Tourism Experience in Accessible Tourism: Designing a Mobile Application for the Deaf and Hard of Hearing

Tjaša Alegro, Marica Ilić, Milica Rančić Demir
University of Maribor, Faculty of Tourism, Brežice, Slovenia
tjasa.alegro1@um.si, marica.ilic@student.um.si, milica.rancic1@um.si

Abstract How someone experiences a tourist experience depends on several factors. This article will focus on ways to ensure active participation and thus a pleasant and memorable experience for people with disabilities, specifically people with hearing problems – the deaf and hard of hearing. With the development of ICT technology, the possibilities for developing tourist products intended for the deaf and hard of hearing are even greater and can be friendlier to them. Various mobile applications complement a city's tourist products and services and are more than a welcome help for people with special needs. With an innovative Design Thinking method suitable for planning projects or designing services or products intended for end users, we designed an idea for a mobile application for Ljubljana that is tailored to deaf and hard of hearing tourists, as Slovenia does not yet have a similar application. We designed the product idea based on an overview of good practices. Through five phases of the Design Thinking method, we analysed the indispensable elements of the mobile application for deaf and hard of hearing tourists and evaluated it through the HEART framework matrix developed for user experience assessment.

Keywords:
experience,
accessible tourism,
deaf,
hard of hearing,
Design Thinking

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1 Introduction

Tourists pay more and more attention to experiences and to quality of experiences when traveling. Man has encountered different types of experience throughout history, as people are shaped in one way or another from the beginning of birth to death. The experience gained by learning how to light a fire to make different equipment was crucial to the survival of humanity and the development of the human brain. Without experiences, people as a race would not be in the place they are today. However, experience as a phenomenon also consists of more mundane tasks requiring little or no preparation, ranging from meeting other people or obstacles, encountering sudden unexpected events, or even just mowing the lawn. These different tasks, given as examples, may seem a bit mundane, but they are also essentially experiences (Backlund, 2014). It may seem boring to us, but for some, it means participating in everyday life.

Experiences can be divided into two types in a certain view. One consists of experiences gained in everyday life, and the other involves what people create on their own, including experience planning (Abrahams, 1986). A study published by Aho in 2001 seeks to create a general theory of the tourist experience and explain the key elements thereof. He also points out that tourism can be seen as a mixture of controlled and uncontrolled activities to create an experience of moving people from one location to another. It means that from his point of view, everything a tourist encounters during their trip is part of the tourist experience. He suggests that experiences have multiple core contents, but emphasises four fundamental ones: emotional experiences, informative experience, practice experiences, and transformation experiences. In addition to these experience cores, he also points out that individuals have different conditions for experiencing and enjoying it (Aho, 2001).

In tourism, little attention is paid to people with special needs or people with disabilities (PwD) and little work is done to involve them in tourism events. Theoretically, there is a name for the type of tourism aimed at people with special needs, namely “accessible tourism”. The word "accessible" itself means "able to be reached or easily got" or "easy to understand" (Cambridge Dictionary, 2021). In practice, unfortunately, many tourist destinations are still not easily accessible, or

people are unable to understand them due to their limitations without the help of personal or material assistance.

The European Network for Accessible Tourism states that disability is a widespread phenomenon that includes only people with motor, hearing, vision, and mental disorders. People with respiratory problems and different types of allergies also need customised content (Krželj, 2019), and all restrictions, not just the possibility of unimpeded movement, should be considered when planning tourist experiences.

Our research will focus on a specific group of people with special needs, namely the deaf and hard of hearing. We will develop the idea of how to adapt the tourist experience so that the experience will be just as memorable and positive for them, and stimulate their desire to visit the destination again.

Hearing impairment is a disability marked by an impaired ability to perceive sounds (Hörsellinjen n. d.). Hearing impairment is spectral, with varying degrees of hearing loss, so the deaf and hard of hearing may have different accessibility needs. The general concept for hearing loss is that communication can be more demanding. It is more challenging to detect sounds in noisy environments that strongly affect communication (Hörsellinjen n. d.). According to the World Health Organization (WHO), there are 466 million people on the world with hearing loss.(WHO, n. d.). In Slovenia there are around 1,500 deaf and hard of hearing people who use Slovene Sign Language and about 75,000 people who use hearing aid (GOV.SI, 2019)(GOV.SI, 2019).). There is no mobile application in Slovenia intended for deaf and hard of hearing tourists who visit large, touristy Slovenian cities. Since the number of registered deaf or hard of hearing people in Slovenia is not negligible, such an application would be a significant achievement.

People with the same language communicate more easily. If people do not understand the language, they may feel disappointed and excluded (Kožuh et al., 2016). The communication process often requires them to listen to sounds and try to find meaning.

People with hearing impairment rely heavily on facial expressions, attention-grabbing techniques, and voice quality to receive and understand information (Kožuh et al., 2016). Notifications via, for example, sound devicescan be very difficult for them to understand. For information to be adequately understood, data must be presented visually.

The technological development of the online world provides essential tools to facilitate communication between the deaf and hard of hearing (Kožuh et al., 2016). Smart apps are good support for regular updates. Mobile applications can be defined as support programs, making it easier for people with special needs to be informed about a tourist destination (Hörsellinjen n. d.). Particular emphasis will be placed on mobile applications that enable people with special needs or disabilities to visit certain places. Technologies are essential because, for example, mobile technologies in tourism can help remove obstacles to travelling for people with special needs.

In the following, we present an idea for a mobile application that would facilitate on-site travel or tourist experiences for deaf and hard of hearing tourists.

2 Literature review

Accessible tourism is a type of tourism that entails a process of collaboration between stakeholders. It allows people who have access requirements, such as mobility, vision, hearing, and cognitive dimensions of access, to operate in an independent fashion and with fairness, honour, and respect while universally created tourism products, services, and environments are delivered. This definition embraces an approach where people have benefits from accessible tourism for as long as they live and entail people with permanent or temporary difficulties in the form of disabilities: seniors, overweight, family units, young children, and people who work in safer and more socially arranged environments (Darcy & Dickson, 2009).

Even though the growth of initiatives connected to a rise in the availability of tourism for disabled people, tourism for the deaf was seldom studied separately from the whole, almost as if those with hearing disabilities are seen as a group that has been excluded from the tourism literature (Barnes & Mercer, 2010; Zajadacz & Szmal, 2017). A common social experience is typical for deaf people, which is caused

by, among other things, the feeling that they are different. This sense of being different could be perceived as a social stigma. (Daruwalla & Darcy, 2005). Although this group of people is incredibly miscellaneous, what keeps them connected is, without a doubt, sign language, which enables them to communicate (Fraser & Supalla, 2009). The language wall standing in their way means that these people's impairment has a social nature, which appears during the phase where they communicate with a portion of the society that does not have these disabilities. Those that are accustomed to using sign language claim that they do not have the sensation that they are different when within groups where this is normal (Zajadacz, 2014).

Making the optimal range of tourist product and services requires dealing addressing the segment with hearing disabilities, which in turn requires insight into their needs and expectations (Zajadacz, 2014). When it comes to surpassing the language barrier, it is vital to consider the kind of views people without these disabilities have and how willing they are to initiate conversations about this subject (Atherton, 2007). The use of sign language by those who can hear is regarded as showing respect and is a good foundation for social integration (Young et al., 2000).

Previous tourism experience and accumulated knowledge about people with disabilities (PwD) allow them to deal with obstacles in a more positive and well-informed way, which increases their sense of security and encourages their motivation and desire to travel. Facilitators can be very diverse. These are various factors most often related to the availability of accessible tourist services, contributing to the greater participation of PwD in tourist activities (Devile & Kastenholz, 2018). People with different types of disabilities need different kinds of adjustments or access to the information they need. For example, people with a low level of disability, needing such things as special glasses or a hearing aid that would allow them to live a reasonably everyday life, require fewer adjustments than those with a high level of disability, such as people with tetraplegia or blind or deaf people (Michopoulou et al., 2007; Michopoulou & Buhalis, 2013).

There is little research on the experience of tour guides with people with special needs. As those with special needs have far fewer tourist options tailored to their specific needs, guides accordingly have less experience therewith (Chikuta et al., 2017). Chikuta et al. (2017) explored the experiences of tour guides with people with

special needs in museums and national parks. They found that the tourism industry is not adapted to people with special needs and that there is not enough information in the tourism sector about the needs of these people. When guiding people with special needs, guides face mainly time management, language choice, and other barriers due to equipment and obstacles, especially in natural environments. As a solution, the authors suggest training tour guides that lead people with special needs to be aware of such tourists' needs and how to deal with them when travelling. They also recommend appropriate communication skills and learning about possible health problems during trips or on tours. Of course, it is first necessary to ensure of the physical accessibility of the space where the guiding takes place.

State-of-the-art mobile technologies, destinations, and providers can access broader groups of people and allow tourists to have access to broader quantities of information and personalised content (Zajadacz & Szmal, 2017). The developments in mobile technology, particularly when it comes to smartphones and tablets, is considered crucial for tourism in the future. Touch-screen technologies have been gradually embraced in a wide spectrum of applications requiring assistance. Tablets and smartphones could be widespread and used across the board as a way of connecting people and enabling smoother autonomy for those with impairments; mobile applications could also be seen as an instrument used to facilitate mutual understanding between the impaired people and those who are able to hear during communication (Milicchio & Prosperi, 2016).

Mobile applications are developed to help people with disabilities must provide relevant information according to their needs. For example, information about places and attractions to visit, local transport and their accessibility, opinions and experiences of other similarly affected persons on the proposed points of visit, information on local conditions to support visits from people with disabilities. It is also desirable that mobile applications created to support people with disabilities allow interaction between themselves and service providers (Ribeiro et al., 2018). Applications in tourism can contribute to a personalised experience or provide specific information and facilitate the communication and transmission of personalised information to people with disabilities as well; such applications are designed for learning. The use of technology would help a large group of tourists who are now neglected and contribute to the development of accessible tourism and to general satisfaction with the tourist experience.

Gračan et al. (2021), in their research of mobile applications in the city of Zagreb, found that the usefulness of using all analysed applications is statistically related to the level of satisfaction with visiting the destination Zagreb. They also found that users are more satisfied with an app that provides more personalised information than general information apps. A study by Palos-Sanchez et al. (2021) has realised that tourism apps need to be innovative, designed for self-education and entertainment to achieve user satisfaction with the app. The primary measure of an information system's success is user satisfaction. To achieve a level of satisfaction, it is necessary to adapt the application or information system to the user's wishes and needs. Failure most often occurs when a user's requirements are not recognised (Michopoulou & Buhalis, 2013), and the product or service does not meet their needs.

3 Methodology

3.1 Structure literature review: a review of good practices

In the first step of the research, we made a structured literature review or review of good practices. We searched the Internet using the Google Chrome web browser for relevant examples of good practice by browsing the web pages of results. The key search criteria were applications or pages in Slovenian, Croatian, and English. The search countries were Slovenia, Croatia, and others. The keywords we used for the search were: app for the deaf, app for the deaf and hard of hearing, app for people with special needs, tourism for the deaf, deaf in Slovenia or in Croatia, and app for the deaf in Slovenia or in Croatia. We could say that the most important criteria were the keyword app and the keyword deaf.

For each term entered, we looked at the first 30 hits. See Figure 1, which shows that we used six keyword combinations.

3.2 Design Thinking and HEART Metrics Framework

The next step in our research was developing a business idea for the mobile app through the Design Thinking method. Design Thinking is a process and a method (Rowe, 1987). It is a creative method that helps the researcher solve wicked problems (Buchanan, 1992). Design Thinking can be defined as a methodology embedded in

a wide variety of innovation activities with a human-centred design ethos. (Brown, 2008). It is a method that can be included in project planning or designing services or products for end users (Chou, 2018). It is also a prevalent method in teaching (Lynch et al., 2019). The Design Thinking method has proven to be an innovative and practical approach to problem-solving in the past. The Stanford University students developed an innovative product using this method – a baby warmer sleeping bag – which helped keep newborns alive in undeveloped areas where access to hospital care is difficult (Soule, 2013).

The Design Thinking process differs from the traditional way of dealing with processes in social entrepreneurship (Chou, 2018). Social entrepreneurship is a form of entrepreneurship that responds to problems in society and seeks to create social benefits through services and products. It contributes to innovative solutions to social, economic, and environmental issues and deals with the social inclusion of vulnerable groups (GOV.SI, 2021); therefore, the Design Thinking method is suitable for designing a product or service intended mainly for the deaf and hard of hearing when travelling or visiting a destination, so that their experience can also be positive.

A Design Thinking process is repetitive and usually contains five phases: *Empathy/Empathise* (the market situation is researched, people's needs and requirements are identified, and the human element is preserved) → *Define* (refers to considering proposals and conditions regarding the needs and desires that arose in the first phase, followed by defining the idea or making proposals for solving the problem) → *Ideate* (through brainstorming, the team sets different views, including those out of the box, which can contribute to innovative solutions) → *Prototype* (a prototype of the solution or a product is developed, and it is ready for testing) → *Test* (the last phase, where the prototype is presented to the target group, which provides feedback for possible improvements and changes). If the need for change arises, it is possible to return to any stage of Design Thinking and repeat the whole process several times. It is not a linear process. We also know the Design Thinking model with seven phases: *Define* → *Explore* → *Ideate* → *Prototype* → *Select* → *Implement* → *Review*. Because it is a universally accepted model with five phases, we will use five steps model. It also contains a phase of empathy that is especially important when designing a product or service intended for PwD.

As the second part of the Design Thinking method, we used the HEART Metrics approach to test our idea. This is a framework developed by researchers at Google (Rodden et al., 2010) and serves to check the quality of the user experience. The HEART Metrics framework is most often used to evaluate online products, such as applications. It is a framework that contains recommendations on the perspectives that are desirable to consider for the success of an application or web tool (Flaounas & Kokkinaki, 2015). There are five categories: *Happiness* (a measure of satisfaction or attitude with a product/service, usually recorded with user survey) → *Engagement* (a measure of how much a user interacts with a product of their interest) → *Adoption* (it defined the number of new users over a specific time frame. It measures how successful you are at attracting new customers; it measures customer experience rather than user experience) → *Retention* (a measure of keeping your existing users for some amount of time) → *Task Success* (it defines time spent on any given task or the percentage of successful completion of a specific task).

4 Empirical part

4.1 A review of good practices – Apps for the deaf and hard hearing

The first combination, "app for the deaf", gave us 7 usable hits of 30. The second combination, "app for the deaf and hard of hearing", yielded only 5 usable results out of 30. The third combination, "app for people with special needs", gave us as many as 20, because it was a much broader term that could encompass multiple types of disability. The fourth combination, "tourism for the deaf", gave us the most results, 25 of them, because it included the word tourism and deaf without the word "app". The fifth and sixth combinations gave us the least results because they refer to Slovenia and Croatia, and we managed to find only one application from that area. The fifth combination, "deaf in Slovenia or Croatia", gave 9 results mostly related to various associations for the deaf. The results of the website review are shown in Figure 1.

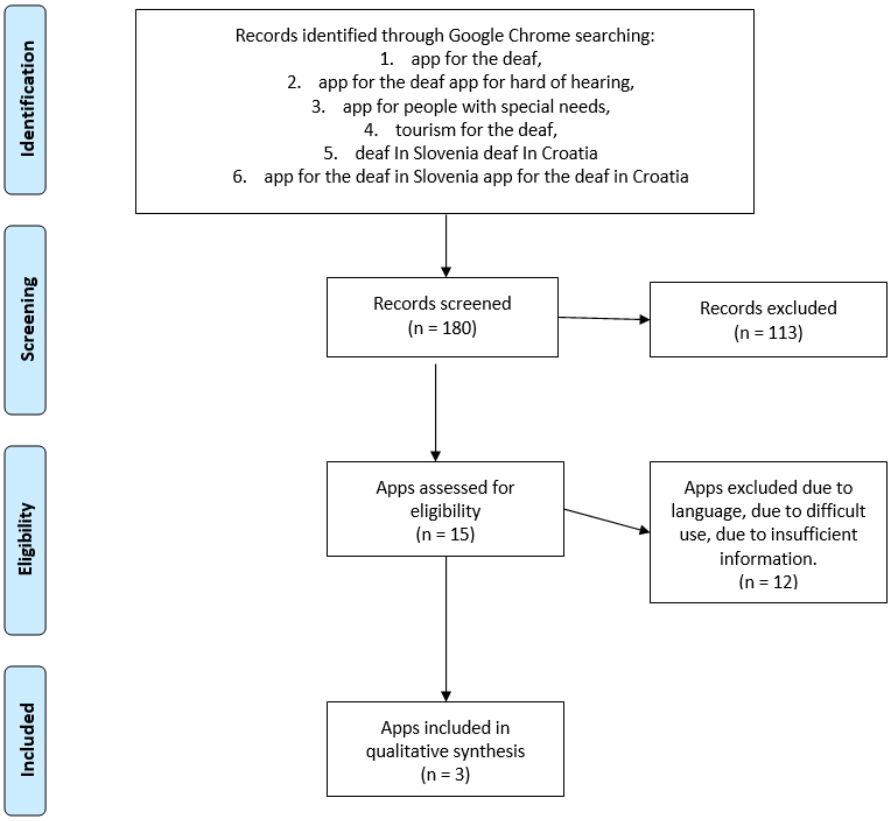

Figure 1: Structured review of good practices

Source: own.

Through a review of good practices online, we found that in Slovenia there are no similar applications that would help people with disabilities, so we present three good practices, one mobile application for the deaf and hard of hearing from Croatia, one from Span and Portugal, and one that works globally. These applications met most of the criteria, namely that they are applications for the deaf, available on search engines, and contain English and other languages. Below are more detailed descriptions of selected applications that we recognised as examples of good practices.

Mobile application Deaf Friendly Tourism

A few years ago, the Epoca360 agency from Novigrad, Croatia, recognised the problem of limited amount of tourist products for the disabled, especially the deaf and hard of hearing. According to them, the cause of this problem is the insufficient sensitisation of the national tourism sector to the challenges and difficulties faced by the deaf and hard of hearing due to the inadequacy of adapting tourist services to their needs.

The main task of Deaf Friendly Tourism is summed up in the fact that it is a tourist guide adapted for the deaf. The basis of the tourist guide consists of an interactive map with points of interest. Clicking on the topic of interest opens a screen with relevant visual information in sign language, along with text in Croatian and English. Deaf people can watch the video in Croatian sign or international sign language (Krželj, 2019).

As part of the project, 20 informative videos in sign language have been recorded so far, which enable deaf and hard of hearing people to view the wide range of services offered by the site of the Novigrad pilot project. The app is available on all Android and iOS mobile devices.

Another essential part of the application is the "GO SOCIAL" platform, enabling communication between all application users. The user can search for all users within the database, those who, of course, want it and will be able to view all application users within a certain radius (Krželj, 2019).

Unfortunately, this option is not available for the wider area, so, in the Republic of Croatia, the only geographical area covered by this mobile application is the town of Novigrad.

Mobile application TUR4all

TUR4all is a mobile application designed to promote affordable tourism. The innovators of this mobile application believe that anyone with a problem should be able to move and travel freely and enjoy free activities like any tourist. This mobile application covers a wider geographical area, particularly Spain and Portugal, and is

available in several foreign languages: Catalan, English, French, German, Portuguese, Italian, and Chinese. This app is interactive so users can comment, add, share content, and even promote facilities accessible to people with disabilities. Users can search for content according to specific categories, such as accommodation, bars and restaurants, buildings, etc. (Krželj, 2019).

For example, a user can search for the city of Barcelona and find places that are accessible to the blind. Still, if they want to narrow down the search results and get more precise answers, they can categorise the results the interested in to search the museum in Barcelona for the blind and deaf (Krželj, 2019).

Mobile application Let Me Hear Again

Let Me Hear Again is a mobile app designed for people who have hearing problems. There are two versions of this app, Let Me Hear Again and Let Me Hear Again Pro. Some features make the versions very different. One of the differences is in the price, because the Pro app is not free, and the other is in the content itself and the app's options. The free application has a drop-down menu to translate the content into English, French, Italian, Spanish, and 36 other languages. Still, when the user chooses one of the 36 languages, the application leads him to purchase the Pro version (Krželj, 2019).

The app helps deaf people automatically translate the conversation into text, which would mean that if a person is on a guided tour and the guide does not know sign language, the user of this app could use the guide services like other tourists. The real problems with this application are that in case of loud noise the application cannot translate properly, and in most cases on frequent and well-known tourist attractions the noise level is sufficient to disrupt or disable the proper operation of the application. In conditions of silence, the application operates entirely normally, with the translation being affected by the speed of speech. So, if a person speaks too fast, the app will not translate the person's speech. In addition to providing a translation of speech, the user can also type what they want to say and leave it for their interlocutor as a voice message, which enables the communication between the deaf and those who do not know sign language (Krželj, 2019).

Our business idea, modelled on applications proven to be good practice, would upgrade the examples we found. The deaf and hard of hearing application has excellent potential, but efforts should expand its use and accessibility in several languages. For Slovenian destinations, it would cost a lot to upgrade an existing application in collaboration with Epoco360. The upgrade of an existing application is described in Table 1.

Table 1: Upgrade of an application

	Upgrade of existing applications
Language	Croatian (HZJ), British (BSL), American (ASL), Slovenian (SZJ), Italian (LIS), and German (DGS) Sign Language
Destinations/cities	Ljubljana, Maribor, Portorož, Piran, Postojna Cave, and major towns in Croatia
Online vs Offline	Online to download the desired video with sign language interpretation. Offline after downloading the desired video
Mobile phone operating systems and more	Location (GPS) turned on Android and IOS

Source: own.

4.2 Business idea app for the deaf and hard of hearing through Design Thinking

Through five phases of Design Thinking, we defined in Table 2 the challenges of deaf and hard of hearing people that can be solved by a mobile application tailored to them. The task of the application is to provide a good and memorable tourist experience for PwD, specifically for deaf and hard of hearing people. The last two phases of the Design Thinking process, Prototype and Testing, are described only hypothetically, in the event the business idea were to be realised and we were to begin working with a company that develops mobile applications. The description is in Table 2.

Table 2: Description of the five phases of Design Thinking

PHASE	IDENTIFYING CHALLENGES OF THE DEAF AND HARD OF HEARING BY PHASE THAT CAN BE SOLVED BY A MOBILE APPLICATION
EMPATHY	The problems faced by deaf and hard of hearing people in tourism are that their services are not similar to others. People working in tourism do not know how to communicate with them and provide them with dignified service. One of the best examples would be that tour guides do not learn sign language, and deaf and hard of hearing people cannot get to know the destination like people without hearing problems. Also, services in hotels, cafes, info centres are not adapted to the deaf.
DEFINE	One of the solutions to the problems faced by deaf and hard of hearing people is to design an application that will help them navigate tourist destinations. This information must be in sign language. The second and more elusive solution is for tourism professionals to learn sign language.
IDEATE	The idea is to design a mobile application to help deaf and hard of hearing people in tourist destinations. This is the most effective solution because everyone uses mobile phones daily and don't go anywhere without them. As technology advances, it should serve man as much as possible. The application will contain information in sign language, such as information about the destination, attractions, services for the deaf, and where the sign language is spoken.
PROTOTYPE ***** we hypothetically describe the process that would be carried out if a mobile application for the deaf and hard of hearing were launched	In line with Epoca360 from Croatia, which developed a similar application, the existing one would be upgraded to be used in a larger area, more precisely in Croatia and Slovenia. For the beginning, the sign languages of Croatia and Slovenia, along with English as a lingua franca, would be on the application. The app will feature a map, for example, of Slovenia, where people can see where the destination explanation is in sign language by clicking on the app logo next to each attraction that has that video. After the click, a video opens in which someone explains in sign language where the user is and tells some exciting things about the place. The map also shows where the facilities where services for the deaf can be found, and one can read the comments and impressions of the users who were there.
TEST ***** we hypothetically describe the process that would be carried out if a mobile application for the deaf and hard of hearing were launched	If the application proves successful, it would be extended to the whole country and later to the Balkan region. The languages of the Balkan countries and some of the world languages such as German, Italian, Spanish, etc., would be added. If the application does not work well in specific segments, these things must be fixed and a new prototype re-released.

Source: own.

4.3 Testing a business idea through the HEART Metrics Framework

According to the HEART Metrics Framework, a set of keyframe elements is organised as a set of Goals, Signals, and Metrics. Goals must be clearly defined, and each one must be measured using one or more signals. Signals are what most people call "metrics". The difference between signals and measurements is technical. The signal describes the high-level quantity that the evaluator or user experience developer wants to capture. For example, the signal could be the number of deaf people active in the app per day. The measurements are more formal and technical descriptions of the low-level signals and reflect the emphasised application infrastructure. An example could be the measurement of the above signal: the number of registered users in the app who are deaf or hard of hearing people and who perform one or more actions, for example, rate the app with stars or comment. In Table 3, we present the HEART Metrics Framework for our mobile app.

Table 3: HEART METRICS for LISTEN UP!

	GOALS	SIGNALS	METRICS
HAPPINESS	Users are happy with the app and have no problems using it. We want at least 80% positive feedback.	Users respond to surveys (for example: How satisfied are you with the app? What are you missing and what would you add to the app? What needs to be improved in the application – suggestions for improvements?), Leave five stars as an app rating, leave positive feedback in the form of comments.	User satisfaction through rating -number of 5-star ratings and number of positive reviews of results after each month.
ENGAGEMENT	Users enjoy the app and engage with it through a whole tour of the city, not just in some parts. We would monitor how many tourist guides use this app monthly, and we would like at	Users spend more time in the app – whole tours through the cities. The number of registrations per week is higher; more tourist organisations are engaging in using this app, there is more interest in the application.	The number of registered users who are deaf or hard of hearing is based on registration per month. The average number of app visits by all users. Average time spent in the application per user.

	GOALS	SIGNALS	METRICS
	least 10% of tours guided in Ljubljana or any other city to use this app; use the LISTEN UP! app.		
ADOPTION	New users see the value of the app. We want as many people as possible to learn about this app in the first month.	Downloading the app, registering in it (number of measured registrations in the app in a week), using features – if all are used?	Download speed, registration speed, the adoption rate of new features. The number of registered users who are deaf or hard of hearing based on login in one month.
RETENTION	Users have used the app at least once for their own needs when viewing a particular site and reuse it at least once when viewing another site offered by the app. After a specific time, when revisiting, they reuse our application, which already has other functions, as it is constantly updated with information and various possibilities of use.	Application users are active in using the application, and the number of return users is increasing.	The proportion of registered users who use the app at least once a week/month/year and the ratio of registered users who never return.
TASK SUCCESS	We want the app, of all registered users of the app, to be used by at least 60% of deaf or hard of hearing. Of these, less than 10% will give a negative comment or mark the application as useless to them.	Quick search and content view without technical problems, practical help with city orientation. The number of users satisfied with the application and its implementation, and the ratio of the number of users who leave the application per month.	Exit speed from the application, application crash rate, the number of active users and completed tasks in application, the number of users delete the application from week to week. We will try to figure out why users delete the application.

	GOALS	SIGNALS	METRICS
	Positive comments for the app will also be submitted by people who do not have special needs.		

Source: own.

5 Results

Following the Design Thinking method and prior acquaintance with the market situation, we formed a business idea to develop a mobile application for accessible tourism, specifically an application for the deaf and hard of hearing, which we named: LISTEN UP!

Our idea is an upgrade of the applications we have found through a structured literature review of good practices on mobile applications for the deaf and hard of hearing, which are currently offered mainly on the Croatian market. The target group we focus on are deaf and hard of hearing people. These people are our primary target audience, but the app would be available to anyone, even people with no special needs, on Google Play or the App Store.

Our goal is to make tourism and tourist attractions more accessible to people who cannot actively hear about the places they visit on their travels. It is undoubtedly true that everything can be read online today. Still, it is also true that not everything is written there and that it is a better experience to stand in front of a historic building and hear about it. It would be an ideal opportunity for people on group trips to have a sign language guide.

We have also presented another solution: an application that translates what the guide says into text format. We described this example in the Let Me Hear Again app section and pointed out the shortcomings. So if a person speaks too fast, the app will not translate the person's speech, and in the event of loud noise, the translation app is disabled. We think a mobile app would be most effective: a mobile app that will serve as a travel guide adapted for deaf and hard of hearing people with visual information in sign language. With the help of location recognition, a video is displayed in which a person describes the environment in sign language. Our

application LISTEN UP! would be launched for Ljubljana first then for other cities. Since we are not experts in mobile application development, we would seek a partner in the first phase, name the prototype development phase, who would collaborate on the prototype and later also the final version of LISTEN UP!

The next step is to determine the following locations that will be displayed in the application. Then we would look for a sign language interpreter for American (ASL) and British (BSL) also for some who knows version of Slovene (SZJ) Sign Language. . Initially, we would look for a tourist guide who knows and uses sign language in their tours. The interpretation would adapt cultural and natural heritage and other attractions in the cities for tourists. Otherwise, we would hire interpreter for the interpretation, who would be involved in preparing the performance of the sign language interpreter. A team would also be necessary to produce videos of sights and attractions, which would then be uploaded to the LISTEN UP! mobile application platform.

As the second part of developing our business idea, we would place QR codes in cities or near the main tourist attractions, which via LISTEN UP! would launch a video with audio or sign interpretation about the given landmark. LISTEN UP! would be presented to the locals and tourist information centres, encouraging its use. We would also contact tour operators and introduce them to the possibility of using the application as additional help in the work of tourist guides with deaf and hard of hearing people. LISTEN UP! would first be in SZJ and ASL also in BSL. If the project proves successful, other versions of sign languages, Croatian (HZJ), Italian (LIS) and German (DGS), will be added later.

We would design a brand with a logo to launch LISTEN UP!. The colour versions are shown in Figure 2 and Figure 3.

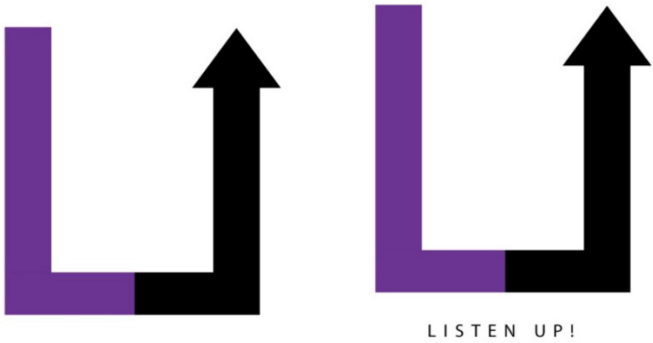

Figure 2: Listen Up! with a white theme
Source: own.

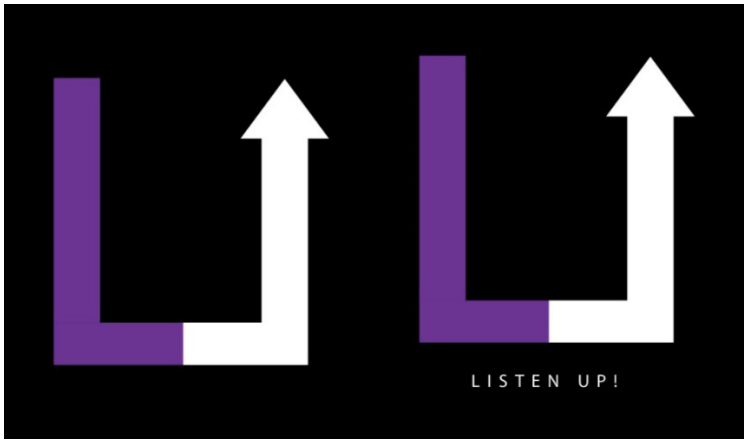

Figure 3: Listen Up! with a black theme
Source: own.

The app would work as follows: you need to have the location turned on when you download it from Google Play or the Apple Store. Open it and select a language. The map shows your current location. Icons with the app logo will appear on the map, as you can see in Figure 4. It means that these are places that have video in sign language. When you click one of the icons, a video is displayed. The maps also show if there are any accommodation facilities, restaurants, bars, etc., nearby. Users could mark places where staff can communicate in sign language, such as a hotel.

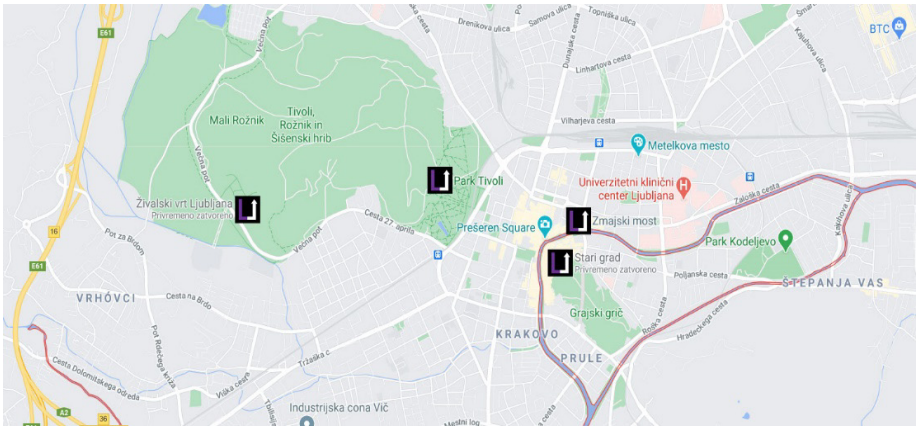

Figure 4: Map with your current location
Source: own.

After clicking on the logo icon or any icon on the map, it will be possible to leave comments below and give your opinion on whether this video was helpful or, for example, where are tourist accommodations where you can speak sign language. Comments can also be left on Google Play or the Apple Store, and the app can be rated from 1 to 5 stars. When users log in to the app, they must enter their personal information and whether they are deaf or hard of hearing. They will also need to leave their e-mail address, and if they wish, they can indicate that they want to receive notifications about new features and changes in the app. They would be financed from EU funds and advertised through television advertisements (Web TV), social networks, leaflets in associations for the deaf and hard of hearing (Institute for the Deaf and Hard of Hearing in Ljubljana, Association of the Deaf and Hard of Hearing of Slovenia), International Play with Me Festival Ljubljana, Semič, Krško and Radlje ob Dravi).

It would be the same in Croatia if we tried to work with Epoco360, who designed Deaf Friendly tourism. We believe this would reduce costs. If the idea of this kind of mobile app were accepted, we would propose an upgrade described above and extend it to more extensive parts of Croatia, starting with Zagreb. They would also be financed from EU funds and advertised through television ads (Deaf TV, HRT), social networks, leaflets in associations for the deaf and hard of hearing (Croatian

Association of the Deaf and Hard of Hearing), Festival of Equal Opportunities (Zagreb).

6 Conclusion

Accessible tourism is a unique form of tourism whose products and services are adapted to people with special needs or people with disabilities (PwD). Such a tailored offer needs to be designed precisely according to PwDs' needs, considering how we can make it easier for them to take advantage of their tourist offer. It is vital to note that people whose disability is not visible at first glance are often overlooked.

With the development of technology and smartphones that have access to the internet and our location, it is possible to develop products that facilitate mobility or help us find ourselves in space and access important information in our home or the foreign environment when we travel. With the spread of technology, it is possible to help people with disabilities, such as the deaf and hard of hearing, to engage in tourism. Destinations also improve their competitiveness and destination image by developing different offers for different PwD groups, resulting in a higher number of visitors, an additional segment, and a higher destination income.

However, the bid for PwD must be adjusted accordingly. Therefore, we tackled our business idea development through three parts. First, after a structured review of good practice examples, we identified where the hole is in mobile applications and identified the problems that deaf and hard of hearing people face in city visits. Then, with the innovative Design Thinking method, which addresses the explicitly human-centred design and enables the design of a solution that addresses a specific problem of a particular target segment, we developed the business idea of a mobile application. The LISTEN UP! mobile application concept is primarily intended for deaf and hard of hearing people and tourist guides who guide deaf and hard of hearing individuals or groups. We also tested the business idea through user experience, corrected any errors, and improved it to the point that it addresses the critical problems faced by the deaf and hard of hearing when visiting cities.

Such a mobile application enables the smooth transmission of tourist information. The application replaces the sign language interpreter when visiting a city and promotes the independence of deaf and hard of hearing people in this type of tourist activity.

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