workID: "Nokia"}, literal: "Nokia"},
{name: "workFor", literal: "
 I'm working in "},
{name: "workDetails", features: {workID: "Nokia"}, literal: "Yes, exactly that Nokia, as the strongest mobile phone in history! "},

Figure 8. Story generation - workplace

4) Pet – is assigned to the character randomly to make the story richer in detail and tell more about Finnish culture, e.g. the Finnish names for pets and local breeds. Two Finnish dog breeds were identified; however, no Finnish cat breeds were found, and hence, a European cat breed was used (Figure 9).

```
{name: "petDescription", children: ["petIs", "pet", "petDetails"]},
{name: "petIs", literal: "<br>I have a "},

{name: "pet", features: {petID: "dog"}, literal: "dog"},
{name: "petDetails", features: {petID: "dog"}, literal: " of a Finnish lapphund breed, named Turre. "},
{name: "petDetails", features: {petID: "dog"}, literal: " of a Finnish spitz breed, named Lumi. "},

{name: "pet", features: {petID: "cat"}, literal: "cat"},
{name: "petDetails", features: {petID: "cat"}, literal: " of a European shorthair breed, named Mirre. "},
```

Figure 9. Story generation - pets

5) *Free-time spending* – is assigned to characters based on preferred lifestyle, active or passive. Active lifestyle was represented by camping, skiing and visiting hockey games. Passive was shown via visiting a sauna, staying at home by the fireplace. (Figure 10)

```
{name: "hobbyDescription", features: {hobbyActivityLevel: "active"}, children: ["hobbyDetailsActive", "active"]},
{name: "hobbyDescription", features: {hobbyActivityLevel: "passive"}, children: ["hobbyDetailsPassive", "passive"]},

{name: "hobbyDetailsActive", features: {hobbyID: "outdoors"}, literal: "<br>I prefer to spend my free time on nature
outside the city. Camping is a hobby that makes me a happy person. "},

{name: "hobbyDetailsPassive", features: {hobbyID: "indoors"}, literal: "<br>As every Finn, I love to visit sauna weekly.
Every Finnish house is equipped with sauna, but I prefer to visit public sauna on the lake coast, so I can communicate
with others and swim in lake.   "},
```

Figure 10.   Story generation - hobby

Next, two alternative Intro stories are presented in Figure 11. The Figure 11 (a) shows the story for character **Miika** (*male, adult*, place of living: *city,* climate: *warm*, lifestyle: *passive*), while the Figure 11 (b) the story for character **Kaarina** (*female, adult,* place of living: *village,* climate: *cold*, lifestyle: *active*).

Hi! My name is **Miika**. I am just like you, but born in Finland. Miika refers to 'who looks like God'.
I live in **Espoo**, the second largest city nearby Helsinki. Although relatively highly populated, it has large amounts of natural wilderness: the city has a total of 71 lakes and a long coastline on the Gulf of Finland.
I'm working in Finnish forest industry company Metsa. The job is hard, but I like it, because I spend working hours on nature.
I have a dog of a Finnish spitz breed, named Lumi.
As every Finn, I love to visit sauna weekly. Every Finnish house is equipped with sauna, but I prefer to visit public sauna on the lake coast, so I can communicate with others and swim in lake.

Hi! My name is **Kaarina**. I am your Finnish version. Kaarina translates from Finnish as 'pure'.
I live in **Rantasalmi**, a place in the heart of Savo area with a lot of beautiful lakes.
I study in university, like many others.
I have a cat of a European shorthair breed, named Mirre.
Every weekend I take my family to spend some time on nature. Together we love to walk on a frozen lake and play with snow.

Figure 11.   *Two alternative versions of an intro story: Mikko (a); Kaarina (b)*

The generation of the **final story** is based on the virtual character and the shopping adventure. It narrates the overview of virtual shopping, including visited shops and virtually purchased products. The final story can be divided into five parts (in the same logic as the introductory story)

1) *Place of living – extended.* This story segment depends on the place of living, age, and gender of the character. It provides more details on the Finnish lifestyle – the family ties of the character (lives with *parents/girlfriend/boyfriend/partner/wife/husband*) together with the description and location of a place of living: a Finnish house (for a place of living: village) and a Finnish flat (for a place of living: city). Few alternative descriptions of the location were coded to add variance for the story, for example, observing the sunsets over lake/field/forest or walking distance to the park/river/lake. This angle helps to present the connection between the Finnish people and nature around.

2) *The introduction to the virtual event reminder and the means of getting there.* The second part brings the generated event and in addition, narrates on the means of how Finnish people travel in the country (randomly assigned transport: *by car, by bus or by train*).

3) *Finnish food* – This element narrates what kind of dinner the character had during the virtual event and uncovers the traditions of Finnish cuisine. Three options of food were coded: *salmon soup*, *kalakukko* - a traditional Finnish dish made from fish baked inside a loaf of bread and *grilled sausages*.

4) *Overview of purchased products* – This part reminds the user about visited shops and how the purchased products were used during the event. The description was created for each product depending on the purpose of use. For instance, the products like clothes and shoes were "keeping the character warm", the presents "were appreciated" and so on.

5) *Plans for future* – This part was designed to evoke the feeling and empathy of the users. It narrates the ending for the virtual event and how pleasant it was. It further uncovers the future of the character, which includes more facts on Finnish culture. This part is generated based on the type of the event (with friends or with family) and follows 2 different structures. With family, the character shares plans *for pregnancy/engagement / taking a pet / starting new work* or *moving to another city* and the story narrates how the family reacted. With friends, the character plans to meet them in the future no matter the distance between them.

Further, two alternative versions of the final stories are shown in Figure 12 for the same characters (Miika (a) and Kaarina (b)).

Hi again! I live in **Espoo**, next to Helsinki in the south of Finland. I live together with my wife in a small flat with a balcony, from where we can observe sunsets over lake almost every day.
My family members gathered for Vappu in summer cottage this weekend. All my family was happy to see us, as it have been a while since we met last time. I gifted the **Aalto vase** I bought and the **woolen socks** I chose was appreciated. For our dinner, we decided to eat kalakukko, traditional Finnish dish made from fish baked inside a loaf of bread. the **Karhu beer** I got made people happy.
In the evening, we went to sauna on a lake coast and **Jokapoika T-shirt** kept me warm. During the night we enjoyed some drinks, good music and interesting boarding game.
I chose this evening to inform everyone about our plans to buy a summer house together. I was so glad that my family supported us! New life period is starting soon and my family will be there for me.

Hi again! I live in **Rantasalmi**, situated in the east side of Finland. I live together with my Mom in a small, but cozy house with a balcony, from where we can observe sunsets over forest almost every day.
My friends gathered for a birthday party in summer cottage this weekend. Everybody were happy to see us, as it have been a while since we met last time. I gifted the **Tarkkanen jewelry** I got and the **RuisSipsa** I got made people happy. For our dinner, we decided to eat grillimakkara, translated from Finnish as grilled sausages. the **kuksa** I chose was used to drink some drinks.
In the evening, we decided to go fishing before the sunset and **Moomin Alphabet sweatshirt** kept me warm. I have met new friends and now we are planning a camping trip together. Unfortunately, they live in another city, but for Finns it's not a barrier and we will see each other again for sure!

Figure 12.   *Two alternative versions of a final story: Miika (a); Kariina(b)*

4.2.2 Shopping-related Storytelling

To create a context for the virtual shopping at the airport a Finnish persona is being invited to a virtual event, for which they need to perform some shopping. The event is generated based on the user's age (adult or young) and preferred climate (warm or cold). The virtual event may be a Finnish traditional celebration in a summer cottage or family house (e.g., Vappu, Midsummer or any other celebration as a birthday of friends and relatives, or a housewarming party) or outdoor activity (e.g., a beach picnic or camping). The example of the invitation is presented below:

"This weekend, my Granny will go on a camping trip. To prepare, I need to do some shopping."


Figure 13.   *Two illustrations for a virtual event: Finnish cottage (a); camping place (b)*

In the first designs, this generated part was placed at the end of an Introduction story of the virtual character. However, during the pilot study, the need to place it separately together with visual content (such as photography, illustration or animation) was identified. Hence, in the final design, the invitation to the virtual event is displayed in a separate web-page together with illustration in flat design style (Figure 13).

Further, the application redirects to the story view, which suggests a product to be virtually purchased for the event together with the product description on one tab and a shop description on another tab. The example of narrations about shop and products is shown in Figure 14 – (a) story view and (b) shop view. In the first tab, with the icon of a book instead of heading, the application provides reasoning to buy a specific product (why this product is required for the virtual event) accompanied with a marketing text. The second tab with info icon presents the marketing description of a shop, which represents the brand from the perspective of its uniqueness and Nordic culture. The same information is presented in all eight shops of the application.

The advertised product is selected randomly from three options of products per each shop. In total, 24 products were selected to be used in the story and further categorised. The illustration or image of the product is not shown to the user but is given as a reward after visiting the shop. Hence, the user virtually collects virtually purchased products, which may be opened from the map view.
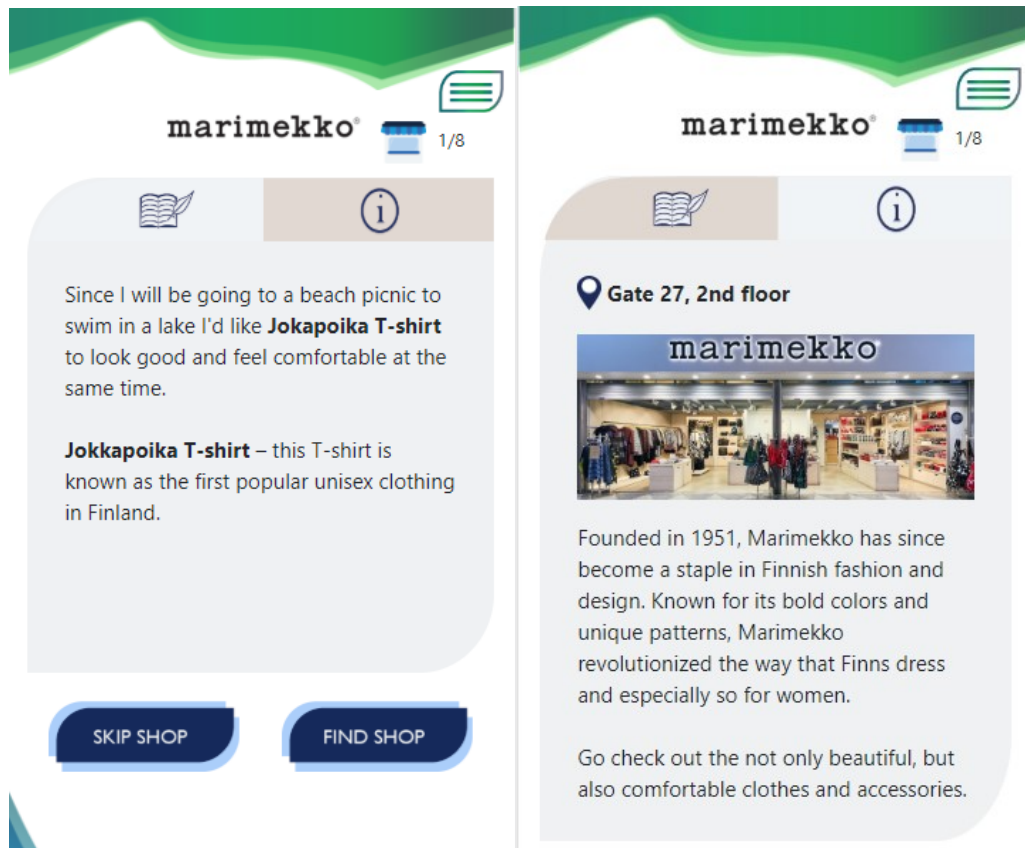
Figure 14.   *The example of shopping-related storytelling content: (a) Story view; (b) Shop view*

5. RESEARCH STUDIES

This chapter presents the conducted research study, which consisted of two iteration-rounds: the pilot study in a simulated airport environment and the filed study at Helsinki airport. The studies description includes a detailed description of methodology, procedure, participants and finalised with results. Methodology, participants and procedure are described together with the results and modifications to clearly define the differences and similarities of the iterations.

5.1 User Study in the Simulated Airport Context

This study is described in the paper *The Finnish You – An interactive storytelling application for an airport environment,* published in the Mindtreck'18 conference [8].

The first testing was held to evaluate the usability and functionality of the application, including the story segment grammar and flow, in a controlled environment before taking it to the real context. This way, it was possible not only to avoid usability issues and failures but also to enhance the logic and aesthetics of a story-generation before bringing the application to actual target users, the passengers at the Helsinki airport.

Hence, with this study, we evaluated the effectiveness and quality of a personalised story in terms of consistency. Second, we measured user experience and engagement with interactive storytelling applications in general and collected information on how to make it better.

It was conducted at Tampere University with international student-participants. The experiment was conducted in-office alike surroundings, simulating an airport shopping environment and hence, persuading the participants to physically move while using the app and search for shops.

5.1.1 Methodology

In the first iteration, both qualitative and quantitative data were collected (via online questionnaires and interviews) to gather statistically analysed data and support it with in-depth user insight.

The quantitative data was collected in two steps via pre- and post- online questionnaires (made with Google forms). The pre-questionnaire *(Appendix D)* consisted of seven questions to collect the background of the participants, including name, gender, age, country of birth and travelling/shopping-related questions. We collected what Finnish brands the participants knew before, how often they travel and do they buy products and souvenirs in airports.

Post-questionnaire consisted of 4 parts *(Appendix D).* The first part was adopted from the QUIS questionnaire and collected the overall reaction by measuring the users' subjective satisfaction [21]. The participants were asked to answer the question "What do you think about the application?" by selecting a point between pairs of bipolar words on a 5-point semantic differential scale.

The next section consisted of nine statements, adopted from the USE questionnaire [31]. Participants were asked to express their opinions about the usability of the application on a 5-point Likert scale (1=Strongly Disagree, 5=Strongly Agree). All further sections are structured in the same style to easier the process of filling in. The third part was contributed to the storytelling feature and consisted of six statements on the structure and hedonic aspects of the story. The last section consisted of three statements to evaluate the content of the application from the company's perspective, e.g. if the presented information on shops is valuable and attractive for users.

The qualitative data was collected with the semi-structured interview *(Appendix E)*, which consisted of 5 leading and multiple follow-up questions. The interview was oriented to record the thoughts and feelings of the participants on the application and their Finnish persona's story. In addition, two questions were related to their attitude toward shopping and knowing of the Finnish brands. The last question dived into the usability of the application, e.g. navigation, structure, and logic of the application as well as into possible application modifications and enhancements.

5.1.2 Participants

Nine students from technical fields (8 from HCI, 1 Signal Processing) participated in the study. There are multiple benefits of having multinational student participants. First, they have a knowledge of User Experience and Product Development, and thus, have a clear vision of the principles of usability, fresh memories from learning experiences and insight from participation in various projects. Second, being not native Finnish, they could also provide valuable perspectives on the cultural side of the application. After the study, the participants were rewarded for their help with one movie ticket to the local cinema.

More detailed background of the participants goes as follows: the participants were aged from 20 to 30 (M = 25); there were 7 females, 1 male and 1 participant of neutral gender. They represented the following nationalities: 4 Chinese, 1 Vietnamese, 1 Malaysian, 1 Bangladeshi, 1 Ukrainian and 1 Russian. Regarding their travel habits, two of the participants travel more than 4 times a year, four participants travel 2-3 times a year, one travels once a year and two left the answer blanc. Further on buying products and souvenirs at the airport, one of the participants responded that they prefer to do it at the airport, four responded they would buy products and souvenirs at the airport if they need something quickly and four responded they do such shopping at the airport sometimes. We also identified that the majority of the participants were familiar with some of the Finnish brands, presented by the application. Only one participant marked one shop – *FineFood.* The rest were familiar with at least three brands: *Marimekko*, *Iittala* and *Moomin*, and one of them knew also *Finspiration* and *FineFood*.

5.1.3 Procedure

Prior to the experiments, eight photos of the airport shops (presented by the application) were printed and located around the room at a distance of 1-1,5 meters from each other in random order. Hence, experimental conditions were modified to be more like the airport environment, as the participants would be physically active during the experiment and would experience the challenge of looking for shops based on their appearance.

The experiment started with an introduction to the research agenda. After, the participants read and signed the consent for audio recordings during the whole experiment. Next, the moderator presented the description of the application and the study practicalities, including instruction and example for the thinking-aloud method. Next, participants filled in the pre-questionnaire from the laptop. After the recordings started, the participants were handed the following scenario, meant to create contextual frames for the future simulated shopping "adventure":

"You have arrived at Helsinki airport and your next flight (to Rome) is in 3 hours. You have selected a cosy café, ordered some drinks and connected to local wi-fi to know what you can do during waiting for the next flight. After you have connected to the internet, you were redirected to the Finavia start page. You have noticed an invitation to try a new shopping application called "The Finnish You"…"

After, the participants were handed with Galaxy S7 (on Android 7.0 operating system) with the open application and the following list of tasks.

Task 1. – *Start the game and fill in the information asked*
Task 2. – *Read an intro to your Finnish story and proceed further*
Task 3. – *Find information about the suggested shop (shop description) and go
              visit the shop*
Task 4. – *Open the map of shops and check the reward you just got*
Task 5. – *Visit 2-3 shops; details are up to you*
Task 6. – *Access the summary of your adventure and save the story to a device*

After the simulated shopping adventure was over and the participants successfully saved their final story to the device, they filled in post-questionnaire and answered interview questions.

5.1.4 Results

This section describes the combined results of questionnaires and interviews, presented by four sections: *1)* overall reaction to the designed storytelling application, *2)* usability and user satisfaction section, *3)* storytelling and user engagement section and *4)* storytelling and shopping/related section. Further, this chapter briefly explains what modifications were implemented after this user study.

Overall reaction to the application. The overall reaction to the application was positive. The concept of using interactive storytelling at the airport for time-spending and shopping exploration was found to be interesting and useful, the participants saw many benefits of such applications. The participants' reaction demonstrated that the application is applicable for airport context of use and may bring values to the end-users.

P7*: "I think it's a good application, it can motivate people to find shops and do shopping"*

P6: *"I think it kind of different shopping experience than before. It gives me unique rec-ommendations for my shopping and some reward that can motivate me to find the shop and, I think, the Finnish story of mine is interesting."*

P2:" "*I think it's interesting and have a very good idea, because it would totally reduce the expanse of human resources in the airport*" (regarding *"really big Chinese tourist groups"*)

One of the participants thought that this application would reduce the feeling of being lost and persuade to explore the airport facilities:

P1: *"Actually, I will use it if there is kind of application in the airport, because you always feel lost in the airport and if you have a lot of time, you just don't know, you want to go around, but you still feel lost."*

The quantitative data analysis demonstrated that despite the potential of the concept, the application requires modifications and enhancements. As shown in Figure 15, re-garding the pair of words *terrible-wonderful* (MED = 3), 4 participants were positive, 4 were neutral and only one was negative. Further, five participants found the application to be easy to use, two were neutral and two found it to be difficult (MED = 4). Seven participants found the application to be satisfying, one was neutral, and one found it to be somewhat frustrating (MED = 4). Five participants were neural and four positives to the pair of words *dull-stimulating* (MED = 3). Finally, five participants found the applica-tion to be flexible, three were neutral and one found it somewhat rigid.
.
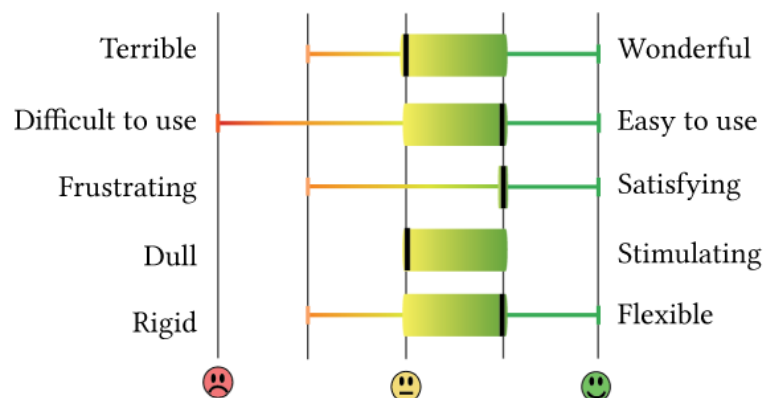
Figure 15.   *Overall reaction to the application, adapted from QUIS question-naire*

Usability and User Satisfaction. The pilot evaluation showed, that the design of the application is intuitive and appropriate (see Figure 16). Most of the participants (N=7) found the application to be user friendly (MED = 4) and easy-to-learn (MED = 4). None of the participants thought it was hard to remember how to use the application (MED = 5). Further, almost all the participants, excluding one, were indeed satisfied with the ap-plication (MED = 4). More than half of the participants (seven) enjoyed using the appli-cation, one stayed neutral and one did not enjoy the experience with the application. Five

participants agreed they would recommend the application to their friends, two were neutral and one strongly disagreed, commenting "*I won't share it, it's not interesting for my friends*". Regarding the freedom of choice, while performing activities with the application, three participants agreed to this statement and six were neutral. In regard to usability and user interface, participants commented:

P6: *"I liked it, the application was very nice and easy to use. It was clear what to do and I liked the story, in the end, included all the stuff that I visited"*

P1: *"And actually, I quite like the interface, it was so cute and icons – I love it very much. And after you enter the shop, there are 2 selections to verify if you already went to the shop, so that is quite cute. And icons are related to the brands, so I don't know, it makes me feels very fashion."*
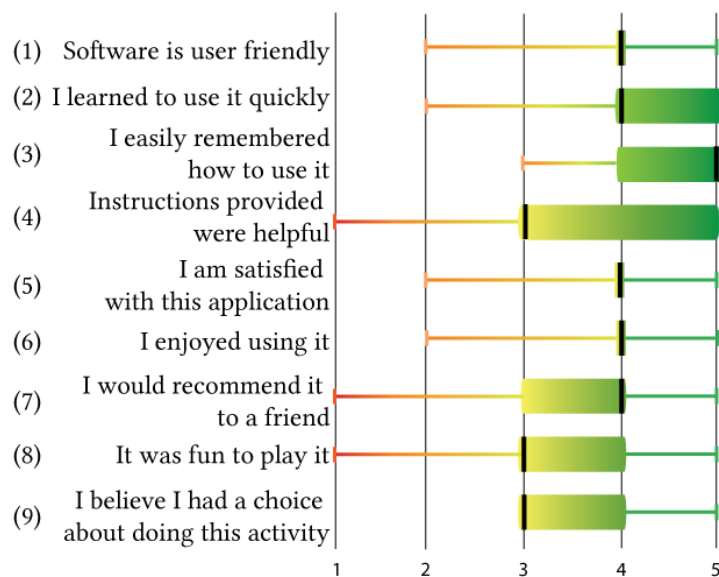
Figure 16.   Usability and User Satisfaction results, the statements are adapted from USE questionnaire

Nevertheless, we identified the weakest points of the application are provided instructions and the feeling of fun. Three participants strongly agreed, one agreed, three were neutral, one disagreed and one strongly disagreed that the instructions provided were helpful (MED = 3). During interviewing the participants, we gathered that provided instructions were too long to read, so most of them just skipped to read it. Further, all application's functionality was presented at the very beginning of the working with the application and did not attract the users' attention. In addition, only four participants (two of them selected positive extreme) had fun while using the application. In contrast, three participants selected neutral response to this statement and two selected negative response (one of the selected negative extreme).

Storytelling and User Engagement. The interactive storytelling was found to be engaging and interesting; six participants were interested to read more about their Finnish version (MED = 4) in contrast with two participants, who disagreed with this statement.

Further, five agreed and two disagreed that the summary of their adventure was interesting to read (MED = 4). Two participants liked that the summary story included a reminder on all visited shops and further commented:

P6: "I liked that it actually summed up in a very nice way and it was pleasant to read in the end when she was telling it was such a nice evening with my family, it makes me feel really good."

P2: "And in the end, it was so pleasful - a pleasure to me to read some kind of story. Although it's not a real me, I feel that ok, I am something like that."

The feeling of being immersed with an interactive storytelling application and being motivated by the story was also raised by some of the participants during interviews.

P1: "Ah, that is very interesting for me, because you feel like you are immersive into the application, being a part of it. This is quite new to me."

P3: "Yeah this is the part (the story) I enjoyed so much, because like it gives the energy to explore this app and do the tasks step by step."
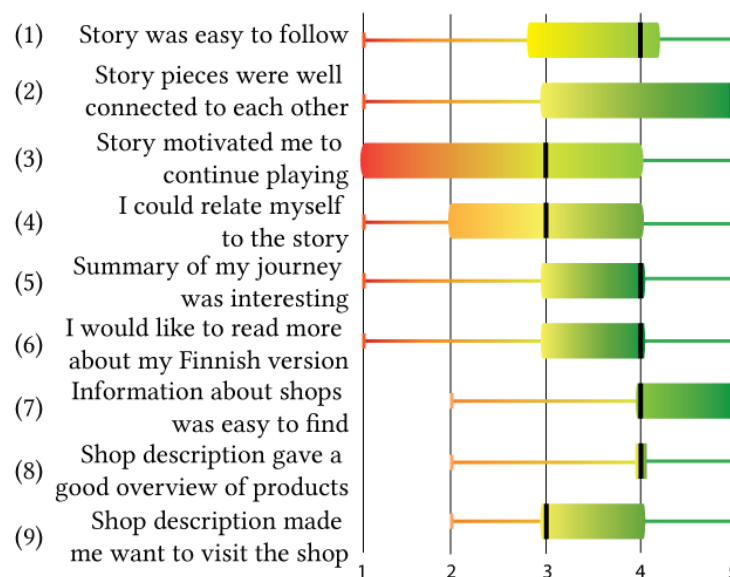
Figure 17.   *Storytelling and content evaluation results*

Nevertheless, less than half of the participants could relate themselves to the story, two strongly disagreed with this statement, one disagreed and two were neutral (MED = 3). Further, despite four participants agreed (one of them strongly agreed) that their story motivated them to continue playing, three other participants strongly disagreed, one disagreed and one stayed neutral (MED = 3). By linking these two statements, we observed some relations between the feeling of being related to the story and motivation, however, the sample is too small to provide any statistically proven results. In-depth, all three participants, who disagreed that they felt related to the story, selected negative extremes to the statement on motivation. On the other hand, out of four participants who felt related to their story character, only one disagreed that the story was motivating. One participant,

who marked the neutral feeling of being related to the story, on the opposite, found the story to be strongly motivating. This finding indicates there are other subjective metrics affecting motivation when using this application.

Two female participants raised the topic of ethics in such storytelling from a different point of view. Their final stories included the "pregnancy plans" or "news on engagement", and one participant showed a positive reaction to such a piece of the story, while another was disappointed.

P3: (talking about pregnancy plans of their Finnish version)
"To me, it's perfectly fine because I know it's not me, it just a story. It just a fun part for me also. I enjoyed it and I don't have any ethical problem, so it fine, it's just a story."

P2: (talking about news about engagement of their Finnish version)
"*Because I am female with an age 24, so they target me as a female who is going to get engaged. But you don't know the applicant's family status, so it might be hurting if they don't have a boyfriend yet. Because, women are sensitive like emotionally, so not actually engagement. It can just be with your family, nothing to do with engagement.*"

During the interviews, some participants showed a desire to get alternative versions of the story and play around with input data. They also shared few ideas on how to enhance personalisation and relevance of the story and character, for instance, more detailed background data collection (via questions and pictures), selecting between alternative stories and customizing avatars.

P2: "*The story is good, like, if I based on my age it could be probably related to my life. It would be fine if I try the game if I am a man at the age of 40, how that would be.* [laughing] *Yeah, I would like to see how it comes.*"

P7*: "If you can create your own character here, pick your hairs colour and dress you wear and maybe this little girl can follow you when you find the shop."*

Regarding the quality of the personalised storyline, more than half of the participants found the story to be easy to follow (MED = 4) and strongly agreed that story pieces are well connected to each other (MED = 5). However, it was also mentioned by one of the participants that the story is "very generic" (P5). Other participants commented that the story itself, including intro, finally story and shop descriptions, was "*really long to read*" (P4) *"a bit long for me"* (P7) and suggested to *"break into small stories"* (P4) and add animations and pictures. In general, the tendency for replacing textual information with visual information was spotted among the participants. For instance, some participants commented that *"pictures with several words under it will be a better choice for me"* (P1) and *"image in the middle and sentence on the up and down"* (P4) instead of long text. However, there were participants, who reviewed the length of the story appropriate and asked to add even more information on Finnish culture and lifestyle.

Storytelling and Shopping. As qualitative data showed, narrations on brands and products were descriptive and motivating for some of the participants. Most of the participants

(eight) agreed to that shop description gives a good overview of products, three of them selected positive extreme, one disagreed (MED = 4). Further, two participants disagreed, that stories were motivating to visit shops, three were neutral and three agreed (MED = 3). The participants commented:

P8: *"Story is a good way to help customers to know what they can buy"*

P5: *"I think it's a fun way to explore different shops, because usually when you visit duty-free places, you just go there and look for items and ask people around to see, what are the Finnish stuff that I can get? But with this, you can kinda know what the main Finnish stuff is. That is obviously very useful for me if I am like going to last minutes' souvenir shopping ball."*

Student-participants also generated a variety of ideas on how to enhance the shopping guidance and representation of shops. They suggested to add more shops and add a feature to categorise and filter shops by segment, e.g. souvenirs or cosmetics. They also suggested adding other features, from recommendations to trying a product on an avatar.

P1: *"Yeah, I want all of them. If you can have all the airport shops inside the application, it will be the best."*

5.1.5   Modification to the Application after the Pilot Study

Based on this study's results and on the duration of the whole study, the application was modified to fix usability mistakes and other issues. Critical mistakes were fixed on-the-go, for instance, the navigational bug, which led to adding drop-down menu right after the second participant. As a result, the following changes have been implemented before the field study with actual users. The On-boarding pages were modified: lengthy text was replaced with short statements and pictures. A generated invitation to a virtual event, which was primarily displayed together with an Introduction story, was placed on a separate page in combination with visualization of location (e.g., the picture of the cottage or the beach picture). The map of Finland visualization was enhanced by adding orange ticks to the visited shops. Some language and structural mistakes in text generation were identified and fixed, the font size was increased. The drop-down menu was designed together with icons and placed to the right upper corner on every page. Pages with information were also redesigned following suggestions of the students – less text, more visuals.

5.2   Field Study at the Helsinki Airport

This study is described in the paper *Promoting Local Culture and Enriching Airport Experience thought Interactive Storytelling*, published in the MUM'19 conference [9].

The field study was initiated to observe how the application will be used in a real context by real travellers of the Helsinki airport. The goal was to understand how travellers would perceive the concept of interactive storytelling for learning new facts about the culture and how it may affect their shopping routes and intentions.

5.2.1 Methodology

In consonance to the first iteration, both quantitative and qualitative data were collected during the field study. To not only measure the user's perception of the application, but also to systematically evaluate the user's behaviour, the observation fill-in form was utilized in addition to the questionnaire and interview.

The observation form *(Appendix F)* was instructed to be filled for each participant. It included information about the amount of the participant during the session (individual or in pairs) and the level of their English language skills. It also collects their reading styles– if they read the text fully or party or scan the text segments with eyes. The form also collects the participants' behaviour during the shop finding process, e.g. do they visit the shop and what activities they perform at the shop (e.g., observing or touching the products).

In contrast to the pilot study in a simulated shop environment, in the field study, we utilized paper-based questionnaires instead of online. This is due to the airport context of use: using a laptop might be harder to manage in the public space of the airport. For the same reason, we focused to keep the questionnaire to extent short – to be no longer than one page. As a result, the paper-based questionnaire *(Appendix G)* consisted of three parts:

- the part on background data collection, including age, gender and nationality of the participants,
- the part on overall reaction to the application, adopted from the QUIS questionnaire [21] and rephrased for the convenience of use. In this part, the participants answered the question "What do you think about the application?" on a 5-point scale between the five pairs of bipolar words.
- a part of the user's reaction towards the idea of the application and the concept of storytelling. In this part, the participants selected to what extent they agree or disagree to provided 7 statements on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

The interview frame *(Appendix E)* consisted of 6 questions and few leading-up questions. It was designed to gather the strongest and weakest points of the application as well as to understand the effect of storytelling on the culture learning and shopping exploration. The interview was intended to be no longer than 7 minutes.

5.2.2 Participants

In total, 15 travellers of different nationalities participated in the field study. The targeted amount of the participants (30) were not reached due to the circumstances, described further in the Procedure section. The nationalities are spread as follows: 8 were Chinese, 4 Russians and the remaining were French, Israeli and Nepalese. The participants (9 male, 6 female) were aged between 19 to 47, with a median being 27.

Nine of the participants used the application individually, and the rest six used the application in pairs (3 pairs).

5.2.3 Procedure

The airport terminal area is a place of high security and cannot be accessed by other people than air tourists with tickets purchased. Hence, the organization of a field study at the terminal area was not simple and required special access rights from airport officials. After a long discussion, we managed to agree on a one-day user study under the supervision of airport officials. To utilize the given time with maximum value, three researchers (native Chinese, English and Russian speakers) participated in a study.

The researchers, accompanied by a company's representative, accessed the terminal area and started to approach possible participants. The instructions *(Appendix H)* on how to recruit participants and act during the study were provided to the researchers in order to be persistent with a procedure. The strategy was to find a person or couple of people, who are sitting at the gates and waiting to board their flight. The company's representative had proposed the gate numbers with the most relevant flights. The testing procedure was designed to be performed with one person or in pairs.

After a brief introduction of the testing procedure and the application, if travellers agreed to participate in the study, they signed in the consent form for participation and audio recordings of the interview. Then, more detailed instructions to the procedure were provided and methods of the study were described. Next, the participants have been handed with a smartphone: Samsung Galaxy S7 running on the Android 7.0 operation system. No instructions were further provided. The researchers embraced the freedom of exploration and interacted with a participant if only required, for example, when the participant asked a question or need help with the application. For the duration of the study, the researchers were observing how participants react to the storytelling component and how they proceed with a verification process at the shop. After two-three shops were visited, the researchers asked the participants to stop a shopping adventure as well as find and read their final stories.

After the usage of the application was over, the participants filled in the paper-based questionnaire and answered the interview questions. All the participants were rewarded with candies for their participation.

5.2.4 Results

This section describes the combined results of questionnaires, interviews and observation forms in three sections: *1)* overall reaction to the application, *2)* storytelling and user engagement section and *3)* storytelling and shopping section.

Overall Reaction to the application. The concept of interactive storytelling for airport context was met positively. Some travellers admitted the creativity and novelty of the concept, one of them commented, that it was "*not typical, funny and cool way to go through the shops*" (T3). Participants also commented:

T2: *"It's interesting, it's new and I have never tried something like this".*

T4: *"I like it as a game and if you have some free time at the airport you can enjoy it."*
T5: *"I liked it and it's funny, it's something new, I have never gone through this before"*
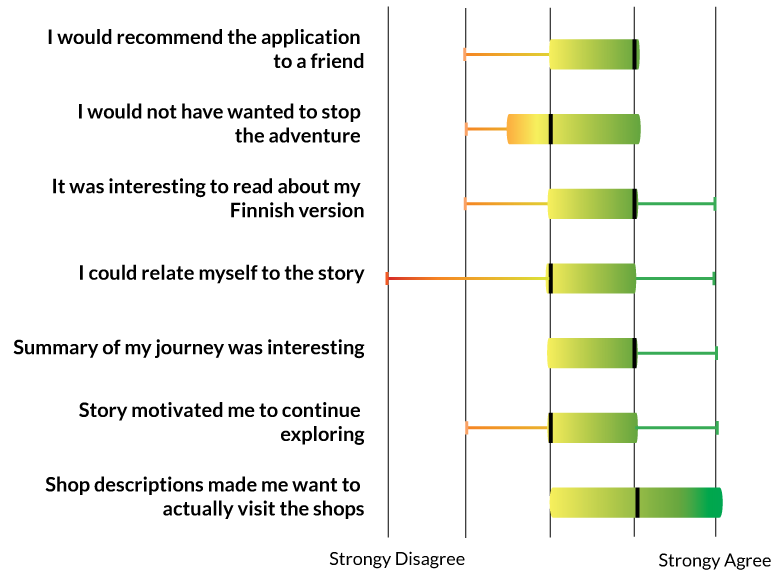**T7:** *"I think it is quite interesting, like an adventure."*
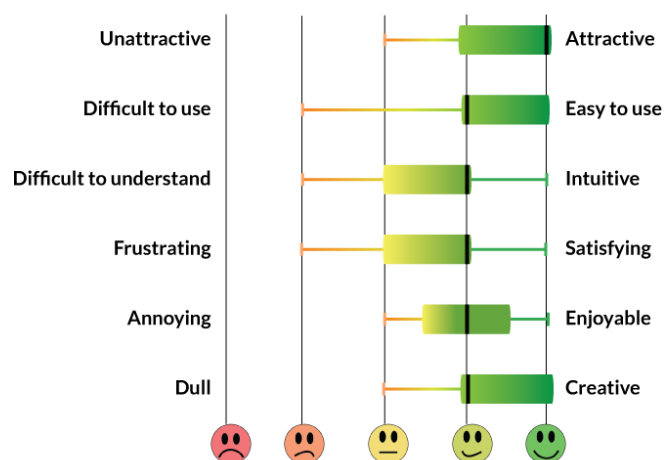
Figure 18. Overall reaction to the application

The results of the questionnaire on the overall user reaction are shown in Figure 18. The application was found to be attractive by twelve participants (80%); eight of them (53,3%) selected positive extreme (MED = 5). Twelve travellers (80%) found the application easy-to-use; half of them were on the positive extreme, while only one found it to be difficult-to-use (MED = 4). Two travellers (13.3%) admitted some difficulties with understanding the application, while nine travellers (60%) found it to be intuitive; three of them were on positive extreme (MED = 4). For instance, some of the participants commented that they had some challenges in understanding English text; few of them suggested adding other languages than English, for example, Chinese and Russian. However, one traveller mentioned that despite the difficulties of reading in English they *"still not interested in translation"* and review reading in English as an advantage of the game. Further, ten travellers (66,6%) found the application to be satisfying in contrast to one traveller, who found it to be frustrating; the rest four travellers were neutral (MED = 4). None of the participates were annoyed with the application, in contrast, eleven travellers (73,3%) found it to be enjoyable; four were neutral (MED = 4). And lastly, twelve travellers (80%) found the application to be creative and three were neutral (MED = 4).

Storytelling and User Engagement. The questionnaire results on user engagement and storytelling are shown in Figure 19. Ten travellers (66,6%) agreed they would recommend the application to a friend; one disagreed and the rest were neutral (MED = 4). Regarding the storytelling content, eight travellers (53,3%) found a story about their Finnish version to be interesting; three found it to be not interesting and the rest were neutral (MED = 4). One of the travellers commented:

T4: *"I remembered the girl, and I liked that it tells the story about the country and the shops. We are in Finland now and it's interesting to know how people live here."*
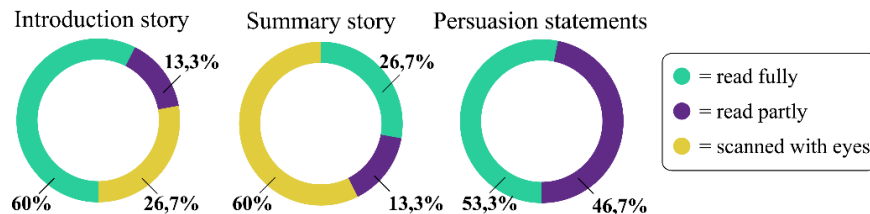
I would recommend the application
to a friend

I would not have wanted to stop
the adventure

It was interesting to read about my
Finnish version

I could relate myself to the story

Summary of my journey was interesting

Story motivated me to continue
exploring

Shop descriptions made me want to
actually visit the shops

Strongy Disagree   Strongy Agree

Figure 19. *Questionnaire results on storytelling component*

Some travellers showed interest in the cultural aspects of the story and expressed the desire to invest more time into cultural exploration. They were asking questions about culture and expressing their emotions about new facts they have learned. In addition, ten travellers (66,6%) found the summary of their journey to be interesting (MED = 4).

T3: *"Is it true that every Finnish home has a public sauna?"*
T6: *"Moomin is Finnish? Maybe it would be interesting to really say that this is everything about Finland because Moomin is quite famous."*

On the negative side, the storytelling component was perceived with a variation of opinions: only five travellers (33,3%) were motivated by the story, three disagreed and seven were neutral about this statement (MED = 3). Only five travellers (33,3%) would not want to stop their shopping adventure in contrast to four, who would want and six who neither agree, nor disagree with this statement (MED = 3). Moreover, only six travellers could relate to their stories and Finnish versions, while three could not and one of the selected negative extremes; the rest six were neutral (MED = 3).

Introduction story   Summary story   Persuasion statements

13,3%   26,7%

● = read fully
● = read partly
● = scanned with eyes

60%   26,7%   60%   13,3%   53,3%   46,7%

Figure 20. *Travellers engagement with various textual information*

The observation results demonstrated how the users were engaged with various elements of storytelling (Figure 20). An introduction story seemed to be the most engaging, as 60% of the users read it fully and 26,7% scanned it in contrast to 26.7% of the users, who read the final story fully and 60% who scanned it.

Storytelling and Shopping. The shops-related content of the application was found to be appropriate: ten travellers (66,6%) agreed that the shop description was motivating enough to visit the shops; the rest of the participants showed a neutral reaction. Figure 21 demonstrated how the travellers behaved during the verification process while being exposed to visit the advertised shop. In total, 66,6% of the users have visited the shops for the following reasons: 26,6% visited the shop to proceed with verification, the same number of the users visited shops for both verification and exploration of shopping offers, while 13,3% proceeded with verification outside the shop and afterwards visited it to check out the products. The results showed that one-third of the participants were not persuaded towards visiting the shops.
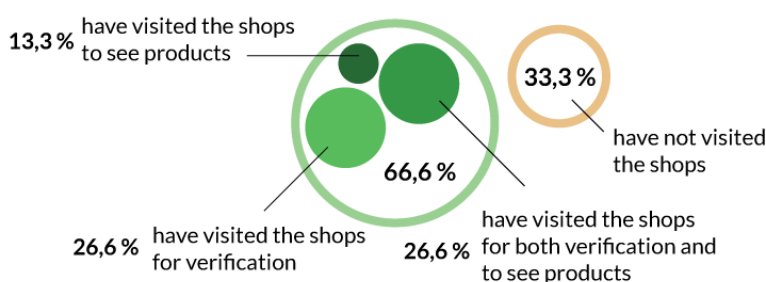
Figure 21.   *Observation results on the users' behaviour while the shop verification process*

The qualitative results showed that when people were not expecting anything else, but time-killing, their perception of the application and of their generated story was more positive. Even if they could not relate to a generated character, they were reading and following their shopping adventure. Some of the travellers commented:

T14: *"It gives me a scenario. If I don't know what to buy, it gives me a suggestion to find the shop"*
T7: *"If you first come here without searching for some tips or guidance, it (the application) would be helpful to get familiar with the overall shopping situation at the airport. It is a practical and usable service."*

On the other hand, the misunderstanding of the purpose of time killing in the application caused a negative reaction towards the designed shopping adventure. One participant shared that it was not clear, *"if the application is trying to entertain or sell something to me"* (T6). Few participants were expecting to see a purely shopping application or guide with information on discounts and special offers. When they faced the storyline to read, a limited amount of visual content on shops and no directly assessable photos of the products in addition to the lack of guidance to the shop itself, they were disappointed. The story part was found to be *"irrelevant"* in this scenario. They explained:

T14: *"I lost interest. I don't want to read; I am in a hurry. I just want to know the best products, top-selling Finnish products."*
T7: *"I think the created story is extra, which is totally not related to me"*
T8: *"I would like to skip the story part and directly tap the buttons of stores I want to visit."*

6. DISCUSSION

This chapter presents the reflection on findings from both studies by answering research questions. The primary research question is opened in Section 6.1 by summarizing the key findings. The discussion is continued with addressing sub-questions by developing the two lists of design implications for interactive storytelling application from the perspective of content creation (RQ 1.1, see Section 6.2) and the role of contextual factors (RQ 1.2, see Section 6.3). Next, this chapter presents the limitations of the study and suggests possible future research directions (see Section 6.4).

6.1   The Summary of Findings

This thesis aims to visualise the potential of applying storytelling to enable entertaining time-spending via enabling culture exploration and shopping activity at the Helsinki airport. It compiles the findings and insight from the iterative user study to uncover how the concept of interactive storytelling may be applied to generate cultural immersive experiences in the context of airports (or other large public spaces). As a result, this thesis demonstrates an example of applying the concept of cultural interactive storytelling in the form of a personalised storyline from a generated virtual persona, a Finnish version of the user. The primary question of the study is fulfilled by conducting the development and evaluation processes of *The Finnish You* storytelling application following the research through design approach.

Based on the outcomes of the study, the thesis demonstrated that a personalised generated storyline is an appealing approach to support the concept of airport journey experience and facilitate novel cultural experiences, which should be further explored. However, at the current iteration, it caters to a narrow group of users due to the reasons, presented in the next section. Hence, the gained insight was framed in a form of design guidelines (from the perspective of content and context) to illustrate the challenges and design solutions in developing such applications. With these guidelines, this thesis aims to enhance the quality of storytelling application in the context of airports and, hence, to extend the group of users, who might appeal to such applications.

6.1.1   Storytelling, Culture and Airport Experience

The overall reaction to *The Finnish You* application was positive; the participants highlighted the novelty of such experience and the creativity of applying the concept of interactive storytelling to support time-spending at the airport. This indicates that the concept of interactive storytelling is a promising approach to enhance immersive cultural experiences. However, it does not appeal to every air traveller for several reasons.

Firstly, the study recorded that the travellers, who were looking for interesting time-spending, found the application to be indeed engaging. User engagement with a story and its elements coupled with the novelty of the experience increased a positive effect

on their overall airport experience. In contrast, for travellers with other needs, for instance, efficient shopping and discounts, a storytelling feature might seem unnecessary and even negatively influence their overall airport experience.

The participants with a primary goal to have fun and fight their boredom were more open to new experiences and showed less critical thinking towards the application. Hence, they were ready to explore the application and partake in all the activities facilitated by the application: cultural exploration and shopping adventure. The motivation to discuss the Finnish culture and get more information indicates that the goal of the application - promoting local culture, was fulfilled with a storytelling component. As follows, the narrations from a generated Finnish persona provided a decent representation of culture and lifestyle to spark travellers' interest and motivate them to explore more.

As the qualitative results demonstrated, the feeling of being related to the character males the users to be more engaged with the story. Hence, it influences positively the effect of narration transportation, which in turn is found to increase the positive effect of mental simulation [42]. Due to this effect, the character storyline not just blindly guides the users, but adds meaning to the airport shopping activity, thus intensifying the experience of airport journey by drawing relations between travellers, story and the destination itself [49]. Hence, when the users are reading the narrations from their virtual Finnish persona, which they can relate to, they immerse into the story and are more likely to follow the mentally simulated situation, such as shopping adventure. Feeling immersed, these travellers also potentially spend more time exploring local shopping offers by trying them out and touching. As travellers' time is being filled with something meaningful and interesting, their overall airport experience tends to be positive.

Although the novelty factor may play its role in the successful adaptation of interactive storytelling, such applications would work beneficially in case they truly engage their users. One of the major findings of the study demonstrated that reading as a process cannot engage everyone. The majority of the participants showed a desire to cut textual information and add more engaging content, for instance, pictures, animations, videos, and music, while one of the participants expressed an extremely negative reaction towards reading as a process. It indicates that both story content and methods of storytelling should be enhanced to truly engage the participants. Although the application was perceived with interest and curiosity, there are still ways to make the storytelling and its components more engaging to compile with other products presented on the market. One of the reasons for it is that nowadays people are exposed to huge amounts of digital experiences and data in various forms. Rapidly developing trending technologies, such as virtual and augmented realities (VR and AR), influence and dictate the content creation and the information demand. People have a possibility to select in which format they want to consume the information and might not consume the information if it does not fit their demand. Hence, such storytelling applications should be more flexible to interest more users.

To sum up, for the group of users who were looking for entertainment, the application worked beneficially from all perspectives: it enabled the adventurous experience, promoted local culture and encouraged them to spend time exploring local shopping offers. The design implications presented further in the Discussion aimed to address these findings.

6.1.2 Storytelling and Shopping

Considering the small sample of users, who participated in the field study, this thesis cannot claim any significant effects of *The Finnish You* application on shopping intentions. None of the travellers-participants purchased products during the study. Nevertheless, the observation helped to determine the indications of possible positive impact, which should be further explored.

First of all, a storyline from generated virtual persona transparently generates a context for visiting shops at the airport, thus, creating circumstances for mental simulation of the shopping activity. In the situation when a user is immersed in a story, the products from the story would generate more positive reactions and brand evaluation due to narrative processing [15]. Also, in accordance with related work [39] stories about products were found to be persuasive and interesting to read for some of the participants. Despite participants expressed the desire to see also pictures and photos of the products, the textual description was found to be enough to motivate the users to visit the shop. These finding together with qualitative results demonstrate, that a personalised storyline is an appropriate strategy to advertise products at the airport.

Secondly, the application potentially can influence shopping routes and brand recognition, as it guides users thought predefined shops and persuades them to look around. Some of the participants had admitted, that they would never actually move around the airport and go shopping without the application. The observation results showed that 66% of travellers visited the advertised shops while playing *the Finnish You*. Furthermore, some participants said they have noticed more shops they would like to visit, especially small shops. This indicates that a gamified storytelling application might promote local shops and brands by motivating travellers to walk around and navigate to the shop on their own, without the guidance from the system. However, this explorative approach would work only for travellers with hedonic shopping values [11]. For the travellers, who had utilitarian shopping values in mind and perceived the application like a shopping guide, in contrast, the application was disappointing. They found the storyline to be extra, criticised the application and suggested multiple modifications to its shopping functionality, e.g. categorization, personalisation, guidance to the shop.

To conclude, a generated personal storyline would beneficially influence overall airport experience among travellers, who are looking for entertainment and might negatively influence it for the travellers, who are looking for an efficient shopping guide.

6.2 Design Implications for the Storytelling Application Content

As one contribution of this thesis, *the list of design implications* was created to frame collected insight for promoting the research on developing engaging storytelling content and applications. By providing five implications, this thesis answers to the RQ1.1 on engaging content development. These implications are primarily based on the analysis of qualitative data from the first user study in a simulated airport environment and further extended with the data from the field study.

1. **Multiple methods of storytelling should be utilized with an emphasis on visuals.** There are many methods to enrich the storytelling component by combining various methods of information representation. For instance, it would be beneficial to support textual information with images and animations or replacing textual information with video or audio recordings. This implication does not imply that textual information should be avoided. It should be designed and presented to users in an appropriate manner depending on the use case, accessibility requirements and device properties. Various techniques can be used to design textual information. For example, the key information or words can be highlighted (colours, underlining, bold or italic style), the lengthy paragraphs can be divided to be displayed on more than one page.

   The amount of textual information per page should be designed in regard to the context of use, for instance, in a chaotic airport environment, it should be minimised to the extent possible, making the information to be clear from a glance. Most of the participants suggested using a picture (or animated picture) with a line of text above or below. This implication affords for using the application on the go as well as beneficially influences memorability and engagement [23]. Another valuable idea is to provide alternative methods of consuming information, for example, providing music or sounds of nature, which would be easily turned OFF/ON.

   The use of innovative technologies (e.g., omnidirectional photos and videos, AR and VR technologies), should be also researched as a means of storytelling. The use of novel technologies would beneficially affect user engagement and would present culture-specific information in a more aesthetically interesting and intriguing manner. For instance, a visual representation of a Finnish family (via AR or VR) sitting around the fire and grilling sausages in the forest coupled with the sounds of nature (e.g., wind, leaves, birds singing) would demonstrate the basics of Finnish culture in a more tangible way than any sophisticated textual pattern. Further, the advertised products could be this way demonstrated in the use, for instance, using kuska (traditional Finnish cup made of wood) to collect berries. Facilitating such visually rich experiences with the application allows the users to become a part of the scene and hence, be fully immersed and emotionally connected to the story, culture, and products [15].

   Regarding the content on shopping-related information, visual content is a requirement, which may have a major effect on travellers' decision-making. Most of the participants expected to see multiple photos and videos of a recommended product before visiting the shop. Especially travellers with utilitarian shopping values saw no point in using the shopping application, which does not display and visualize shopping offers.

2. **Storytelling content should be personalised to the extent possible.** A personalised story from a virtual Finnish persona was found to be a good way to present culture-related and shopping information. However, the feeling of not being related to the Finnish persona decreases interest in the story and consequentially decreases the effect of narration transportation. This, in turn, cause more critical thinking towards the story [15] and thus, less positive emotions about the

experience with the application in general. Hence, the story should be generated with more attention to the user's personality to establish a personal sense [2]. The question on how to personalise the storytelling content is still widely opened, however adding variation and criteria is clearly better than random generation. The personalisation methods used in *The Finnish You* application were basic and should be advanced by increasing the number of factors for story generation. For this, data gathering methods should be extended, e.g., more interactions and questions to the user. These questions can be asked in game alike manner for the duration of the game, while user's actions while shopping should be recorded to provide further levels of details. Besides, artificial intelligence could also be utilized to enhance the story and make shopping recommendations more relevant for the user and the context of use (season, time, travelling route, other) Information can be also collected from the users' personal devices; however, this method rises the questions of ethics and data privacy, e.g. which data may be collected, and which must not.

3. **Avatars should be customizable or generated based on the user's appearance.** The study showed that users want avatars to distinctively reflect their personality and would like to have more control over the way avatars look. Avatars, as a game element, are a representation of a user's identity [10]. The lack of identification with the avatar results in the decreased feeling of social presence [6] and decreased immersion in the game itself. Hence, avatars may be generated based on the user's visual appearance, for example, from a picture or via AR-face recognition. Further, the application should include a means of customizing the avatar, such as picking hairstyles and clothes. The customizable avatar's elements can be also used to promote local shopping offers, for instance, after visiting the Marimekko brand shop, the avatar can be dressed in the brand clothes.

4. **Extrinsic motivators should be utilized and presented to the users in the very beginning.** The story alone might be motivating for a narrow group of users; hence storytelling applications should be further supported with extrinsic motivators and gamification elements. Adding something feasible to reward the users during the game would not only attract more attention and help to advertise an application, but also stimulate travellers to explore shopping offers and surroundings. The rewards, used in the application, were metaphoric and may be replaced with souvenirs, discounts or coupons. Gamification element points, which are given for visiting shops and which can be exchanged to feasible rewards, is another method to raise extrinsic motivation. The users should be able to see first of all what kind of benefits they would get from going to the adventure and track their progress towards desired items (for example, how many points they should collect to get a 5% discount for a Marimekko shop).

5. **Various playful activities and socialization factors should be used to increase intrinsic motivation.** The intrinsic motivation could be addressed in a more meaningful way by introducing small in-place games (e.g., treasure hunt,

trivia questions) and socialization activities. Further, adding a sense of competition between players via gamification elements (e.g., timer, leaderboards. levels of difficulty) would beneficially influence the user's intrinsic motivation.

6.3   Design Guidelines to Address the Contextual Factors

Our studies revealed the significant role of contextual factors for designing interactive storytelling application. When designing an application, it is essential to consider the limitations and requirements of the context of use. The following guidelines were developed to address sub-question 2 based on the results of the field study. In contrast to the previous design implications, these guidelines review how to efficiently use the contextual factors to make the application more goal-efficient and maximise the number of possible users.

1. **Enabling context-awareness.**
   Despite the overall positive reaction towards *The Finnish You* application, the storytelling component in its current implementation would not attract a wide group of travellers at the airport. For instance, travellers with utilitarian shopping values might negatively perceive the storytelling component and find it to be unnecessary long, as it does not contribute to making the shopping process more efficient. Hence, such applications should be more flexible to cater to a wider audience and provide various scenarios depending on the needs of the user. For instance, the qualitative results indicate users' demand for so-called sales tours, which would guide them to the products with reduced prices via brief narrations. Such scenarios can be generated per target group (for instance, family or business travellers), per shopping categories (for instance, beauty products or food and beverages) and based on environmental factors (e.g., seasonal or celebration discounts).

2. **Clarity of the value proposition.**
   The application should provide a clear and distinct description of the idea and purpose, in this case - entertainment or time-killing via a personal storyline. In other words, the application should present what kind of value it is about to bring to the users. Some travellers, who participated in the field study, misinterpreted the entertainment purpose of the application and reviewed it as an application for shopping, which led to a negative perception of the application. Based on this, the on-boarding pages, which presents the application description and its value, were found to be inefficient method in the airport context due to high cognitive load. The solution might be to provide an interactive description of the application coupled with questions, which could allow further redirection to various airport services according to user-defined needs. Thus, people interested in time-killing would be redirected to *The Finnish You* application, while people who are interested in efficient beauty product shopping, for instance, can be redirected to another scenario, with shorter storytelling components and more product information.

3. **Transparent instructions.**
    Based on our results, on-boarding pages that deliver the application description and all instructions at the very start is a disadvantageous approach. Due to the chaotic airport environment, the functionality and application structure should be presented on the go, meaning providing instructions step-by-step and only when needed, for instance, when new features are introduced.

4. **Facilitating cultural exploration.**
    The study outcomes showed that most of the participants liked to read the culture-related information and were interested to get more in-depth information about the Finnish lifestyle. Further, some of them also expressed the eagerness to visit Finland in the future and feel the narrated experience by themselves. In order to encourage this desire, the application should support the means of profound culture exploration. For instance, providing links to external resources, such as touristic websites, could support further information retrieval by demonstrating more interesting facts about Finland and supporting travel plan creation.

5. **Persuading shopping intentions.**
    Some participants still showed the desire to use the application for entertainment (to explore shopping offers and get more cultural aspects), despite the feeling of being related to the story was low. The travellers were touching products and asking how to use it, as the application does not provide this practical information. Hence, the shopping activity may be designed in a more motivating way to persuade these users. Based on the qualitative results of the field study, we identified the potential of accumulating interactive and tangible experiences with advertised products. To enable such experiences, airport facility providers should be included in the application design and development process. Together it would be possible to design advertising tangible experiences, such as co-creation process of cooking or crafting.

6.4   Limitations and Future Work

Despite this iterative study brings light on how to apply the concept of interactive storytelling in the context of an airport, the findings are somewhat limited to the selected context of use and a small sample of the participants. Firstly, the limitations of the study include a rather small public space – the Helsinki airport. The application design, in particular the challenge of locating the shops, was influenced by the size and simplicity of the airport terminal area. Other, more explicit solutions should be explored and evaluated for designing a shop finding process in large-scale airports and other large-scale public places, such as AR-guidance, interactive maps, and others. Secondly, another limitation is a small number of participants as well as low variance in their background and demographics in both studies. This limitation made it impossible to identify any correlations between the perception of a storytelling approach and age, gender or culture of the users.

Hence, it is important to address these limitations by conducting a follow-up study in larger public spaces with a bigger number of participants. These studies could investigate the potential of an interactive storytelling approach focusing on culture-related factors or explore how the approach may be generalised to people of different ages, gender, and background. Exploring and identifying ways to enhance the personalization of a storytelling feature is another valuable research direction. This can be approached from two directions: 1) how to make the story to be linked to the external factors such as passengers' purpose of travel, amount of waiting time as well as the culture and climate of the location, season and time of the day; and 2) how to make the story to be more related to the user, including how to ethically gather and utilize collected data.

Another interesting research direction is defining various storytelling scenarios to target other needs of air-travellers. In the current iteration, the storytelling component caters to travellers, who are looking for entertainment time-spending. The results of the study suggested that storytelling, if modified, can serve to the shopping process, for example by guiding travellers to discount and special offers. Going further, the engagement with a story as well as how the elements of gamification and the use of trending visual technologies, such as 3D photos, omnidirectional videos, VR, AR filters and visualizations, etc., would affect user engagement with a storyline and a shopping adventure. Alternatively, future research may be held from the marketing perspective, focusing on how particular elements of user experience contribute to the marketing aspect of storytelling, for instance, the facilitation of co-creation processes.

7. CONCLUSIONS

This study addressed stated research questions by conducting the human-centred design and development process of *The Finnish You* application, based on cooperation with the airport-owner company. *The Finnish You,* a personal storytelling-based application was found to be an interesting and creative way to entertain air travellers and fill their waiting time at the airport. A generated Finnish version of the user, who is narrating about the Finnish lifestyle, was found to be an appealing approach to present the culture of the destination and to potentially motivate travellers to visit the country in the future. The shopping adventure, facilitated by a personal storyline, was found to be engaging for shoppers with hedonic values. A shopping experience with *the Finnish You* application promote local shopping offers by persuading users to investigate shopping options and to visit the shops. The results showed, that 66% of air travellers visited advertised shops to check the products, complete verification process or both.

Nevertheless, at the current iteration the application appeal to the narrow group of users, as reading as a process is not attractive for everyone. Among other modifications, the story should be more visual and consist of various storytelling methods to engage the users of the 21st century. The list of design implications (*section 6.2*) for storytelling applications was created to summarise the findings regarding engaging content development. Any content should be suitable for the context of use and thus, the list of design guidelines (*section 6.3*) was designed to illustrate how to adopt a storytelling application to the airport context with a goal to extend the target user group.

In conclusion, the findings of this iterative study demonstrated the potential of applying the concept of interactive storytelling to address discretionary time spending in the context of large touristic spaces, such as airports. Interactive storytelling in combination with the elements of gamification may be utilised as a strategy to facilitate travellers' shopping activity while focusing on both touristic and business perspectives. Storytelling-based gamified applications are capable to persuade travellers towards exploring airport surroundings and visiting local brands while promoting the culture of the destination. Being engaged with such an application would fill in the waiting time with meaningful activity and decrease critical thinking and consequentially, positively affect the airport experience. This may further contribute to the destination development process, positively affect the image of the destination and the overall touristic experience, motivating travellers to visit the country in the future. In addition, storytelling-based applications may encourage money spending and thus, increase revenues from commercial activities.

These findings suggest that a concept of interactive storytelling would be beneficial in other large public spaces, like ferry terminals, bus and railway stations, urban spaces (e.g., shopping malls, theme, and amusement parks, playgrounds) and national parks. The storytelling feature should be further adapted to the context of use and the needs of all the parties. This thesis work contributed to the HTI-community by designing guidelines, which may be further utilised and iterated. By developing these guidelines, the author of the thesis longed for inspiring the growth in the research on interactive storytelling for large public spaces.

REFERENCES

[1]   Ali Ekber Akgün, Halit Keskin, Hayat Ayar, and Ebru Erdoğan. 2015. The influence of storytelling approach in travel writings on readers' empathy and travel intentions Peer-review under responsibility of the International Strategic Management Conference. *Procedia - Social and Behavioral Sciences* 207: 577–586. https://doi.org/10.1016/j.sbspro.2015.10.129

[2]   Bryan Alexander. *The new digital storytelling : creating narratives with new media*.

[3]   Julie Baker. 1986. The role of the environment in marketing services: the consumer perspective. *The Service Challenge: Integrating for Competitive Advantage*, April: 79–84.

[4]   Mary Jo Bitner. 1992. Servicescapes: The Impact of Physical Surroundings on Customers and Employees. *Journal of Marketing* 56, 2: 57. https://doi.org/10.2307/1252042

[5]   Bodil Stilling Blichfeldt, Aurimas Pumputis, and Kiya Ebba. 2017. Using, spending, wasting and killing time in airports. *International Journal of Culture, Tourism, and Hospitality Research* 11, 3: 392–405. https://doi.org/10.1108/IJCTHR-05-2016-0045

[6]   Boberg, Marion & Piippo, Petri & Ollila, Elina. (2008). Designing avatars. 232-239. 10.1145/1413634.1413679.

[7]   Richard F Bowman. 2018. The Clearing House: A Journal of Educational Strategies, Issues and Ideas Teaching and Learning in a Storytelling Culture Teaching and Learning in a Storytelling Culture. *Issues and Ideas* 913, 3: 97–102. https://doi.org/10.1080/00098655.2017.1373547

[8]   A. Burova, C. Kelling, J. Hakulinen, P. Kallioniemi, T. Keskinen, M. Turunen, and H. Väätäjä. 2018. The Finnish you – An interactive storytelling application for an airport environment. In *ACM International Conference Proceeding Series*. https://doi.org/10.1145/3275116.3275142

[9]   Alisa Burova, Chelsea Kelling, Tuuli Keskinen, Jaakko Hakulinen, Pekka Kallioniemi, Heli Väätäjä, and Markku Turunen. 2019. Promoting local culture and enriching airport experiences through interactive storytelling. *ACM International Conference Proceeding Series*. https://doi.org/10.1145/3365610.3365640

[10]   Edward Castronova. 2003. Theory of the Avatar.

[11]   Yi Shih Chung. 2015. Hedonic and utilitarian shopping values in airport shopping behaviour. *Journal of Air Transport Management 49*, 28–34. https://doi.org/10.1016/j.jairtraman.2015.07.003

[12]   Cynthia Corrêa and Camila Kitano. 2015. Gamification in Tourism : Analysis of Brazil Quest Game 1 Introduction and Theoretical Background. *ENTER 2015 Conference on Information and Communication Technologies in Tourism* 8, 3: 1–2. https://doi.org/10.19080/PBSIJ.2018.08.555740

[13]   Sebastian Deterding, Dan Dixon, Rilla Khaled, and Lennart Nacke. 2011. From game design elements to gamefulness. *Proceedings of the 15th International Academic MindTrek Conference on Envisioning Future Media Environments - MindTrek '11*: 9. https://doi.org/10.1145/2181037.2181040

[14]   Roland Enabou and Jean Tirole. 2003. Intrinsic and Extrinsic Motivation. *Review of Economic Studies* 70: 489–520. Retrieved June 29, 2018 from https://www.princeton.edu/~rbenabou/papers/RES2003.pdf

[15]   Jennifer Edson Escalas. 2004. Imagine yourself in the product : Mental simulation, narrative transportation, and persuasion. *Journal of Advertising* 33, 2: 37–48. https://doi.org/10.1080/00913367.2004.10639163

[16]   Jordan Frith. 2013. Turning life into a game: Foursquare, gamification, and personal mobility. *Mobile Media & Communication* 1, 2: 248–262.
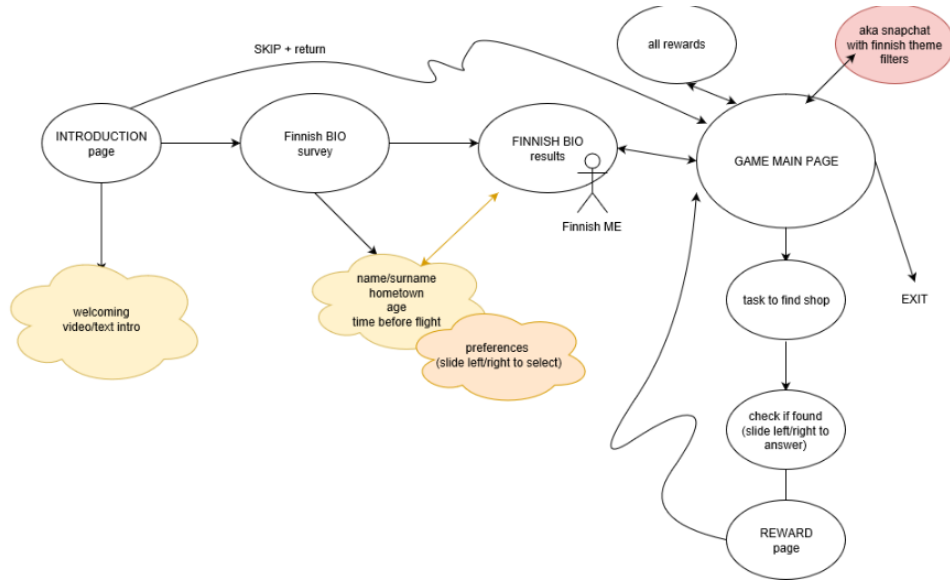
https://doi.org/10.1177/2050157912474811

[17] Maggie Geuens, Delphine Vantomme, and Malaika Brengman. 2004. Developing a typology of airport shoppers. *Tourism Management* 25, 5: 615–622. https://doi.org/10.1016/j.tourman.2003.07.003

[18] Mark. Gottdiener. 2001. Life in the air : surviving the new culture of air travel. Rowman & Littlefield.

[19] Melanie C Green and Timothy C Brock. 2000. The Role of Transportation in the Persuasiveness of Public Narratives. *Journal of Personality and Social Psychology* 79, 5: 701–721. https://doi.org/10.1037//0022-3514.79.5.701

[20] Juho Hamari, Jonna Koivisto, and Harri Sarsa. 2014. Does gamification work? - A literature review of empirical studies on gamification. *Proceedings of the Annual Hawaii International Conference on System Sciences*: 3025–3034. https://doi.org/10.1109/HICSS.2014.377

[21] Ben D Harper and Kent L Norman. 1998. Improving user satisfaction: The questionnaire for user interaction satisfaction version 5.5. *Proceedings of Mid Atlantic Human Factors Conference*, January 1993: 224–228.

[22] T Harrison, A., Popovic, V., Kraal, B. J. and Kleinschmidt. 2012. Challenges in passenger terminal design: A conceptual model of passenger experience. In *In Proceedings of the design research society (DRS) conference*, 344–356.

[23] Lane Harrison, Katharina Reinecke, and Remco Chang. 2015. Infographic Aesthetics. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems - CHI '15*, 1187–1190. https://doi.org/10.1145/2702123.2702545

[24] Wei Jue Huang, Honggen Xiao, and Sha Wang. 2018. Airports as liminal space. *Annals of Tourism Research* 70, May 2017: 1–13. https://doi.org/10.1016/j.annals.2018.02.003

[25] Kai Huotari and Juho Hamari. 2012. Defining gamification. *Proceeding of the 16th International Academic MindTrek Conference on - MindTrek '12*: 17. https://doi.org/10.1145/2393132.2393137

[26] IIAC. Incheon International Airport Guide. *2600*.

[27] Philip J Kirk, Vesna Popovic, Ben Kraal, and Alison Livingstone. 2012. Towards a taxonomy of airport passenger activities. *Proceedings of DRS2012 Bangkok. Chulalongkorn University, Bangkok, Thailand*: 1–12.

[28] Yi Hsin Lin and Ching Fu Chen. 2013. Passengers' shopping motivations and commercial activities at airports - The moderating effects of time pressure and impulse buying tendency. *Tourism Management* 36: 426–434. https://doi.org/10.1016/j.tourman.2012.09.017

[29] Justine Lloyd. 2003. Airport Technology, Travel, and Consumption. *Space and Culture* 6, 2: 93–109. https://doi.org/10.1177/1206331203251254

[30] Vincenzo Lombardo and Rossana Damiano. 2012. Storytelling on mobile devices for cultural heritage. *New Review of Hypermedia and Multimedia* 18, 1–2: 11–35. https://doi.org/10.1080/13614568.2012.617846

[31] Arnold M Lund. 2001. Measuring usability with the USE questionnaire. *Usability interface* 8, 2: 3–6. https://doi.org/10.1177/1078087402250360

[32] Mantouka, Eleni & Barmpounakis, Emmanouil & Milioti, C. & Vlahogianni, Eleni. (2018). Gamification in mobile applications: The case of airports. Journal of Intelligent Transportation Systems. 1-10. 10.1080/15472450.2018.1473157.

[33] L Mossberg and EN Johansen. 2006. Storytelling–Marknadsföring i upplevelseindustrin (Lund: Studentlitteratur). Retrieved July 1, 2018 from https://scholar.google.fi/scholar?cluster=3032338949840172010&hl=en&as_sdt=2005&sciodt=0,5

[34] Lena Mossberg. 2007. A Marketing Approach to the Tourist Experience. *Scandinavian Journal of Hospitality and Tourism* 7, 1: 59–74. https://doi.org/10.1080/15022250701231915

[35] Lena Mossberg, Anette Therkelsen, Edward H Huijbens, and Anna Karin Olsson.

2010. Storytelling and Destination Development. December: 65. Retrieved from http://www.rmf.is/static/files/Documents/Publications/Reports/2010/final-report-storytelling.pdf

[36] Thomas O'Dell. 2005. Experiencescapes: Blurring Borders and Testing Connections. Retrieved June 28, 2018 from http://portal.research.lu.se/portal/en/publications/experiencescapes-blurring-borders-and-testing-connections(92c110da-0cc9-4905-aed9-a5b94050ec5b).html

[37] Deborah. Schiffrin, Anna. De Fina, and Anastasia. Nylund. 2010. *Telling stories : language, narrative, and social life*. Georgetown University Press.

[38] Singapore Changi Airport. Airport Attractions - Singapore Changi Airport. Retrieved from http://www.changiairport.com/en/airport-experience/attractions-and-services.html

[39] Eeva Solja, Veronica Liljander, and Magnus Söderlund. 2018. Short brand stories on packaging: An examination of consumer responses. *Psychology & Marketing* 35, 4: 294–306. https://doi.org/10.1002/mar.21087

[40] Richard C. Stedman. 2003. Is it really just a social construction?: The contribution of the physical environment to sense of place. *Society and Natural Resources* 16, 8: 671–685. https://doi.org/10.1080/08941920309189

[41] Jakub Swacha and Robert Ittermann. 2017. Enhancing the tourist attraction visiting process with gamification: key concepts. *Engineering Management in Production and Services* 9, 4: 59–66. https://doi.org/10.1515/emj-2017-0031

[42] Shelley E. Taylor and Sherry K. Schneider. 1989. Coping and the Simulation of Events. *Social Cognition* 7, 2: 174–194. https://doi.org/10.1521/soco.1989.7.2.174

[43] E. Torres, J.S. Domínguez, L. Valdés, and R. Aza. 2005. Passenger waiting time in an airport and expenditure carried out in the commercial area. *Journal of Air Transport Management* 11, 6: 363–367. https://doi.org/10.1016/J.JAIRTRAMAN.2005.04.001

[44] Asuka Wakao, Kohei Matsumura, Mao Suzuki, and Haruo Noma. 2016. Treasure hunt game to persuade visitors to walk around a shopping mall. *2015 IEEE 4th Global Conference on Consumer Electronics, GCCE 2015*: 527–530. https://doi.org/10.1109/GCCE.2015.7398555

[45] Walanchalee Wattanacharoensil. 2019. The airport experience. *Air Transport - A Tourism Perspective*, February: 177–189. https://doi.org/10.1016/B978-0-12-812857-2.00013-0

[46] Walanchalee Wattanacharoensil, Markus Schuckert, and Anne Graham. 2016. An Airport Experience Framework from a Tourism Perspective. *Transport Reviews* 36, 3: 318–340. https://doi.org/10.1080/01441647.2015.1077287

[47] Leo Widrich. 2012. The science of storytelling: Why telling a story is the most powerful way to activate our brains. 7–14. Retrieved from http://lifehacker.com/5965703/the-science-of-storytelling-why-telling-a-story-is-the-most-powerful-way-to-activate-our-brains

[48] Feifei Xu, Jessika Weber, and Dimitrios Buhalis. 2013. Gamification in Tourism. In *Information and Communication Technologies in Tourism 2014*. Springer International Publishing, Cham, 525–537. https://doi.org/10.1007/978-3-319-03973-2_38

[49] Kamel Ben Youssef, Thomas Leicht, and Lidia Marongiu. 2018. Storytelling in the context of destination marketing : an analysis of conceptualisations and impact measurement. *Journal of Strategic Marketing* 4488: 1–18. https://doi.org/10.1080/0965254X.2018.1464498

[50] Hongmei Zhang, Susan Gordon, Dimitrios Buhalis, and Xifen Ding. 2018. Experience Value Cocreation on Destination Online Platforms. *Journal of Travel Research 57*, 1093–1107. https://doi.org/10.1177/0047287517733557

[51] John Zimmerman, Shelley Evenson, and Shelley Evenson. 2007. Research Through Design as a Method for Interaction Design Research in HCI. January. https://doi.org/10.1145/1240624.1240704

[52]   Strayboots - Team Building Activities and Scavenger Hunts - Worldwide Scavenger Hunts, Custom Team Building Activities, and Corporate Orientation Days. Retrieved June 29, 2018 from https://www.strayboots.com/

APPENDIX A: APPLICATION FLOW

(1)

(2)

APPENDIX B: APPLICATION SCREENS – ON-BOARDING PAGES AND INPUT FORM

This adventure will tell you a story of **your life if you were Finnish** and **guide you** throught Finnish brand shops

Want to pick your next shop?

Find a **MAP VIEW** to see all suggested shops

Visit all suggested shops and get **the summary** of your Finnish adventure!

In hurry to **catch your flight** and can't finish this adventure? NO PROBLEM!

Surprise your relatives and share your Finnish story with friends and family.

Find **FINISH ADVENTURE** to get the summary without visiting all shops

But firstly we want to know you!

Enter your full name

Enter your age

Select your gender

CONTINUE

APPENDIX C: DESIGN ELEMENTS

BUTTONS

SEE REWARD GO BACK SKIP SHOP CONTINUE

ICONS:

HESBURGER MENU

-MENU-
- TO STORY VIEW
- SEE MY STORY
- GET SUMMARY AND EXIT GAME
- RESTART GAME
- INFO

-MENU-
- TO MAP VIEW
- SEE MY STORY
- GET SUMMARY AND EXIT GAME
- RESTART GAME
- INFO

HEADER
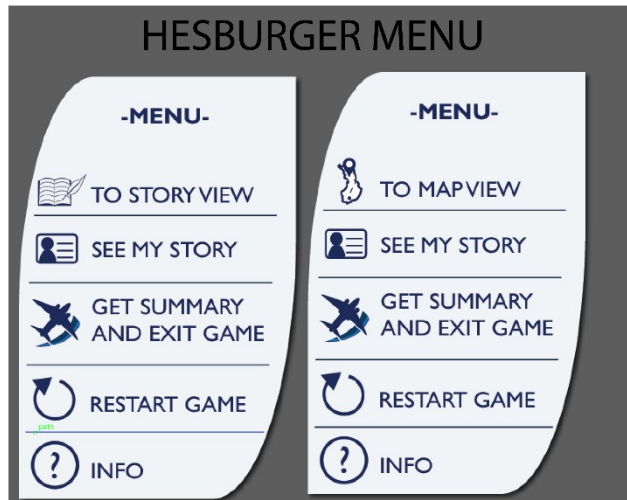
REWARD:

SHOP VERIFICATION ALTERNATIVES

AVATARS:

FOOTER

APPENDIX D: PRE- AND POST- QUESTION-NAIRES FOR THE PILOT USER STUDY

Pre-questionnaire:
1) Name [text input]
2) Gender [Female / Male / Unisex / Prefer not to tell]
3) Age [text input]
4) Country of Birth [text input]
5) Mark the Finnish brands you know [*Marimekko / Iittala / Arctic World of Santa / Finspiration / Lindroos / FineFood / Moomin*]
6) How often do you travel? [*more than 4 times in a year / 2-3 times in a year / once in a year / less than once in a year / I do not travel*]

Post-questionnaire:

1) Overall reaction to software: What do you think about it? (on a 5-point scale)
   a. Terrible-Wonderful
   b. Difficult to use – Easy to use
   c. Frustrating – Satisfying
   d. Dull – Stimulating
   e. Rigid – Flexible
2) Usability and User Satisfaction Statements ()
   a. Software is user friendly
   b. I learned to use it quickly
   c. I easily remember how to use it
   d. Instructions provided are helpful
   e. I am satisfied with this application
   f. I enjoyed using it
   g. I would recommend it to a friend
   h. It was fun to play it
   i. I believe I had some choice about doing this activity
3) Storytelling (on a 5-point scale, 1 = Strongly Disagree, 5 = Strongly Agree)
   a. The story was easy to follow
   b. Story pieces are well connected to each other
   c. Story motivated me to continue playing
   d. I can relate myself to the story
   e. Summary of my journey was interesting
   f. I would like to read more about my Finnish version
4) Shopping Statements (on a 5-point scale, 1 = Strongly Disagree, 5 = Strongly Agree)
   a. Information about shops is easy to find
   b. Shop description gives a good overview of products
   c. Shop description makes me want to visit the shop

APPENDIX E: INTERVIEW QUESTIONS

(1) Interview question for the pilot study.

1. What are your thoughts, feelings, and ideas about this experience?
2. Have you learned something new about Finland / Finnish Brands? What?
3. Would you like to visit this shop in the nearest future? Why?
4. What do you think about your Finnish persona/story? (why/why/why)
5. Was it easy to understand the game flow? (Navigation, structure?)
       a. What do you think about the design? What would you change?
       b. Do you have any ideas what can be done better in the game? What would you change?

(2) Interview question for the field study

1. Please name things you liked about the application. Why?
2. Please name things you disliked. Why?

       a. … Do you have any ideas what can be done better in the application? What would you personally change?

3. What do you think about your Finnish adventure? What do you think about the Finnish persona/ the summary of your journey? Why?
4. Would you like to buy something from presented shops? Why? What can motivate you to buy them?
5. What are your thoughts, feelings, and ideas about this experience? (if applicable still)
6. Any questions or thoughts?

APPENDIX F: OBSERVATION FORM, FILLED BY THE RESEARCHERS DURING THE FIELD STUDY

Please mark all the important details!

1) **Type:** Individual/Group
if group, how much people? _____
Other notes:

2) **Level of English:** Low / Medium/ High or other language used during the experiment- which?
mark if there were any language-related problems – which?
Other notes:

3) **Reading** – observe reactions and emotions during the reading process

The participant has read / scanned with eyes the intro story fully / not fully

The participant has read / scanned with eyes motivational statements

The participant has read / scanned with eyes the summary story fully / not fully

Other notes:

4) **Level of engagement:** observe if the participant was interested in the brand/products
The participant (when found the shop in the airport terminal)
- visited the shop to proceed with verification
- visited the shop to see the products
- visited the shop to find the exact product from the app
- have not visited the shop

Did the participant show interest in buying something from the shop? Specify what:

APPENDIX G: QUESTIONNAIRE FOR THE FIELD STUDY

Nationality: _____   Gender: ☐ Male   ☐ Female   ☐ Other

Age: _____ years

What do you think about the application?
Please grade following on the scale "totally negative" to "totally positive".

	☹	☹	😐	🙂	😊	
Unattractive	☐	☐	☐	☐	☐	Attractive
Difficult to use	☐	☐	☐	☐	☐	Easy to use
Difficult to understand	☐	☐	☐	☐	☐	Intuitive
Frustrating	☐	☐	☐	☐	☐	Satisfying
Annoying	☐	☐	☐	☐	☐	Enjoyable
Dull	☐	☐	☐	☐	☐	Creative

Please mark to what extent do you agree/disagree with following statements.

	Strongly Disagree		Neutral		Strongly agree
I would recommend the application to a friend	☐	☐	☐	☐	☐
I would not have wanted to stop the adventure	☐	☐	☐	☐	☐
It was interesting to read about my Finnish version	☐	☐	☐	☐	☐
I could relate myself to the story	☐	☐	☐	☐	☐
Summary of my journey was interesting	☐	☐	☐	☐	☐
Story motivated me to continue exploring	☐	☐	☐	☐	☐
Shop descriptions made me want to actually visit the shops	☐	☐	☐	☐	☐

Date : _____._____.2018

APPENDIX H: INSTRUCTION TO THE RESEARCHERS FOR THE FIELD STUDY

Instructions for FINAVIA user study

1. Look for waiting/bored people (ideally!), but try to ask as many as possible.
2. Introduce yourself and briefly explain the purpose of the study:

"Hello, I am X from the University of Tampere, finland and I am looking for participants to a research study!

- Have you ever imagined how your life would look like if you would be born on the other side of a planet? Today you can find out what your life would be if you would be born in Finland and that way help us to evaluate the application. It would take only 20-30 minutes of your time and you will be rewarded with traditional Finnish sweets ☺
- Do you have some time to help us evaluate the first-ever storytelling shopping guide for the airport? You will not only get to know your Finnish persona, but also help us to make it better! It would take only 20-30 minutes you will be rewarded with traditional Finnish sweets ☺

- One important detail is that the evaluation is not about you, but about the app! We are highly interested to hear your real opinion about it. Everything matters, so whenever you have something to say – we encourage you to say it.
3. When participant is recruited, handle the consent form and only after that give the device with an app.

! Before each user, pls clean the browser history & cookies!--> Settings ->History->clear browsing data

4. The testing procedure is based on free exploration -> no instructions. If participants ask you questions -> try to avoid answering straightly and encourage them to find the answer (give hints.)
5. Let the participants visit 2-3 shops and stop them:

"Unfortunately, we need to stop your adventure because of time constraints. "

6. Handle Questionnaire
7. Do short interview
8. Thank the participant and reward them with candies