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Articles

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The current issue is the fourth of the seventh volume of the *Athens Journal of Tourism,* published by the Tourism, Leisure & Recreation Unit of ATINER.

Gregory T. Papanikos
President
ATINER

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A World Association of Academics and Researchers

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Mediterranean Studies, 29-31 March & 1 April 2021, Athens, Greece

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Important Dates

- Abstract Submission: **30 November 2020**
- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **1 March 2021**

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The Social Program Emphasizes the Educational Aspect of the Academic Meetings of Atiner.

- Greek Night Entertainment (This is the official dinner of the conference)
- Athens Sightseeing: Old and New-An Educational Urban Walk
- Social Dinner
- Mycenae Visit
- Exploration of the Aegean Islands
- Delphi Visit
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7-10 June 2021, Athens, Greece

The Tourism, Leisure & Recreation Unit of ATINER organizes its **17th Annual International Conference on Tourism, 7-10 June 2021, Athens, Greece** sponsored by the Athens Journal of Tourism. The aim of the conference is to bring together academics and researchers from all areas of Tourism. You may participate as stream leader, presenter of one paper, chair a session or observer. Please submit a proposal using the form available (https://www.atiner.gr/2021/FORM-TOU.doc).

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- **Dr. Peter Jones**, Co-Editor, Athens Journal of Tourism & Professor of Management, University of Gloucestershire, UK.

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Resistance to Customer-driven Business Model Innovations: An Explorative Customer Experience Study on Voice Assistant Services of a Swiss Tourism Destination

By Anna Victoria Rozumowski[*]*, Wolfgang Kotowski*[±] *& Michael Klaas*[‡]

For tourism, voice search is a promising tool with a considerable impact on tourist experience. For example, voice search might not only simplify the booking process of flights and hotels but also change local search for tourist information. Against this backdrop, our pilot study analyzes the current state of voice search in a Swiss tourism destination so that providers can benefit from those new opportunities. We conducted interviews with nine experts in Swiss tourism marketing. They agree that voice search offers a significant opportunity as a new and diverse channel in tourism. Moreover, this technology provides new marketing measures and a more efficient use of resources. However, possible threats to this innovation are data protection regulation and providers' lack of skills and financial resources. Furthermore, the diversity of Swiss dialects pushes voice search to its limits. Finally, our study confirms that tourism destinations should cooperate to implement voice search within their touristic regions. In conclusion, following our initial findings from the sample destination, voice search remains of minor importance for tourist marketing in Switzerland as evident in the given low use of resources. Following this initial investigation of voice search in a Swiss tourism destination, we recommended conducting further qualitative interviews on tourists' voice search experience in different tourist destinations.

Keywords: *Business model innovation, resistance to innovation, customer experience, tourism marketing, voice search, Swiss destination marketing, destination management*

Introduction

Since innovations like big data and machine learning have already caused lasting changes in the interaction between companies and consumers (Shankar et al. 2010), interconnection and automation enable the autonomous decision-making of technical systems under the term "Internet of Things." This "fourth industrial revolution" (Tussyadiah 2020) has new, in part hardly foreseeable, consequences for marketing and especially for customer experience management. To contribute to the understanding of this profound disruption, this study deals with voice assistants as part of the Internet of Things and their influence on marketing (Pagani

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et al. 2019). These systems enable new services, such as voice search, which allow new customer experiences. "Voice search is the technology that enables users to access information using spoken queries" (Li et al. 2009, p. 769). Using an example of these services' innovation diffusion in Swiss tourism by investigating a sample destination, this study shows how companies react to this contemporary disruption.

Natural language processing and voice recognition processes are increasingly sophisticated, as they can rely on more advanced computing power and algorithms (Hirschberg and Manning 2015, Hoy 2018). For example, voice assistants not only play music, order products from an online shop, or make phone calls (Saad et al. 2017) but also independently perform complex tasks such as setting appointments with a hairdresser without being recognized as a computer system by their human counterpart (Kreutzer and Sirrenberg 2020). This increasingly better quality of processes makes these services valuable to consumers and accessible through products such as Apple's Siri, Google Home, or Amazon's Alexa (Kumar et al. 2020). A voice assistant is not bound to hardware like Amazon's Echo Dot. An app on a smartphone or even on a notebook with low computing power is sufficient, as they only establish a connection to a powerful server via the Internet where the actual service is running.

As voice assistants support consumers in many daily tasks (Kreutzer & Sirrenberg 2020, Lee and Choi 2017), they are increasingly replacing smartphones with which these tasks have previously been performed using text input (Schalkwyk et al. 2010). About 70% of users in the United States are using voice assistants more frequently to search for something (McCaffrey et al. 2018). Therefore, the total number of voice assistance users is growing steadily. Moreover, new consumer groups such as blind people (Barata et al. 2018) and children (Lovato and Piper 2019) are using these services with rising demand, whereby children are socialized at an early age to use them. A Swiss study showed that one-third of the Swiss population is already using voice functions mainly via smartphone (Kunath et al. 2019). People use voice search mainly to retrieve information (e.g., weather data) followed by navigating and localizing (Kunath et al. 2019). As a result, revenues of USD 27.8 billion are expected from the sale of such devices (IDC 2018). Moreover, revenues of more than USD 40 billion are expected from shopping using voice assistants in the United States and the UK by 2022 (Perez 2018).

However, despite these impressive figures of consumption, voice marketing is relatively underdeveloped, for instance, concerning the use of certain search terms (Kreutzer and Seyed Vousoghi 2020). Moreover, consumer and marketing research on voice assistants and their usage is still at an early stage. For example, a common theoretical framework is missing (Cecchinato and Harrison 2017, Purington et al. 2017), which is surprising as voice assistants provide new customer touchpoints that enable new customer experiences (Kreutzer and Seyed Vousoghi 2020). Therefore, this pilot study's general purpose (Smith 2019) is to contribute to the understanding of the customer experience using voice assistants.

Studies on consumer interaction with voice assistants are still rare (Rhee and Choi 2020, Rzepka 2019) although some have focused on text-based chatbots (e.g., Hill et al. 2015, Von der Pütten et al. 2010). Moreover, as far as customer

experience is concerned, previous studies assume that all senses of the consumer are stimulated (Pagani et al. 2019). However, this must be questioned in the case of voice assistants because of restrictions such as the lack of image representation (Carmel 2019, Mari 2019). Thus, the individual interaction of a consumer with a voice assistant still requires considerable research (Liu et al. 2017).

To contribute to closing these research gaps in marketing and consumer research, the investigation of voice assistants in tourism, especially in hotels, is a suitable use case (Kattara and El-Said 2014). For example, there are first applications in hotels (Amazon 2020, Lodging Magazine 2016), and consumers could be observed along the entire touristic customer journeys (Esser 2019). The potential and effects of customer interaction automation by voice assistants could be investigated (Ivanov and Webster 2019a, 2019b). The creation of new customer journeys, which leads to new customer experience, is a central object of such research (Tussyadiah 2020). These new customer experiences are new social phenomena, which is why such studies should focus not only on technical but also sociocultural aspects (Russell et al. 2015), which gain relevance with the emergence of those innovations.

To begin this research program, the general investigation of hotels is a good way to start as they provide the context in which consumers interact with voice assistants during vacations. For example, by providing devices such as Amazon's Echo Dot in hotel rooms, hotels offer their guests the opportunity to continue consuming services that they are accustomed to at home. By providing content such as information about the hotel or the destination (Bowen and Morosan 2018, Hörner 2019), hotels can also investigate how their guests respond to these offers and how they use the voice assistants. Thus, the influence of voice assistants on branding (Ho and Bodoff 2014, Kang et al. 2016, Tam and Ho 2005) could be studied.

Surprisingly, however, it became apparent at the beginning of this pilot study that the provision of such innovative service by hotels remains rare despite initial practical exceptions. Consumer acceptance of this new technology, and accordingly innovation diffusion, is intensive as they recognize its usefulness and ease of use (Klaus and Zaichkowsky 2020, Wirtz et al. 2016). In contrast, resistance to innovation otherwise normally observable among consumers (Bagozzi and Lee 1999) and especially barriers to the adoption of smart services (Hong et al. 2020) are, in this case, present among hotel managers (Kattara and El-Said 2014). This is unusual as the introduction of innovative products and services is particularly essential for companies' success (Prins and Verhoef 2007).

Therefore, as a first step, this pilot study will examine the interplay of these extremely different innovation diffusions on the part of consumers and hotels. For this purpose, the responsible managers of a vacation destination, hotel and experts in tourism and marketing were interviewed, all dealing with the diffusion of innovations in hospitality. Hence, the specific purpose of this research program is to investigate how touristic destinations use voice assistants as an innovation and thereby provide a customer voice experience for their member hotels' guests. This pilot study contributes to this research program by investigating the given managerial context, technological realities, and innovation conditions. Such

knowledge paves the way to understanding how value is created in the tourist customer journey through consumer interaction and business innovations with voice assistants and how the customer experience is hereby defined.

The remainder of this article discusses innovation diffusion theory and value cocreation. Here, value cocreation does not refer to the direct interaction between consumer and voice assistant but rather to the interaction between a hotel as a provider of a voice assistant and its guests. The theory of business model innovation (BMI) serves as a theoretical lens to examine the reactions of tourism providers to innovation in the consumption of their guests to identify the foundation for voice marketing. The following sections present methods of data collection and analysis, as well as results and implications for research on voice marketing and consumer voice experience.

Literature Review

This section discusses innovation diffusion theory. This theory deals with processes of diffusion and adoption of ideas, process flows, and other objects and content that are new to involved individuals and groups. Innovations affect the creation of value, and as new ideas and processes, they offer new resources and approaches to its cocreation. For companies, these innovations accordingly imply that they must adapt to environmental changes by changing their business model. By doing so, they can continue to cocreate value with customers and thus continue to exist (Keiningham et al. 2019). This section, therefore, discusses innovation diffusion theory in conjunction with the theories of value cocreation and BMI. Theoretical focus is placed on the critical incident when a company rejects an innovation on the side of consumers. This new theoretical perspective provides a theoretical lens for investigating coping strategies of companies that reject innovations or at least do not want to contribute directly to their diffusion.

From a historical perspective, multiple disciplines deal with innovation diffusion theory. For example, anthropologists and ethnologists study the cultural development of social groups (Boas 1942), and sociologists study the spread of new technologies—such as new crops in agriculture (Ryan and Gross 1943). Moreover, in the present, marketing and consumption research deal with the adoption of new products (Ma et al. 2014). The Bass diffusion model, conceptualized by Bass (1969), describes this process as having four elements: innovation, time, communication channels, and a social system (Mahajan 2010). Something is an innovation as long as it is new to an individual (Mahajan 2010). Over time, this innovation is diffused into the individual's social system through communication channels so that the innovation is eventually no longer new for the members of the social system and thus loses its innovative character.

In addition to this process and its development, innovation diffusion theory also distinguishes the actors involved in disseminating innovations into innovators and imitators (Omerzel 2016, Van den Bulte and Joshi 2007). A popular assumption of this model and innovation diffusion research in general is that innovators successfully select innovations (Google Data, U.S., Google App 2016).

However, this assumption ignores the fact that companies also choose unsuccessful innovations that do not help them create value or even destroy value or that companies reject potentially successful innovations (Biondi and Bracci 2018). However, these reactions are the focus of this study.

The adoption and implementation of innovations are of existential importance for companies; otherwise, their competitors will force them out of the market (Drucker 2001). Companies such as Apple or Xerox, which have shifted their central value creation from the manufacture of computers and photocopiers to the provision of media and services (Ivan 2008), have been able to respond to innovations in their markets through BMI. However, this adjustment only occurred after conflicts arose in the application of their former business models and after the deterioration or failure of the value cocreation process with consumers (Amit and Zott 2001). These conflicts result from different barriers that companies have to overcome in their BMI (Chesbrough 2010). Studies on these barriers show different reasons such as an unfavorable allocation of resources that do not stimulate innovations (Gold 2018), a lack of innovation-oriented leadership (Chesbrough 2010), a lack of understanding change in terms of sense-making (McDermott and O'Connor 2002), or a generally strong attachment to logics of their current market so that companies cannot question these given market logics without criticizing themselves (Chesbrough and Rosenbloom 2002).

With the emergence of service-dominant logic in marketing (Vargo and Lusch 2004), consumer engagement is gaining attention as part of the value creation process (Payne et al. 2008). Products and services, such as IKEA furniture or vacations, only gain value for consumers through the experience they create together with the company that is offering these products and services. In this experience-oriented value creation process (Chandler and Lusch 2015), value is an interactive experience in which the experience of emotions, contexts, and symbols is emphasized (Arnould and Thompson 2005). The consumer experience process is divided into different encounters, also called touchpoints between companies and consumers, at which the value cocreation process between companies and consumers takes place (Payne et al. 2008).

On the consumer side, this value cocreation process can change if they, but not the companies, adopt innovations. This changes the environment for companies, that is, the context of value cocreation (Brozovic 2018). Due to cultural and technical changes, however, innovations are constantly occurring on the consumer side, which is why companies would have to react flexibly to these innovations (Hughes and Morgan 2007). Only in this way will they be able to keep their business models aligned with customer experiences and thus avoid losing touch with their customers and their needs (Keiningham et al. 2019).

However, companies reject innovations in some situations mentioned above (Biondi and Bracci 2018). The implications of such rejections for the business model and especially for value cocreation and consumer experience are still theoretically and empirically under-researched. Recent contributions (Keiningham et al. 2019, Libai et al. 2009) explain the interaction between customer experience, innovation diffusion, and BMI. Nevertheless, the critical incident of a company's rejection of an innovation remains unexplored. Therefore, this study aims to close

this research gap. Moreover, the empirical focus on tourism consumption allows this study to contribute to the stream of research on tourism innovation (Maggioni et al. 2014, Pikkemaat et al. 2019), which has also ignored this critical incident.

Methodology

To understand how value is created in the touristic customer journey, we conducted nine semi-structured qualitative interviews. The study aims to analyze current and planned interactions with voice assistants in the tourism industry.

Research Design

If relevant information is lacking and the nature of a (research) problem is unclear (Stebbins 2001), exploratory qualitative research is particularly appropriate to fill this gap (Belk et al. 2013). Especially when research is on product innovations or marketing decisions, meaningful insights are gained through such an approach (Belk et al. 2013, Weis and Steinmetz 2012). Moreover, qualitative research is used to deepen the understanding of each concept being analyzed within the study (Silverman 2020). Table 1 summarizes the study's research design.

Table 1. *Research Design Overview*

Research focus	The use and application of voice search in a Swiss tourism destination organization
Sample	Nine tourism and marketing experts from a Swiss tourism destination (Table 2)
Data collection	Semi-structured guided interviews with experts
Data analysis	Qualitative content analysis based on Mayring (2000) and Schreier (2014)

Expert interviews are defined by the experts themselves and not by a specific approach (e.g., narrative interview) (Flick 2010, Rabionet 2011, Trinczek 2009). The objective of the interviews is to systematically gather information on the nature of the research object, where the experts share their profound knowledge (Trinczek 2009).

Sample

This study focuses on a vacation destination in Switzerland. The experts in the field of digitization and marketing in tourism are composed of the following:

Table 2. *Overview Sample*

Tourism destination organizations	- 1 destination manager (Expert 1) - 1 marketing and communication manager (Expert 2)
Tourism digitization agency	- 2 founders of tourism digitization agencies (Expert 3) and (Expert 4)
Touristic leisure provider	- 1 online marketing manager (Expert 5) - 1 marketing and sales manager (Expert 6)
Hotel industry	- 1 hotel director (Expert 7) - 1 exec. asst. hotel manager (Expert 8) - 1 sales and marketing manager (Expert 9)

Since innovation implementation is ultimately decided by top-level executives (Szelągowski 2019), we interviewed experts in leading positions until we reached a theoretical saturation of our analysis results (Guest et al. 2006). We selected the informants according to the snowball principle to identify the social structures in which innovations are also passed on through referrals (Robinson 2013). Moreover, we talked to two tourism digitization agencies that promote innovations and digitization in tourism destinations. We conducted these interviews from October 2019 to July 2020.

Data Collection

Expert interviews are semi-structured interviews which serve to provide structure to the research subject and guide the discussions (Trinczek 2009). In this way, the research object can be captured from the experts' perspectives, whereby the structuring element of the semi-structured interviews ensures a basis for comparing individual statements and facilitates the focusing of individual topics (Rabionet 2011). In addition, experts are suitable for this study as they already have a high level of practical experience with the research object and are therefore immensely useful for the study, in contrast to interviewees without such expertise, who, for example, quickly express speculations and wishes instead of experiences (Dorussen et al. 2005). The following list shows a selection of topics/questions used in the guide for the expert interviews:

- Definition of the term "voice search"
- Experience within the company using voice search
- Experience involving voice search (customer experience)
- Assessment of expertise in voice search
- Current activities to benefit from voice search
- Importance of voice search in tourism/touristic customer experience
- Opportunities and threats of voice search for destination management/ tourism

The interview guide provides a framework for data collection and analysis that allows the findings and results of the different subjects to be compared (Schreier 2012).

Data Analysis

Since this study concerns the acquisition of information, qualitative content analysis is one of the most suitable approaches for data analysis (Trinczek 2009). Content analysis enables a researcher to systematically analyze and evaluate qualitative results (Mayring 2000, Schreier, 2014).

The interviews were transcribed and anonymized, and we defined categories, coding rules, and anchoring examples for data analysis. The coding process defines that the material is segmented into small units of analysis, and the individual text passages are then assigned codes or categories that assign meanings to these particular passages (Schreier 2012). These codes or categories can often be assigned to the interview questions, which are defined in the guide (Trinczek 2009). In this research, we applied an inductive method because of theoretical saturation. The data per category included the core statements.

Results

Definition of Voice Search

The experts were asked how they would define and explain the term "voice search."

All nine informants defined voice search as a voice-based search query where voice search assistants such as Siri, Alexa, or Cortana are used besides Google's voice search. In other words, one expert explains that "voice search is the conversion of an analog command into a digital one" (Expert 3). Voice search also simplifies and accelerates the online search process for any needed information as typing and haptic efforts are minimized.

Voice Search Experiences

Most of the experts reported that they have already experienced voice search in their business or private lives. However, a big gap in the level of business experience emerged; the answers ranged from "no experience" to "already tested at their touristic region." Two experts said that they had no experience with voice search, nor have they examined the premises. Two informants stated they were aware of being behind in this promising technology; however, adaptions required for voice search technology are on top of their digitization processes. Three experts owned an Echo Dot using Alexa, and they try to integrate the voice assistant into their daily life. One expert mentioned that they have observed use cases and studies; thus, the theoretical knowledge and understanding is present. However, the respondents have not yet used the technology in their touristic

regions. Generally, the experts agreed that voice search technology is not yet widely used in the Swiss tourism industry. Only one expert stated that they have started collecting data in a structured manner to later implement a chatbot or voice search technology.

Tourism Destination Expertise

The informants who already had experience with voice search in their work were asked about the perceived expertise and skills concerning voice search within their company. All five interviewees shared that their companies were in the process of developing their voice search expertise as this knowledge has not yet been fully exploited. However, again, the level of expertise widely varied. The answers ranged from no experience to, again, only one respondent who replied that they possessed the necessary knowledge. Another expert stated that they were at an early stage and that they were trying to encourage the mind-set for new technologies within the company. Again, another expert mentioned that they try to compensate for the backlog by hiring a new person with relevant skills and know-how. Yet another expert lamented the difficulty of being a small company with limited resources to compete with big players.

Tourism Voice Search Status Quo

As a supplementary question, we asked the informants how they assessed the status of their own company in comparison with that of the competition. The experts agreed and estimated that their knowledge of voice search in the Swiss tourism industry is rather limited. Only one informant said that their company has an advantage over their competition in voice search expertise. Two experts expressed their interest in the technology and that they are looking for partners or cooperation as their resources are limited.

Efforts Made within the Organization

Most of the experts claimed that currently no efforts are being made regarding voice search implementation in their organizations. Others have tried to introduce the subject and its relevance to service providers in workshops. One expert mentioned that they managed data on Google My Business (e.g., reviews and opening hours) as this information is also used in voice searches. Two experts indicated that they have introduced a chat platform to their customers. However, only one destination offered a chat program managed by employees during working hours, and only one expert implemented a voice bot in another touristic region.

Importance of Voice Search for the Tourism Industry

Most experts agreed that voice search will become increasingly important in the future, especially for queries such as "where is what." Local information is

essential for tourism destinations and should therefore be accessible via voice search. For the hotel industry, voice search offers a new channel and might attract new customers. One expert said that the booking process is rather complex, and it might therefore be tedious to provide the required data and infrastructure. Moreover, two other experts added that searching for hotels might be done manually as people like to see images of the hotel and its environment. For the hospitality industry, one expert said that it might be simpler to start with restaurant opening hours than the whole booking process.

Opportunities for a Tourism Destination

Two directions emerged when we asked the respondents about voice search and destination management opportunities. On the one hand, the experts mentioned a change or effort in resources (employees). On the other hand, voice search was seen as another channel to get in touch with customers and also to differentiate from competitors. The experts indicated that voice search could lead to an optimization of or even a change in current job profiles. One expert also mentioned that the benefits of voice search strongly depend on the business model, which decides whether the technology is an opportunity or a risk.

Another expert said, "I think people are even more honest when they use voice search. I have the feeling that it is easier to speak and to formulate something, and I believe that we can analyze the search behavior even better in the background with the necessary systems than we can do now" (Expert 2). From a marketing perspective, voice search is another channel where information can be passed on to customers. Thus, it creates a new form of communication with customers. Another expert stated that the topic "voice search" should be included in the business strategy to define how to optimize voice search queries or relevant keywords. "Because I think that in voice search these keywords are probably a bit longer than if you enter them manually." Furthermore, one expert said that voice search is a simple and convenient way to access information, especially for older people. Voice search is, therefore, also an opportunity for that age group. For a younger target group, tourism providers can show that they are keeping up with the trend and are digitally ready. One interviewee also mentioned that the recommendation for a rather new technology should come from a higher-level organization. However, when the time comes, the destination should be prepared to seize the opportunity.

Threats for a Tourism Destination

The analysis of the stated risks on voice search and tourism destination management reveals three directions. The first is the issue of language, followed by questions on budget, skills, and data protection. In Switzerland, there are four national languages, and in each area, people speak a different dialect. The informants consider this problem regarding voice search integration. The question arises on which languages the content should use, and whether users will be accustomed to asking questions in standard German instead of their dialect.

Moreover, the experts believe that in the near future, technology providers will address these language issues in voice search.

Furthermore, according to the informants, another threat is their budgets and their capacity to prepare for the technology so that it is available to users in a practical way. Thus, much time will be needed to acquire skills and manage data and availability (e.g., hotel rooms or even packages). Moreover, the order of search results and the algorithm were mentioned as well. The question of data protection or privacy also poses a risk for the experts when using voice search in a destination.

Two experts further stated that it is difficult to decide which trend or theory to follow. They also mentioned the dominance of Google as well as its impact on search results. One expert says, "I could imagine that this could simply influence opinion formation" (Expert 5). Two experts said that laziness or simplicity is encouraged for the user.

Further Remarks from the Experts

At the end of the interview, many of the informants stated that a superordinate organization would have to manage the introduction of voice assistants, and the destinations would then be the data providers. "[A destination] then takes on the role of data providers and not the role of the technology manufacturers" (Expert 1). In addition, the lack of understanding and resources to implement the digitization of destinations has been stated predominantly. Therefore, voice search is not yet an important issue in many vacation destinations or tourism providers in Switzerland, and it must first become more suitable for the masses and everyday use. Moreover, another expert said, "I am firmly convinced that in the near future, i.e., in about 3–5 years, the use of voice search will always more suitable for everyday use, and as soon as it reaches the masses, new business models will be created" (Expert 1).

Discussion and Conclusion

The study showed that voice search has arrived in customers' everyday life, and all experts could explain the term "voice search." However, the use of voice search in the professional environment is rather low for all interviewed experts. Especially for Swiss tourism destinations, the experts see challenges in the implementation of voice assistants. Challenges with regard to different dialects and languages are obstacles to the use of voice search for both users as well as providers from Switzerland. These challenges involving different dialects and languages in the country could also affect customers' voice experience.

Moreover, destinations often lack the resources and the necessary skills to implement and maintain such technology. Therefore, the experts revealed that partnerships or cooperation with other tourism destinations or with the umbrella organization is necessary and that players in the touristic region should maintain the required data for voice searches. It was also shown that certain tourism destinations are still at the early stages of digitization; hence, there might often be

a lack of understanding and know-how. Some organizations, therefore, hire specialists to fill this gap.

The experts recognize the increasing importance of voice search and its application areas. However, they also think that it will be several years before the technology is suitable for the masses. In addition, the business models of the destinations need to adapt. New BMIs are expected to appear, but no concrete implementations have been made in the examined Swiss vacation destination. Also, Keiningham (2019) stated that external changes in the environment are often the drivers of BMI, which also requires modifications in the value proposition to improve the delivery of the offers to customers (Keiningham et al. 2019, Osterwalder and Pigneur 2019). Thus, value creation for customer requires more customer experience–driven thinking (Keiningham et al. 2019).

The experts also face uncertainty concerning data security and personal privacy. With the increasing use of voice bots, clear regulations are needed as there are currently none that control data collection by Apple, Google, or Facebook (Moore and Tambini 2018, Rühle et al. 2019). People are concerned that personal information is not secure or that personal data is being used without their knowledge when using digital assistants and voice-enabled technology (Olson and Kemery 2019). According to Kunath et al. (2019), users' main concern when using voice assistants is their fear of being eavesdropped.

For Swiss tourism, voice search represents an interesting opportunity to market and differentiate a travel destination or a touristic provider. It also provides another channel for contacting potential guests and informing travelers about destinations. Especially, questions such as "how do I get there" or "where is it located" are typical queries that a tourism organization has to answer. Therefore, voice search implementation would be well suited to improve guest experience.

To conclude, the qualitative study has revealed two gaps. On the one hand, the experts are monitoring and analyzing the increase in voice search usage and the resulting rise in guest expectations, but almost all the interviewed players in the destination have yet to embark on the innovation.

On the other hand, another gap was found in the expectations and acceptance of the individual players in the tourism destination. The technical implementation and the acceptance of the technology are seen as great challenges and should therefore be delegated or initiated by higher-ups, which could be the umbrella organization in this case.

Some limitations could be addressed in future studies. First, we interviewed nine experts from a vacation destination in Switzerland until we reached theoretical saturation of our analysis results (Guest et al. 2006). Future studies could extend the scope of interviews involving experts at the management level. Moreover, the focus could be shifted to hoteliers, as voice assistants are particularly suitable for use in hotels (Kattara and El-Said 2014). Additionally, guests' perspectives should be examined; therefore, future studies should interview guests regarding their expectations and acceptance of voice assistants.

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Travel Format versus Nationality as Drivers of the Perception of Crowding in a Rural Tourist Destination

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Internationally many tourist destinations, both in cities and in rural areas, are confronted with the problem of heavy visitation, which tourists might perceive as crowding. In previous studies different factors have been investigated as drivers of the perception of crowding. This study focuses on travel format (individual travel on land versus group cruise travel) and nationality. A survey was carried out in the rural tourist destination of Geirangerfjord in Western Norway, where a village of 235 inhabitants hosts almost one million tourists every year. Among key findings was that travel format is a significant driver of perceived crowding, whereas nationality can only to a limited degree explain variations. In addition to this, travel format is a moderating factor between the perception of crowding and certain aspects of visitor satisfaction. Explanations of the findings are connected to a "site customization factor", a "personality factor", an "expectation factor" and an "exposure factor", all factors close to the visitors' perception and experience. In this way the study adds to and deepens the understanding for the mechanisms behind perceived crowding.

Keywords: *crowding, nationality, travel format, visitor management, cruise travel*

Introduction

Popular tourist attractions with a mix of visitors coming by cruise ships and traveling on land, like Venice and Barcelona have experienced major challenges related to crowding (see e.g., Garay et al. 2014, Russo 2002). Such challenges are not confined to larger metropolitan areas. In rural Norway, rural cruise destinations such as Geirangerfjord, Flåm, and Svalbard, represent unique challenges to visitor planning in this regard. Identifying factors that influence the perception of crowding is therefore of key importance to visitor planning and management. In line with this, this study explores the relationship between nationality, travel format and perception of crowding.

Congestion and crowding are terms often used interchangeably in the context of heavy visitation to tourist attractions. The two terms however point to different aspects of visitor density. Congestion relates to the physical conditions of high visitation. Visitation numbers are typically a way to describe congestion (Manning and Lime 1996). The term can also be a description of situations when the infrastructure of a tourist site reaches its limits of capacity and visitors compete for the use of services or parking spaces (Lime et al. 1996, p. 10). Crowding, on the other hand, relates to tourists' perception of the presence of other tourists. The

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concept of crowding comprises both descriptive information, relating to the density or number of tourists in a tourist site, and evaluative information – an individual's interpretation of the density of tourists (Vaske and Shelby 2008). As a psychological construct, perceived crowding lies within the mind of individuals. Visitors' perception of crowding in a tourist site is therefore a comparison of the relevant indicators of congestion and visitor density with personal standards of acceptable visitation (Manning and Lime 1996, Vaske and Shelby 2008).

Literature Review

Determinants of Perception of Crowding

The threshold at which the number of other tourists is seen as disturbing varies among visitors. Personal or group standards may differ, and studies have identified various determinants of groups' and individuals' perception of crowding. Several studies show that nationality influences perception of crowding (see e.g., Jin et al. 2016, Kiliçarslan and Caber 2018, Sayan et al. 2013, Sun and Budruk 2017). Cultural differences are seen as the main reasons for these differences (Sayan et al. 2013). Tourists from cultures which are considered more collectivistic, such as from Asian and African countries, have been found to have a higher tolerance for crowding than more individualistic cultures, such as tourists from countries in Europe and North America (Jin et al. 2016). In addition to nationality, distance from the place of residence to the tourist destination is a factor that can influence perception of crowding (Arnberger and Brandenburg 2007). In line with this, prior experience and attachment to the destination lead to higher sensitivity to crowding – a characteristic rather in place with local visitors than with visitors whose residence is further away from the tourist site (Eder and Arnberger 2012, p. 574).

Travel format relates to the composition of the visitor group – free and independent travel versus group travel in package tours is a main distinction (Sun and Budruk 2017). In the case of package tours itineraries are set beforehand. The tourists purchase a bundle of services – e.g., air travel, accommodation and other services – from a travel retailer (Hyde and Lawson 2003). For tourists this form of travel reduces risks connected to language and cultural barriers, and the needs to acquire information and for orientation in an unfamiliar setting. At the same time package tours go hand in hand with larger groups, which in turn add to congestion and crowding in the tourist site (Sun and Budruk 2017). Research on the influence of travel format is scarce (Sun and Budruk 2017). There is some research on the experience of crowding for certain types of transport and travel mode, for example of cruise tourists (Sanz-Blas et al. 2019). Some research indicates that group travelers tend to have a higher tolerance than individual travelers of being surrounded by other tourists. This was for example shown in a study conducted in a German national park (Kalisch and Klaphake 2007). A study about the satisfaction of individual travelers versus package tours in Vietnam on the other

hand found that travel format did not influence perception of crowding (Truong and Foster 2006).

A range of other factors potentially influence perception of crowding. Socio-demographic characteristics of the visitors are found to be a factor (Moyle and Croy 2007, p. 520). Activities that visitors are engaged in at the tourist site and characteristics of the site is another aspect (Moyle and Croy 2007, p. 520). Major motivations for undertaking a visit, as well as expectations about the level of crowding at the tourist site were found to influence the perception of crowding in several studies (Zehrer and Raich 2016, p. 92). Typically, perception of crowding has a tendency to be different among visitors who seek solitude in contrast to those who state social interaction as a motive for their visit (Arnberger and Haider 2007, p. 669). Characteristics connected to encounters with other tourists also tend to play a role in the perception of crowding. Where the encounter takes place is relevant. For example, front-country users are willing to tolerate more tourists than backcountry users (Popp 2012, p. 52). The number of perceived encounters has an effect (Kalisch and Klaphake 2007, p. 110). Also, the behavior of encountered tourist groups, e.g. with respect to noise and littering, and types of visitors met were shown to influence whether visitors tolerated other visitors in the same tourist site and in which number (Cole and Hall 2009, pp. 29–32, Manning and Lime 1996, pp. 29–31). Investigations into the effect of length of stay have been performed by several studies. Typically, only small differences are found, but in a study of wilderness visitors, day visitors were less likely to be sensitive to crowding than overnight visitors (Cole and Hall 2008, p. 35).

Crowding and Visitor Satisfaction

Congestion and perceived crowding can limit tourists' ability to engage in desired activities, lead to undesired social contacts and stimulus overload (Kiliçarslan and Caber 2018, p. 58, Sanz-Blas et al. 2019). Due to the potential negative impacts of crowding on the visitor experience, crowding is an important element in visitor satisfaction. This is especially the case in protected natural areas, where visitors tend to expect solitude and privacy (Cole and Hall 2008, pp. 12–15, Moyle and Croy 2007, p. 519). While crowding typically is seen as negative, this is not always the case – e.g. in bars and sports stadiums crowding has been found to be perceived in a positive way (Kiliçarslan and Caber 2018, p. 56, Popp 2012). Also, even in wilderness areas where visitors tend to seek solitude, most visitors do not wish for complete isolation, but would rather experience wilderness in small groups – "alone together" (Cole and Hall 2010, p. 67). A distinction between negative and positive crowding is thus made (Popp 2012).

Also increased visitation does not automatically result in degraded visitor experiences. This was demonstrated by a series of studies carried out in the same tourist locations, several years apart or over several years. They showed that even though visitor density had increased over time, the perception of crowding was less negative (Kuentzel and Heberlein 2003, Vaske and Shelby 2008, p. 113). Changes of standards of acceptable visitation may partly explain these results. In addition, visitors, especially those most sensitive to crowding, tend to use coping

strategies to deal with heavy visitation. These coping mechanisms include actions like relocation to other tourist sites, choosing a different time to visit, engaging in different activities than would have been chosen in less crowded settings, and re-rationalization and redefinition of the experience and standards of the visit (Moyle and Croy 2007, pp. 520–521).

Hypotheses

The aim of this study is to explore to what degree and how nationality and travel format influence tourists' perception of crowding. Based on literature and previous research, two hypotheses were formed:

1. Nationality influences visitors' perception of crowding based on cultural differences and distance.
2. Travel format (represented by cruise travelers and individual travelers on land) influences visitors' perception of crowding.

Stylized Facts – Study Area

In 2005, Geirangerfjord together with Nærøyfjord was inscribed on the UNESCO World Heritage List as "West Norwegian Fjord Landscape". As one of Norway's most visited destinations, especially within nature-based tourism, Geirangerfjord is an icon of tourism in Norway. Only 235 people live year-round in the village of Geiranger (Statistics Norway 2019), while the number of visitors to the area was estimated at around 1 million in 2018 (Yttredal et al. 2019). The inhabitant-visitor ratio is then approximately 1:4200 per year, while a ratio of 1:5.3 or more is estimated to be a high-risk tourism intensity in cities (McKinsey & Company and World Travel & Tourism Council 2017, p. 22). Tourists are mainly visiting during the summer months of June, July and August. In the peak of month of July, an average of about 10,000 people, visit Geirangerfjord daily. Even in this peak period, however, the number of visitors and therefore congestion fluctuates depending on the time of the day. There is a peak number of visitors between 11:00 am and 7:00 pm, with an extra peak between 1:00 pm and 5:00 pm (Yttredal et al. 2019). This is also the time period in which most cruise ships dock. Visitors who come to Geiranger during peak season but outside this time period, can experience the center of Geiranger as quiet, peaceful and almost empty. The extent of congestion and crowding also varies geographically, with a concentration of visitation in the center of the village Geiranger and on main attractions.

Figure 1. *Map of the Geiranger Area as Defined in the Study*

Source: WMS © Kartverket.

Geirangerfjord and the village of Geiranger are surrounded by steep mountains. To enter Geiranger village, which is the center of the destination, visitors can use one of three access ways – two by narrow and winding roads from the North and South, and the fjord – either by cruise boat or by car ferry (Figure 1). In recent years, the number of cruise passengers has been restricted by limitations on the number of ships per day and was in 2017 and 2018 stable at just below 350,000 (Yttredal et al. 2019). Cruise thus contributes to roughly one third of the visitors to the area.

Methodology

Data Collection

Data was collected in the Geiranger area Mondays through Fridays between July 9th and August 3rd, 2018. The period of data collection thus covered both peak season for leisure visitation during the period of general Norwegian staff vacation, and daily peak visitation period. Questionnaires were only handed out to visitors on their way out of the area, to make sure that they had completed their travel experience in Geiranger. To make clear which area was the subject of inquiry, a map was included in the questionnaire. The participants in the survey could choose between several languages, namely Norwegian, English, German, French, Spanish, and Mandarin. 474 tourists answered questionnaires digitally on tablets or by link.

The questionnaire included several aspects related to perception of crowding and congestion, such as noise, traffic congestion, access to transportation services and parking. The survey also included questions on overall satisfaction –

willingness to recommend the tourist destination and whether nature experiences lived up to expectations. All questions were formed as assertions using a five-point Likert scale ranging from 1 "completely disagree" to 5 "completely agree." The question on perceived crowding was phrased to make sure that it was negative crowding the respondents related to (Popp 2012).

The Sample

Table 1. *Socio-Demographic and other Background Variables of the Sample. Percent of Total, Cruise Visitors and Individual Travelers on Land (N Total = 474)*[1]

Variable	Values	Percent of total sample	Percent of cruise visitors	Percent of ind. land
Transport mode to area	Cruise passengers	29		
	Individual travelers on land	71		
Gender	Female	46	48	45
	Male	54	52	55
Highest level of education	High school or lower	29	28	29
	Bachelor degree	31	26	33
	Master or higher	40	45	38
Household income per year	Lower than 40,000 EUR	21	24	20
	40,000–79,999 EUR	31	22	35
	80,000–119,999 EUR	26	23	27
	120,000 EUR and above	22	30	18
Age	0–34 years	36	31	38
	35–54 years	43	41	44
	55 years or older	21	28	18
Day-visitor or overnight stay	Day-visitor	58	100	40
	Overnight stay	48	0	60
Country of residence	Norway	24	6	32
	Germany	22	33	17
	Other western European countries	36	30	38
	North America	8	23	2
	Others	10	8	11

Source: Own data collection.

[1]The sample includes mainly respondents from Western Europe, USA and Canada. The main reason for this is that cruise-passengers and visitors traveling individually on land are mainly from Western countries (Europe and North America), while for example Asian tourists travel mostly in groups by bus. This study focuses exclusively on cruise tourists and individual travelers on land (418 respondents). Bus tourists are excluded from the analysis.

The proportion of cruise visitors (29%) in the sample reflects the proportion of the total number of visitors quite well. The respondents have a broad and relatively even distribution of socio-economic background factors, such as gender, education, income and age. The proportion of day visitors is 58% while 42% percent have stayed overnight (Table 1).

Method of Analysis

To test hypothesis 1, "nationality influences visitors' perception of crowding" several subsequent comparisons of perception of crowding between Norwegian visitors and other countries or groups of countries were performed. T-tests and Mann Whitney U tests were used, checking for differences of mean and median and the significance of these differences. To test hypothesis 2; "travel format (represented by cruise travelers and individual travelers on land) influences visitors' perception of crowding", comparisons of the perception of crowding were made between cruise passengers and individual travelers on land using T-tests and Mann Whitney U tests. The group "cruise passengers" consists of visitors arriving in the Geiranger area by cruise ship or by bus, but as part of a trip with a cruise ship. Crew from cruise ships was excluded. The group "individual travelers on land" includes visitors arriving to the area by road or ferry mainly using car or motorhome but also motorbikes, public bus transportation or by foot or bicycle.

In the dataset, nationalities arriving in the Geiranger area on land are different from nationalities arriving by cruise ship (see Table 2). German visitors are the only nationality broadly represented both in the group of cruise passengers and in the group of travelers on land. To check for nationality as a confounding variable explaining differences in the sample as a whole, analysis was thereafter restricted to the German subgroup of the sample. The survey measures perception of crowding directly, but also includes other aspects of congestion like perception of parking and traffic congestion. It also includes measures of satisfaction. To understand more thoroughly the relationship between travel format, perceived crowding and other variables, several bivariate correlation analyses were performed for cruise passengers and individual travelers on land separately, and then compared. Both Pearson's r and Spearman's Rho were used. To have comparable group sizes and situations, the analysis was confined to day visitors only.

There is considerable controversy over the use of parametric methods to analyze datasets with dependent variables using Likert scales. Arguments are diverse both opposing (Bentz et al. 2016, Jamieson 2004, Oh 2001) and in favor (Bishop and Herron 2015, Carifio and Perla 2008, Knapp 1990, Murray 2013) of using such methods. Tests of the data from the Geiranger area show that the data are non-normally distributed and that especially the "satisfaction variables" are highly skewed, thus violating assumptions underlying parametric analysis. Furthermore, single Likert type variables are used both as criterion (dependent) and independent variables. To compensate for these characteristics of the dataset, both parametric and non-parametric methods are used in the analyses. The two methods in general create compatible results.

Results

Visitors' overall impression of the Geiranger area is positive. 91% of the visitors completely or partly agree that the nature experience lives up to their expectations and 87% would recommend the area as a tourist destination to others. When it comes to perception of crowding, 46% of the visitors completely or partly disagree with the assertion that "I did not experience the Geiranger area as too crowded". 43% completely or partly agree to the same assertion.

Hypothesis 1: Nationality and Perception of Crowding

Testing hypothesis 1: Nationality influences visitors' perception of crowding in the Geiranger area based on cultural differences and distance.

Table 2. *Perceptions of Crowding. Norwegians and other Nationalities and Groups of Nationalities Compared (1="Completely Disagree" – 5="Completely Agree")*

	"I did not experience the Geiranger area as too crowded"						
	T-test			Mann Whitney U test			
	Mean	Difference of means to Norwegians	Sig. of difference	Median	Difference of median to Norwegians	Sig. of difference	N
Norwegians	2.58			2.00			89
All foreigners	2.92	0.34	0.05	3.00	1.00	0.04	285
Nordic countries except Norway	3.22	0.64	0.02	4.00	2.00	0.02	38
Western Europe except Nordic countries	2.81	0.23	0.22	2.00	0.00	0.20	175
Distant visitors (Asia, Oceania, South America, North America)	3.05	0.47	0.05	3.00	1.00	0.05	59
Southern Europe (Italy, Spain, France)	2.56	-0.02	0.93	2.00	0.00	0.93	34
Germany	2.77	0.19	0.37	2.00	0.00	0.30	82

Source: Own data collection.

Both a T-test (p=0.05) and a Mann Whitney U-test (p=0.04) analyzing the whole dataset show that there is a small but significant difference between Norwegian visitors' perceptions of crowding and all foreign visitors' perception of the same (Table 2). To check if and how distance influence the perception of crowding (Jin et al. 2016, Sayan et al. 2013), foreigners were grouped into Nordic visitors except Norway (Denmark, Sweden, Finland), Western European visitors except the Nordic visitors, and distant visitors (Asia, Oceania, South America,

North America). There are significant differences of the perception of crowding between Norwegian visitors and other Nordic visitors (p=0.02 for both tests), and between Norwegian visitors and distant visitors (p=0.05 for both tests). There is no significant difference in the perception of crowding between Norwegian visitors and Western European visitors from outside the Nordic countries. Additional tests comparing Norwegians to Southern European (Italy, France and Spain) and German visitors showed no significant results.

Hypothesis 2. Travel Format and the Perception of Crowding

Testing hypothesis 2: Travel format (represented by cruise travelers and individual travelers on land) influences visitors' perception of crowding.

Table 3. *Differences in Perception of Crowding between Cruise Passengers, Individual Travelers on Land (All) and Individual Travelers on Land (Day – Visitors) (Scale: 1="Completely Disagree" – 5="Completely Agree")*

	"I did not experience the Geiranger area as too crowded"						
	T-test			Mann Whitney U			
	Mean	Difference of means to cruise passengers	Sig. of difference	Median	Difference of median to Cruise passengers	Sig. of difference to Cruise passengers	N
Cruise passengers	3.19			4.00			118
Ind. travelers land all	2.71	-0.48	0.00	2.00	-2.00	0.00	283
Ind. travelers land day	2.47	-0.72	0.00	2.00	-2.00	0.00	112

Source: Own data collection.

Analyzing differences in the perception of crowding for the whole dataset using a T-test and Mann Whitney U-test, there is a statistically significant difference of means and medians between cruise visitors and all independent travelers on land (p=0.0 for both tests) (Table 3). In the group travelers on land, there is a mix of day visitors and visitors staying overnight. Since cruise visitors are day visitors to the area, such a mix of visitors who stay over night and day visitors in the comparison group might influence the results. T-tests and Mann Whitney U-tests were therefore performed for day visitors only. The difference of means between cruise visitors and visitors traveling on land increases when the analysis is confined to day visitors (-0.72), while the difference of median is the same (2.00). The difference of both median and mean is statistically significant (p=0.0).

Table 4. *Differences in Perception of Crowding between German Cruise Passengers and Germans Traveling Individually on Land (Scale: 1="Completely Disagree" – 5="Completely Agree")*

	"I did not experience the Geiranger area as too crowded."						
	T-test			Mann Whitney U			
	Mean	Difference of mean to cruise passengers	Sig. of difference	Median	Difference of median to cruise passengers	Sig. of difference to cruise passengers	N
Cruise passengers	3.18			4.00			38
Ind. Travelers land	2.41	-0.77	0.00	2.00	-2.00	0.00	44

Source: own data collection

Table 4 shows that there is a quite large and significant difference of means within the German group, with visitors traveling by cruise ship being less sensitive to crowding than those traveling individually on land. The results from the German group thus strengthen the findings that there is a difference in perception of crowding depending on travel format.

Travel Format, the Perception of Crowding and Indicators of Satisfaction

Finding significant and quite large differences between travel format and the perception of crowding made it expedient to look deeper into possible dissimilarities between cruise passengers and individual travelers on land also for other variables.

Table 5. *Bivariate Correlations between the Perception of Crowding and Overall Satisfaction (Scale: 1="Completely Disagree" – 5="Completely Agree")*

	"I did not experience the Geiranger area as too crowded."					
	Cruise passengers			Individual travelers on land day		
	Pearson Correlation	Spearman's Rho	N	Pearson Correlation	Spearman's Rho	N
I would recommend the Geiranger area as a holiday destination to others.	0.06	0.09	117	0.32**	0.39**	110
The nature experience of the Geiranger area lived up to my expectations.	-0.02	-0.03	117	0.32**	0.34**	110

*=sig. at a 0.05 level
**=sig. at a 0.01 level
Source: Own data collection.

Table 5 shows bivariate correlations between the perception of crowding and variables indicating overall satisfaction with the stay. The analysis is confined to day visitors. Pearson's r and Spearmans' Rho are based on different assumptions, but are in this case coinciding when it comes to detecting significant correlations. A medium strong and significant correlation between the perception of crowding

and indicators of overall satisfaction is found; Pearson's r=0.32 and Spearman's Rho=0.39 and 0.34 for the two variables. For cruise passengers there are no significant bivariate correlations between perception of crowding and measures of overall satisfaction.

Table 6. *Bivariate Correlations between the Perception of Crowding and Perception of Other Variables related to Congestion (Scale: 1="Completely Disagree" – 5="Completely Agree")*

	"I did not experience the Geiranger area as too crowded."					
	Cruise passengers			Individual travelers on land day		
	Pearson Correlation	Spearman's Rho	N	Pearson Correlation	Spearman's Rho	N
It was easy to get access to transportation services in the Geiranger area.	0.11	0.17	94	0.257*	0.276*	66
It seems easy to find a place to park in the CENTER of Geiranger.	0.16	0.19	46	0.47**	0.49**	80
Traffic congestion (DID NOT) negatively influences my impression of the Geiranger area.	0.32**	0.32**	98	0.31**	0.33**	105
Noise does not seem to be a problem in the Geiranger area.	0.32**	0.29**	117	0.37**	0.38**	104

*=sig. at a 0.05 level
**=sig. at a 0.01 level
Source: Own data collection.

Table 6 shows bivariate correlations between the perception of crowding and other parameters relating to congestion. For cruise passengers, perceived crowding is significantly correlated with parking (Pearson's r=0.32, Spearman's rho=0.32, $p<0.01$) and noise (Pearon's r=0.32 ad Spearman's Rho=0.29, $p<0.01$). For individual day travelers on land, crowding is also correlated with access to transportation services (Pearson's r=0.26 and Spearman's Rho=0.276, $p<0.05$) and strongly correlated with parking (Pearson's r=0.47, Spearman's rho=0.49, $p<0.01$).

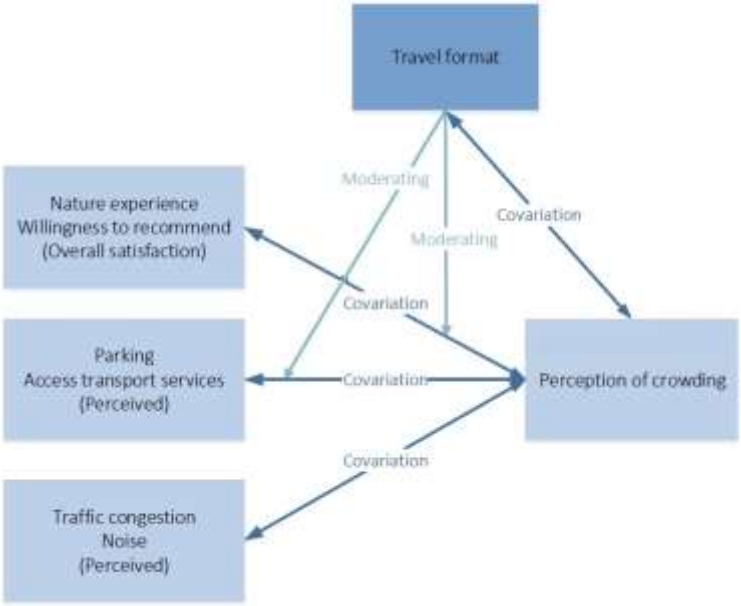
Discussion

Firstly, the results do not support hypothesis 1: Nationality of visitors influences the perception of crowding due to cultural differences and distance from the tourist destination. There is very little evidence suggesting that there are large differences of perception of crowding between groups of countries or single countries. In addition, there is no distinct pattern suggesting that perception of crowding is increasingly positive with distance or is different due to cultural differences. For instance, compared to visitors from the most distant countries, Norwegians are more critical to crowding. This is consistent with the hypothesis. However, visitors from the Nordic countries, who should be the closest to

Norwegians both culturally and geographically, are also more tolerant to crowding than Norwegian visitors, while other Europeans are less.

Secondly, the results strengthen hypothesis 2: Travel format (represented by cruise travelers and individual travelers on land) covaries with the perception of crowding. There is a significant and quite large difference in perception of crowding between group visitors arriving by cruise ship, and individual travelers on land. Furthermore, travel format seems to be a moderating factor (Baron and Kenny 1986) for the relationship between perceived crowding and indicators of overall satisfaction (nature experience and willingness to recommend). The same is the case for the relationship between perceived crowding and the perception of parking and access to transportation services. Travel format does not seem to moderate the relationship between perception of crowding and perception of traffic congestion or noise.

Figure 2. *The Relationship between Travel Format, Perceived Crowding and Other Variables related to Visitor Experience and Satisfaction*



Source: Own figure.

The relationships are illustrated in Figure 2. The causal directions between the variables in the analysis are not possible to determine from the analysis. The relationship between the variables can also be a type of cluster effect, variables covarying without a clear causal connection.

Mechanisms behind the Results

There is no logical causal connection between the type of transport itself, represented by cruise travelers, and independent travelers on land, and perception of the area. However, as shown in the study in Geiranger, mode of transport is also a difference in travel format: Free and independent travel versus group travel by cruise ship (Sun and Budruk 2017). There are several dimensions in the literature

that can help understand the relationship between travel format and the perception of crowding found in the study.

Sayan et al. (2013) show that visitors' tolerance for congestion differ. Such a difference could be manifested in the choice of travel format, with people choosing to travel by cruise ship being more tolerant to congestion than people traveling individually on land. Some studies support this assumption (Kalisch and Klaphake 2007). In this line of reasoning the differences of the perception of crowding between cruise tourists and tourists traveling on land could be explained by different personal preferences and personality traits. Such an understanding of the mechanisms could be called a "personality factor".

Previous research shows various relationships between knowledge, motivation, expectation, behavior and satisfaction (Gnoth 1997, Hsu 2009, Huang et al. 2015). The results can then also be understood on the basis of an "expectation factor". The expectation factor consists of at least two dimensions. One dimension relates to the choice of vacation form. A cruise ship to the Geiranger area often has between 2000 and 5000 passengers (Information from Stranda Port Authority). This means that visitors choosing this mode of transport are surrounded by large numbers of fellow travelers throughout their journey. When visitors choose group travel on a cruise ship, they do not and cannot expect to be alone. The other dimension is related to the destination. Zehrer and Raich (2016) show that expectations about the destination influence the perception of crowding. Most individual travelers on land need to have a minimum of knowledge about individual destinations to organize their trip - leading to pre-travel expectations. On the other hand, cruise travels are organized and mediated by a tour operator. Individual cruise tourists' expectations for specific destinations might therefore not be as clear.

In addition, our data by itself indicate that there is an "exposure factor". The results show that exposure to negative experiences connected to one aspect of congestion and crowding seems to affect the perception of other relating factors. For instance, visitors traveling on land are, by definition, more prone to be exposed to parking problems than people traveling by cruise ships. Our analyses show that parking covaries with the perception of crowding only for visitors traveling on land. Furthermore Figure 2 shows that the perception of crowding covaries with the perception of traffic congestion and noise both for cruise tourists and visitors arriving by cruise ship. While only visitors traveling on land are exposed to parking problems, also cruise travelers moving around the site can be exposed to (negatively) perceived noise and traffic congestion. Since there does not seem to be a clear causal effect between the variables, the data indicates that there is a cluster effect – an exposure factor. If visitors are exposed to one negative effect of congestion, they also perceive other factors related to congestion negatively.

When tourists first came to the Geiranger area in the second half of the 19th century, traveling on the fjord was the only way of entry. Because of this, tourism in the area has developed along with the increase of cruise tourism. Infrastructure, logistics, shops, guided tours and activities are adapted to visitors arriving by sea in bulks. Moyle and Croy (2007) found that such characteristics of the site

influence the perception of crowding. A "site customization factor" thus seems to exist. Characteristics of the site intermediate between travel format and the perception of crowding. Such an assumption is strengthened by two additional findings: Moyle and Croy (2007) also find that the type of activities that visitors participate in can influence the perception of crowding, and Sanz-Blas et al. (2019) found that guides have a mediating effect on the perception of the area. This corresponds with how the destination Geirangerfjord is organized for cruise tourists. Many of them participate in pre-booked tours. They are then guided from the boat to already waiting transportation and are brought to the respective sites. In this way the exposure to negative crowding is minimized.

Conclusion

In this study we show that travel format is the most important driver of the perception of crowding in the Geiranger area. We identified four factors to understand our statistical findings; "a personality factor", "an expectation factor", "a site customization factor" and "an exposure factor". Thus, on an individual level, factors connected to expectations and personalities have explanatory power. On a system level, explanations related to the site itself cause differences in perceptions. In addition, travel format seems to implicate different exposures to the negative sides of crowding.

Drivers of perceived crowding are thereby close to the visitors' experience. They are about the visitors' expectations and preferences meeting experiences on site; traffic congestion versus smooth driving, about easily finding parking spaces, access to transportation services and about noise. Factors further away from the actual experience cognitively or physically, like nationality, do not seem to have the same effect on their perceptions. Our study in this way adds to and deepens existing knowledge on perceived crowding and contributes to the understanding of the mechanisms behind the perceptions.

Our findings have several implications for visitor planning. Firstly, they indicate that visitor planning should address crowding in different ways, depending on visitors' travel format. Furthermore, such planning should have the purpose of addressing the four factors identified above. In the Geiranger case, measures to address the personality factor could include directing persons with a low tolerance for crowding to parts of the area with few other visitors and at times outside the peak season or peak time of day. To address the expectation factor, information and marketing could build on images that portray the situation during peak visitation times realistically. Addressing the exposure factor and site customization factor includes an array of possible measures like traffic signs, additional parking spaces, limitations on the number of visitors and regulations.

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Site Management Strategies for UNESCO World Heritage Sites: The Case of the Letoon Sanctuary in Turkey

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Letoon is an archaeological site in Turkey inscribed at the World Heritage List in 1988 for its influence on the Lycian and subsequent Western architecture. In recent years, in order to protect the international significance of the sites, the World Heritage Committee has required preparing five-year management plans for heritage sites. This study focuses on the methodology of the conservation and presentation of the site by gathering and analyzing the necessary data for the management plan of Letoon. The site management plan defines a framework for the protection and enhancement of the architectural, archaeological, historical and cultural assets of the site. In this paper, a site boundary is proposed for the Letoon Management Plan and studied in three stages. Firstly, protection, presentation, and visitor policies will be developed by providing access to national and international platforms. Secondly, a strategy will be defined according to the vision to solve problems of the archaeological sites, and existing settlements. Finally, an action plan for site activities will be prepared following decisions about usage and transformation for tourism purposes.

Keywords: *site management plan, UNESCO world heritage list, Lycia, Letoon sanctuary, Turkey*

Introduction

The main focus of this study is to evaluate the Letoon Sanctuary for the protection of the natural integrity of the site which has an outstanding universal value in the World Heritage List together with Xanthos since 1988. The purpose of the study is to identify management issues affecting the site; and to make a preliminary evaluation to develop policies, actions, and strategies for the site in order to transfer its values to future generations.

This study is carried out under the name of "Preservation and Site Management Strategies in World Heritage Sites: The Management Plan Proposal of the Letoon Monuments and Its Environment" within the scope of the master thesis in Başkent University, Institute of Science, Department of Architecture. This article is the result of the early data from the thesis.

Xanthos-Letoon are two neighboring settlements that have remarkable archaeological values located in southwestern Anatolia, respectively within the

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boundaries of Antalya and Muğla Provinces. It represents the most unique extant architectural example of the ancient Lycian Civilization, which was one of the most important cultures of the Iron Age in Anatolia. The two sites strikingly illustrate the continuity and unique combination of the Anatolian, Greek, Roman, and Byzantine civilizations (UNESCO 2020). Xanthos-Letoon was co-registered in 1988 and considered as "cultural" (ii[1]) and (iii[2]) criteria (UNESCO National Commission of Turkey 2009).

Located in Antalya province, Xanthos is the biggest administrative center of Lycia. The city, which was independent until it was ruled by the Persians in 545 B.C, was completely burnt down nearly a century later. After this fire, the city was rebuilt. In the second century B.C, it assumed the duty of being the capital of the Lycian League. The city, which later came under the control of the Romans, came under Byzantine rule and remained under Byzantine rule until the Arab raids in the seventh century. This site shows the effects of Lycian traditions, Hellenistic and Roman periods in the structures built by every civilization that settled down (KVMGM 2020b) (Figure 1).

Figure 1. *The Xanthos Ancient City*

Source: Aybike Yenel's Personal Archive 2019.

Located in Muğla province, Letoon was the water source in the Ancient period and the sanctuary associated with the water nymphs. The Letoon Sanctuary, which is settled 4 kilometers away from Xanthos, was the sacred center of the Lycia region that has religious and political significance. Except for the private residences of the priests and religious officials, all monuments have religious

[1]Criterion (ii): Xanthos-Letoon directly influenced the architecture of the principal ancient cities of Lycia such as Patara, Pınara, and Myra, as well as the neighboring provinces. The Halicarnassus Mausoleum, which was ranked as one of the Seven Wonders of the Ancient World, is directly influenced by Xanthos' Nereid Monument (UNESCO 2020).

[2]Criterion (iii): Xanthos-Letoon bears exceptional testimony to the Lycian civilization, both through the many inscriptions found at the two sites and through the remarkable funerary monuments preserved within the property. The longest and most important texts in the Lycian language were found in Xanthos-Letoon. The inscriptions, most of which were carved in rock or on huge monoliths, are considered exceptional evidence of this unique and long-forgotten Indo-European language. The rock art tombs, pillar tombs and pillar-mounted sarcophagi represent a novel type of funerary architecture. The rich series of Lycian tombs in Xanthos and Letoon enable us to fully understand the successive acculturation phenomena that took place in Lycia from the 6th century onwards (UNESCO 2020).

functions. As the official sacred center of the Lycian Union in the Hellenistic period, where the management decisions were taken by the union were announced to the public (Özdilek and Atik Korkmaz 2018) (Figure 2).

Figure 2. *The Letoon Sanctuary*

Source: Aybike Yenel's Personal Archive 2019.

The Letoon Sanctuary is an example of uninterrupted religious development with religious structures up to the seventh century. Archaeological ruins in Letoon, where traces of an uninterrupted sacredness from polytheistic religions to divine religions are traces. It goes back to the eighth century. The most important feature of this sanctuary, which is shaped around an underground water source and rocks, is that it contains traces of the monumental wooden architecture of Lycia. Its impact can be seen in Hellenistic architecture. The concept of holiness in the site has its reflection in the Christian period buildings. There are stone inscriptions in which the longest and most important texts can be seen in the Lycian language.

In this paper, firstly UNESCO's site management strategies for World Heritage Sites will be studied and the current situation of site management policies will be evaluated in Turkey after the legislative changes made in 2004. Secondly, the case of Letoon will be discussed in two scales: "The Lycian Way and Its Surroundings Settlements" and "Letoon Sanctuary and Its Surroundings". Finally, a preliminary assessment of boundaries, scope, and stages of the site management will be proposed for the Letoon.

Literature Review

The Site Management

The site management defines an approach that covers the entire process of identifying the management site, preparing, implementing, monitoring and updating the management plans following international acceptances (Ulusan 2016). In *Conservation Management: A Practical Guide* published by the English Heritage, the definition of site management is as follows: "having a clear idea and specific policies for the improvement of the area and for tackling problems in a number of co-ordinated ways" (English Heritage Towns Forum 1998).

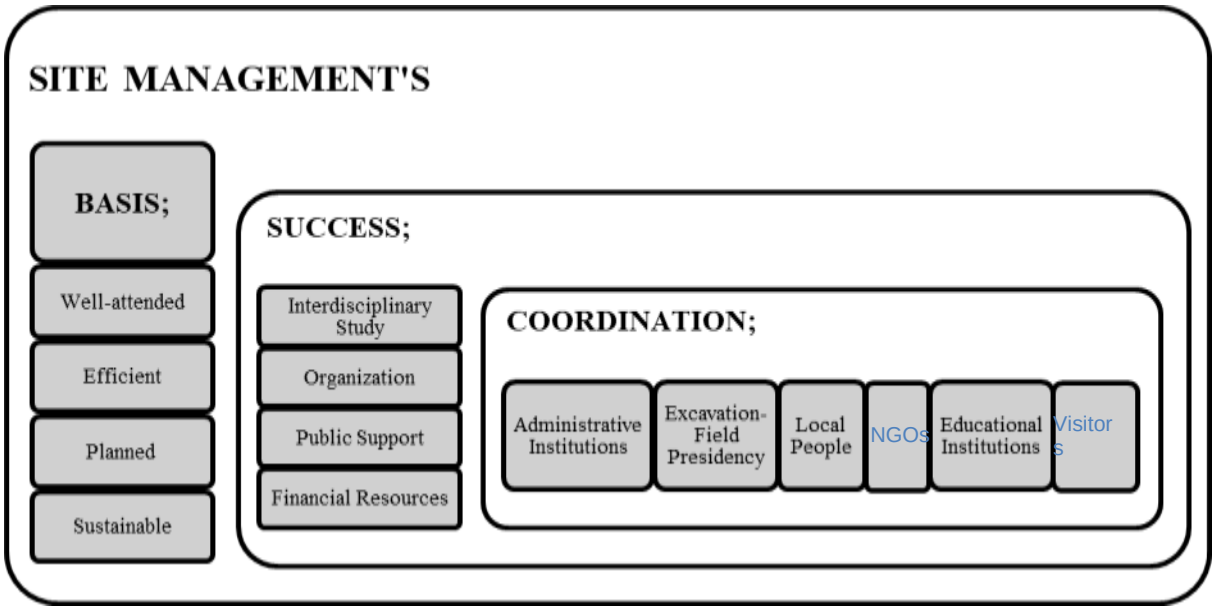
The management plan of ICOMOS is defined in *The Valletta Principles for the Safeguarding and Management of Historic Cities, Towns, and Urban Areas*, as follows: "A Management Plan is a document specifying in detail all the strategies and tools to be used for heritage protection and which at the same time responds to the needs of contemporary life. It contains legislative, financial, administrative and conservation documents, as well as Conservation and Monitoring Plans" (ICOMOS 2011).

The planning process is a multidisciplinary activity and should include input from experts depending on the importance of the site. *Management Guidelines for World Cultural Heritage Sites*, published by Feilden and Jokilehto in 1998, published the standards set by ICCROM in cultural heritage management. Accordingly, the management plan has to consider national and local plans. These plans should implement estimates of population growth or decline, economic factors, traffic, and industrial zones. The management plan should be based on reviews and reports prepared by the appropriate multidisciplinary teams (Feilden and Jokilehto 1998).

The different masses and disciplines that take an active role in urban conservation within the contemporary conservation understanding need to carry out conservation actions in an "efficient" manner and "planned" within the framework of "sustainable" by "well-attended" based on social reconciliation and dialogue. As a result of this requirement, trying to protect within the whole of geographical, social and cultural spaces is the basis of the concept of the site management. The site management is a kind of coordination system (Ekinci 2009).

The site management; administrative institutions with responsibility in the site to be protected, excavation-field presidency, residents and temporary beneficiaries of the site, Non-Governmental Organizations (NGOs), educational institutions (universities, etc.) and non-local elements (visitors, tourists, students, etc.) is a platform to provide communication between. In order to successfully implement site management, interdisciplinary study, good organization, sensitive public support, and financial resources are required (Table 1).

Table 2. *Framework of the Site Management*

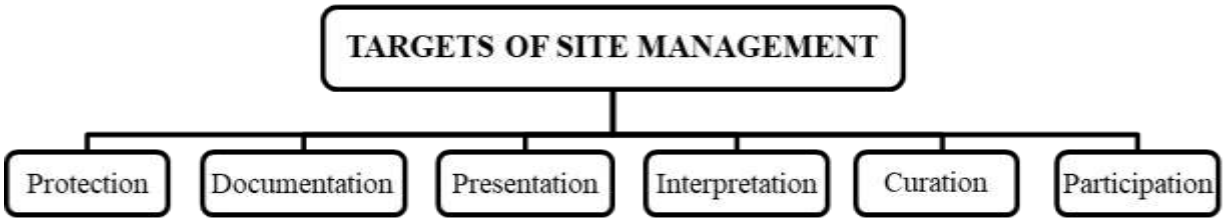


The Site Management for UNESCO

According to UNESCO *Operational Guidelines for the Implementation of the World Heritage Convention*, the aim of a management plan is to ensure the effective protection of the candidate sites for present and future generations (Makuvaza 2017, UNESCO World Heritage Centre 2019).

The site management programme for UNESCO translates into a concrete management plan that combines general strategies and policies with specific goals that relate to the significance and setting of the site. A management plan is obviously targeted at managing over the long-term a site that remains entirely in situ, but also partially excavated sites and what thereof remains, as well as the removed artefacts (UNESCO 2017) (Table 2).

Table 2. *Framework of the Site Management for UNESCO*



The general goals of cultural heritage management policy are:

- Mitigating impacts on endangered sites.
- Preventing destruction of sites and dispersal of artefacts by denying permits to Exploiters seeking private financial gain.
- Creating local, national, and international inventories of the sites.
- Protecting and interpreting sites in situ whenever possible.
- Excavating sites only when there are scientific objectives or interests for public enjoyment, adequate funding, professional staff, and provisions for documentation, conservation, curation, reporting and publication.
- Involving the public so that people can become the guardians of their cultural heritage.
- Bringing the excitement of cultural sites to the public in reputable museum exhibitions, media presentations, and publications (UNESCO 2017).

The following topics should be considered in archaeological sites that have been nominated for the World Heritage List or are currently on the Tentative List:

- Protection, Promotion, Adaptation, and Management.
- Control of central government services in accordance with local authorities and their people.
- Users' attitudes, as well as those involved with the protection process.

- Balanced development of the wider area in association with the local tradition.

As a result, cultural - material (tangible) and intangible- heritage must be contributed to the preservation and appointment of the identity (ICOMOS 2002).

As site management strategies in UNESCO World Heritage Sites:

- It should be targeted with an interdisciplinary approach to various issues related to the protection, presentation, and management of cultural heritage (Bahçeci 1994).
- An introduction should be planned, taking into account the maintenance; repair and/or excavation work in the area, taking into account the restoration work that is part of the presentation.
- In order to ensure the proper presentation, correct perception of the sites, the cultural infrastructure and educational level of the visitors coming to the area should be determined first and the integrity of the site should be considered as the most appropriate way to make the site inviting.

Site Management in Turkey

Turkey adopted *The Convention on the protection of World Cultural and Natural Heritage*[3] which was prepared by UNESCO in 1983. In the candidacy file of the asset to be nominated for the UNESCO World Heritage List, it is mandatory to have an approved management plan, which will be presented as a guarantee of the survival of this heritage and the details of the studies to be carried out in the short-medium-long term.

Accordingly, preparation of site management plans for protected sites in Turkey; Annex-2 of Law No. 5226 on 14.07.2004 to *The Law on the Protection of Cultural and Natural Assets*[4] numbered 2863 dated 21.07.1983 has been added and made mandatory. *The Law & Amendment of the Law on the Protection of Cultural and Natural Assets Laws*[5] numbered 5226 and their related regulations determined the principles of the site management in Turkey.

According to Law No. 2863, a Management Plan is a plan created through considering the business project, excavation plan, landscape plan or urban conservation plan, and prepared to ensure the conservation, sustaining and evaluation of the management site. These plans also include the annual and 5-year period implementation stages and budget and are revised every five years (Annex-2: 14.07.2004-Article 3, Paragraph-11).

The Regulation on the Establishment and Duties of the Site Management and Monument Board and the Procedures and Principles for Determining the

[3]The Convention on the Protection of World Cultural and Natural Heritage (14 February 1983). **Official Gazette** (Number: 17959).

[4]The Law on the Protection of Cultural and Natural Assets (7 July 1983). Official Gazette (Number: 18113).

[5]The Law & Amendment of the Law on the Protection of Cultural and Natural Assets Laws (14 July 2004). Official Gazette (Number: 25535).

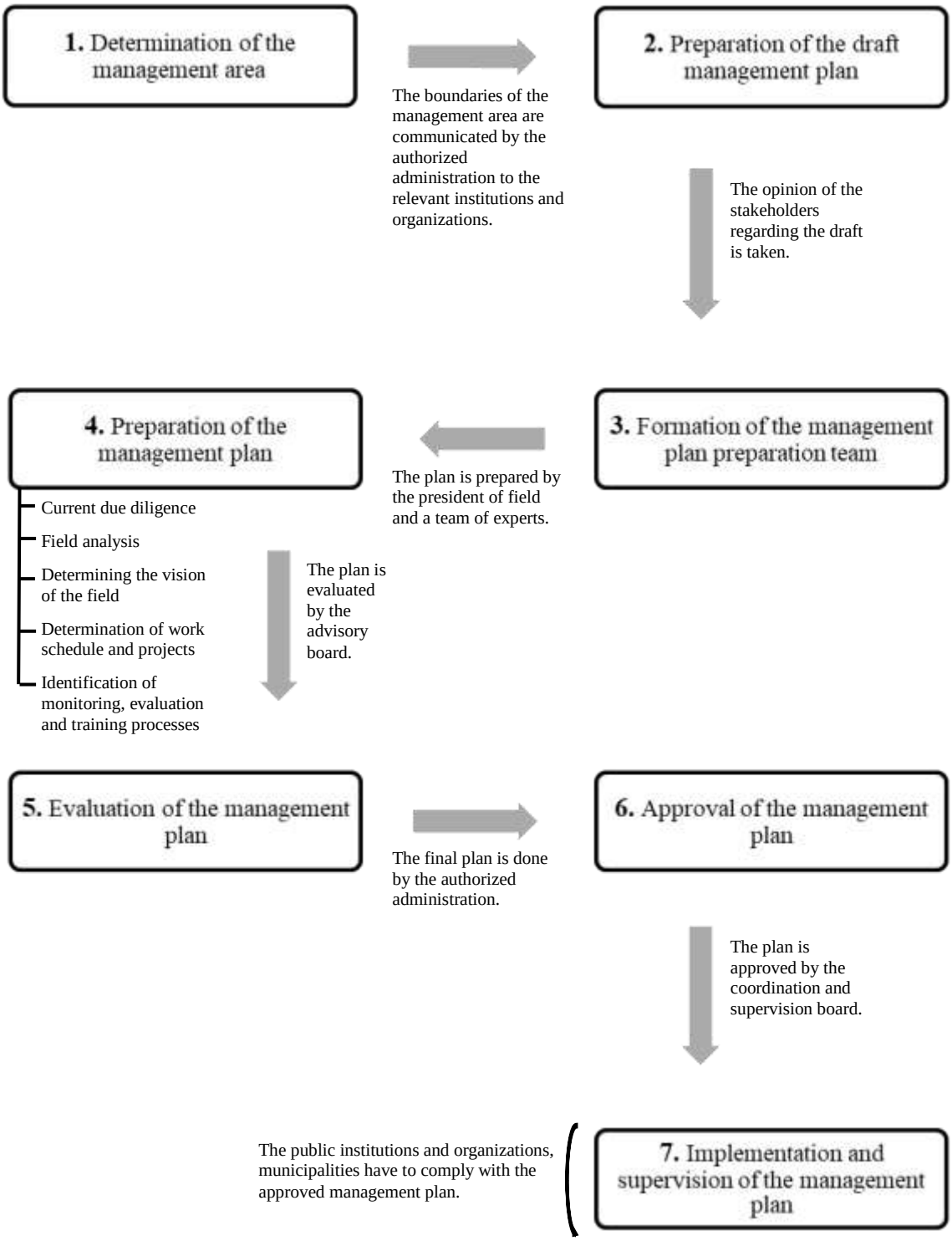
Management Areas[6] was published in the Official Paper dated 27.11.2005. Republic of Turkey Ministry of Culture and Tourism attaches importance to the successful implementation of these laws and related regulations in World Heritage Sites.

Accordingly, the objectives of the site management are as follows:

- Determination of the boundaries of the management site within historical, social, cultural, geographical, natural and artistic integrity in terms of protection, development, and evaluation of the site.
- Demonstration by the management plan of ways to strike an appropriate balance between conservation, access, sustainable economic development needs and the relevance of the local people.
- Development of general strategies, methods, and tools, determination and creation of financial resources to increase the value of the field to an international level.
- Establishment of an event network that will create international cooperation and sharing in order to improve cultural tourism.
- Creation of implementation plans for the development of regional cultural systems in sites with the potential to create a sector by associating them within a certain region.
- Cooperation between public institutions and organizations, non-governmental organizations, property rights holders, voluntary individuals and organizations and local people in the protection and evaluation of the management sites.
- Determination of the principles and limits of use and development within the framework of international protection principles and the provisions of the convention for site management in protected sites (Annex: 27.11.2005-Chapter 2, Articles-5) (Table 3).

[6]The Regulation on the Establishment and Duties of the Site Management and Monument Board and the Procedures and Principles for Determining the Management Areas (27 November 2005). **Official Gazette** (Number: 26006).

Table 3. *The Site Management Process in Turkey*



Source: Annex: 27.11.2005-Chapter 2, Articles-6,7,8,9,10,11,12,13.

Turkey has 18 heritage sites, 16 of them which are cultural and 2 of them which are mixed, on the World Heritage List. In the Tentative List, there are 78 heritage sites, 73 of them are cultural, 2 of them are mixed and 3 of them are

natural (UNESCO 2019). Turkey has accelerated its management planning efforts to protect the World Heritage List and to enable the Tentative List to be included in the List through legal regulations since 2004. There are 14 management plans approved of the sites on the UNESCO World Heritage List and Tentative List by the Republic of Turkey Ministry of Culture and Tourism (Table 4).

Table 4. *Approved Management Plans for the World Heritage Sites in Turkey*

	Date of Inscription	Starting Date of Management Plan[7]
Management Plans in the World Heritage List		
Göbekli Tepe Site Management Plan	2018	2017
Aphrodisias Site Management Plan	2017	2010
Strategic Conservation Master Plan for Ani	2016	2009
Diyarbakır Fortress and Hevsel Gardens Cultural Landscape Management Plan	2015	2011
Ephesus Management Plan	2015	2010
Pergamon and Its Multi-Layered Landscape Management Plan	2014	2010
Bursa and Cumalıkızık Management Plan	2014	2010
Management Plan of Neolithic Site of Çatalhöyük	2012	2010
Edirne Selimiye Mosque and Social Complex Management Plan	2011	2007
Commagene Nemrut Management Plan	1987	2008
Istanbul Historic Peninsula Management Plan	1985	2009
Management Plans in the World Heritage Tentative List		
Mudurnu Cultural Heritage Management Plan	2015	2014
Yesemek Quarry and Sculpture Workshop Management Plan	2012	2019
Harran Site Management Plan	2000	2014

Source: KVMGM 2020a.

In Turkey, as above most of the sites which were listed in the UNESCO World Heritage List do not have a management plan. However, the World Heritage Committee has been mandatory for the sites in this List and Tentative List to have management plans. In Turkey, the legislative changes made in 2004, after that, the management plan has been prepared in many sites. Xanthos-Letoon still does not have a site management plan since 1988.

[7]The start date of the management plan is based on the date on which the boundaries of the management area are approved.

Xanthos-Letoon is located within the borders of two separate provinces. The World Heritage Site is administratively located within the boundaries of two separate provinces and every institution and organization acts within the boundaries of its field of protection. Also, there is no single presidency of field or coordinator for the management of the site. For these reasons, to protect the Xanthos-Letoon, which is registered together in the World Heritage List, and to increase their potential, it was deemed appropriate to consider the management plans of both areas separately (Table 5).

Table 5. *Comparison of Xanthos and Letoon Management System*

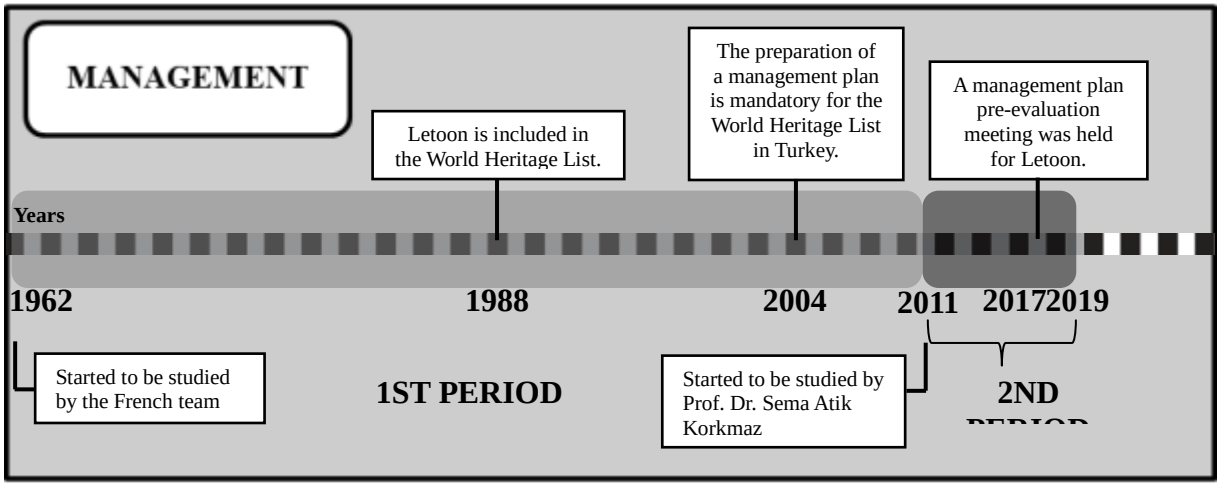
	Xanthos	**Letoon**
Presidency of Excavation	Prof. Dr. Burhan Varkıvanç (Akdeniz University, Faculty of Tourism, Department of Tourism Guidance, Antalya) (2011–2020)	Prof. Dr. Sema Atik Korkmaz (Başkent University, Faculty of Fine Arts, Design and Architecture, Department of Architecture, Ankara) (2011–2019)
Mayoralty	Kınık Municipality	Seydikemer Municipality
Directorate of Protection Regional Board	Antalya Directorate of Cultural Heritage Protection Regional Board	Muğla Directorate of Cultural Heritage Protection Regional Board
Directorate of Museums	Directorate of Antalya Museum	Directorate of Fethiye Museum

Methodology

The main subject of the study is the Letoon Sanctuary located within the borders of Seydikemer district, Muğla province. The main material of the study is archaeological studies for the site, literature data about the site, map, plan and visual material of the site, as well as interviews with the relevant persons on the site. Within the scope of the study, literature review, observation-study-analysis and oral interviews were conducted. This study is the collection of data needed for the management plan that Letoon. The analysis of the data collected focused on the methodology required for the protection and presentation of the site.

The first systematic studies at Letoon were initiated by the French archaeology team in 1962. Letoon was unearthed by the excavations that started by Prof. Dr. H. Metzger and later Christian Le Roy (DÖSİMM 2014). The second cycle of the systematic archaeological studies at Letoon has been carried out since 2011 under the presidency of Prof. Dr. Sema Atik Korkmaz, Faculty of Fine Arts, Design and Architecture, Department of Architecture, on behalf of Başkent University according to the Decree of the Council of Ministry of Culture and Tourism and the General Directorate of Cultural Heritage and Museums (Atik Korkmaz 2015, Letoon Excavation Archive 2017) (Table 6).

Table 6. *Management of the Letoon Sanctuary*



In accordance with the objectives and boundaries, the studies required to be carried out within the scope of the Letoon Management Plan have been dealt with on two scales.

1. On the scale of "The Lycian Way and Its Surroundings Settlements", the following studies have been carried out to determine and define the boundaries of the management site provided that the Republic of Turkey Ministry of Culture and Tourism approves.

    - "Letoon Archaeological and Natural Site Management Plan Preliminary Evaluation Meeting" was held with the participation of the academic members of the Excavation Committee, Fethiye Museum manager and the Ministry of Culture and Tourism representative conducted by the presidency of Prof. Dr. Sema Atik Korkmaz on 04.08.2017.
    - The data obtained from the field study on the settlements of the Lycian route was conducted between 24.07-05.08.2017. The route was followed through the ancient cities of Letoon, Xanthos, Pydnai, Sidyma, Pınara and Tlos.

2. On the scale of "The Letoon Sanctuary and Its Surroundings"; the following studies had also been carried out for the definition of the processes related to the documentation, research and presentation of the monumental structure and building elements.

    - Aybike Yenel has documented the old village houses located in the Letoon in the World Heritage Site with the permission of the Directorate of Fethiye Museum. Within the scope of her master thesis titled "Protection and Site Management Strategies in World Heritage Sites: The Management Plan Proposal of the Letoon

Monuments and Its Environment", a study was conducted in Kumluova town, Kınık town, and Antalya city center between 05-07.11.2019.

Results

The Letoon Management Plan Preliminary Assessment

The Letoon Management Plan Preliminary Assessment, as a whole, with its architectural, archaeological, historical, economic, social, cultural, natural and ecological values in line, which includes the Letoon and the Lycian Road archaeological sites aims to protect, interpret, present and maintain its continuity.

Within the scope of the preliminary assessment, in accordance with this purpose, the studies to be carried out are discussed in two scales:

- On the scale of "The Lycian Way and Its Surroundings Settlements"
- On the scale of "The Letoon Sanctuary and Its Surroundings"

The steps that can be carried out within the scope of the study are described below (Table 7).

Table 7. *The Letoon Management Plan Preliminary Assessment Steps*

CODE	Steps Description
LMP	THE LETOON MANAGEMENT PLAN PRELIMINARY ASSESSMENT
LMPS1	1.On the scale of "The Lycian Way and Its Surroundings Settlements"
LMPS1.1	Research on determining the "Management Area" boundaries and scopes
LMPS1.2	Preparing a Management Plan for the area within the "Management Plan Border"
LMPS2	1. 2.On the scale of "The Letoon Sanctuary and Its Surroundings"
LMPS2	"Interpretation and Presentation Proposal" of the Letoon Monuments in the management plan[8]

LMPS1 The Lycian Way and its Surroundings Settlements

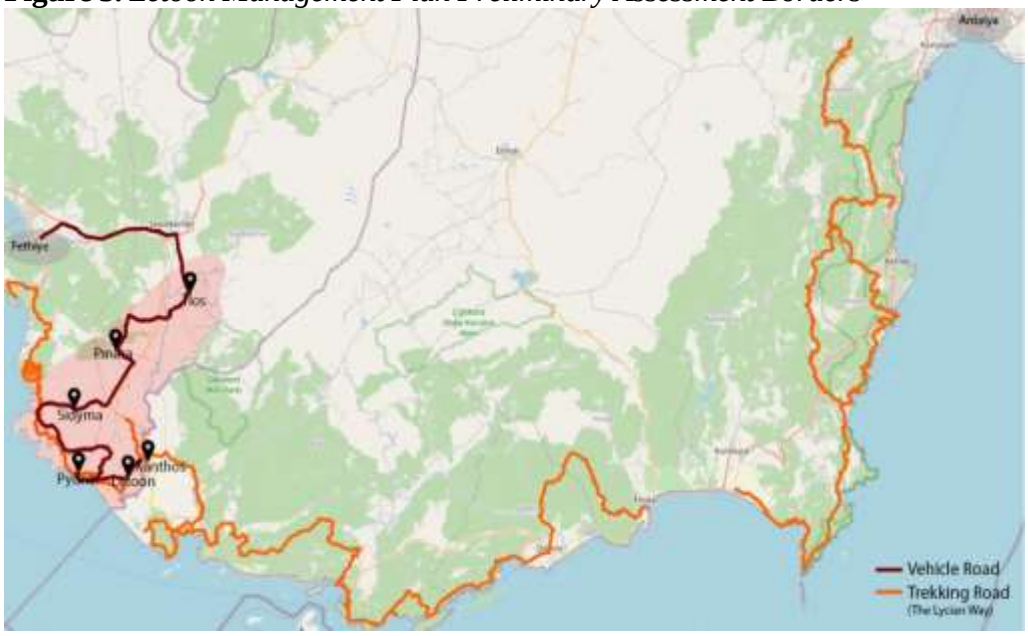
The Lycian civilization is one of the most important civilizations that have left traces rooted in Anatolia. It is a union formed by several small city-states that ruled in the region (DÖSİMM 2014). Lycia is the region today's Teke Peninsula, where the people live called "Lukka" or "Lukku" in the Hittite texts, who threats the whole Eastern Mediterranean in the second millennium (Letoon Excavation Archive 2017). The borders of Lycia, extending to the Mediterranean towards the south, are bordered by Fethiye in the west and Antalya in the east.

[8]*LMPS2* "Interpretation and Presentation Proposal" of the Letoon Monuments in the management plan will be made within the scope of the thesis.

LMPS1.1 In accordance with the purpose and scope described above, the following archaeological sites are defined as boundaries:

- The Letoon Sanctuary (Kumluova).
- The Xanthos Ancient City (Kınık).
- The Pydnai Ancient City (Gavurağılı).
- The Sidyma Ancient City (Dodurga).
- The Pınara Ancient City (Minare).
- The Tlos Ancient City (Yakaköy) (Figure 3).

Figure 3. *Letoon Management Plan Preliminary Assessment Borders*



Source: https://www.openstreetmap.org/relation/51855#map=10/36.5066/29.8531.

LMPS1.2 The Lycian Way was divided into stages and the Management Area was determined. A Management Plan Border proposal was made on the route based on the vehicle road and the Lycian trekking road. This route was created starting from Fethiye with the ancient cities of the Lycian Way and surrounding settlements. The determined settlements are important of Lycia.

The Tlos Ancient City

Tlos located in the district of Yakaköy, 49 kilometers from Fethiye, is on the UNESCO World Heritage Tentative List, and temple tombs carved into the rocks on the slope attract attention. The city is also known as the sports city of Lycia. It carries the traces of the settlement that continued without interruption from the Neolithic period to the Iron Age. Also, which is an important center in terms of the history of Christianity, is one of the most important episcopal centers of Lycia (Muğla KTB 2020c) (Figure 4).

Figure 4. *The Tlos Ancient City in Yakaköy*

Source: Müge Bahçeci's Personal Archive 2017.

The Pınara Ancient City

Pınara located in the district of Minare, 45 kilometers from Fethiye, is on the UNESCO World Heritage Tentative List, although the historical and epigraphic records about the city are very few, it is thought that the city was founded by colonists from Xanthos. The city consists of a bath, theater, agora, odeon, rock tombs, and two acropoleis. The fact that the majority of the rock tombs are in the form of houses gives ideas about Lycian Civil Architecture (Muğla KTB 2020b) (Figure 5).

Figure 5. *The Pınara Ancient City in Minare*

Source: Müge Bahçeci's Personal Archive 2017.

The Sidyma Ancient City

Sidyma is in the district of Dodurga, 57 kilometers from Fethiye, belongs to the Roman Period with its ruins that have survived to the present day. Sidyma acropolis is located on a two-part hill in the north. Southeast of the hill the acropolis was surrounded by walls that were 3 meters long and according to the location of the place. In addition to rock tombs that have similar features as in Pınara, tombs in the form of houses or sarcophagi are also the symbol of Sidyma (Muğla KTB 2020a) (Figure 6).

Figure 6. *The Sidyma Ancient City in Dodurga*

Source: Müge Bahçeci's Personal Archive 2017.

The Pydnai Ancient City

Pydnai is found on the section of the Lycian Way walk near the district of Gavurağılı. The city was probably once a small naval and military base fortress and guarded the very west end of Patara. The marshy area around it was once a bay and was probably a deep water harbor. It is made of well-preserved polygonal masonry with 11 rectangular towers at its corners and midway along the walls. Four or five inscriptions have been found in and around the fort; all are of Imperial date and one links Pydnai with Xanthos (Lycian Turkey 2020b) (Figure 7).

Figure 7. *The Pydnai Ancient City in Gavurağılı*

Source: Müge Bahçeci's Personal Archive 2017.

The Xanthos Ancient City

Xanthos is in the district of Kınık, 61 kilometers from Fethiye, was established on two hills overlooking the plain near the Eşen River. The first one is the Lycian acropolis, surrounded by a wall that rises steeply from the edge of the Eşen River and the second one is the higher and wider Roman acropolis in the north. It is described as the administrative center of the Lycian Union (Turkey Cultural Portal 2019).

LMPS2 The Letoon Santuary and its Surroundings

Letoon is in the district of Kumluova, 65 kilometers from Fethiye, Muğla. It represents the most unique extant architectural example of the ancient Lycian Civilization, as many inscriptions found at the site demonstrate; the federal sanctuary was the place where all religious and political decisions of the ruling powers were declared to the public (UNESCO 2020).

Historical Structure of Letoon and its Surroundings

Letoon was a center for joint worship of "Eni Mahanahi", the Lycian version of Annis Massanassis and her children Ertemi and Natri, or the deities known as Leto, Artemis, and Apollo in the Hellenic religion. The earliest archaeological evidence in Letoon belongs to the end of the eighth century B.C. The arrangements made around the water, the source of life springing out of the headwaters under the ground, as well as the carving of the cliff around it and the offerings presented, testifies the ultimate attention that the Lycians paid to this spring and rocks/ mountains while constituting concrete archeological evidence of a multilayered, complex and multifaceted past with an unknown baseline date. This glorious history of Letoon survived throughout the Persian rule in Western Lycia, the invasion of Alexander the Great, and the subsequent Hellenistic period, Roman and Byzantine eras. It ended probably after the Arab hegemony over Rhodes and then all around the Mediterranean world (Atik Korkmaz 2015, Letoon Excavation Archive 2017).

Geographical Structure of Letoon and its Surroundings

Figure 8. *The Lycian Region Topography Map*

Source: http://www.lycianturkey.com/maps.htm.

Letoon (Kumluova) is located in the Xanthos Valley, the largest of the valleys formed by the Eşen River, within a fragmentary geographical structure with delta

plains between the mountains. It is an important political and religious center of Lycia along with surrounding settlements such as Xanthos (Kınık), Patara (Ovagelemiş), Pdynai (Gavurağılı), Pınara (Minare), Sidyma (Dodurga) and Tlos (Yakaköy) (Figure 8).

Letoon is located on the foothills of Koca Tepe in the northwest of this plain, on the foot of Tümtüm Hill, a small summit extending as a ridge to the northwest. Like the other coastal settlements in the region, Letoon was also founded in the first millennium B.C. The natural environment in the time when Letoon was founded was different from that today. The geomorphological evolution of this environment is the changes in the sea levels during this time span. The depression where the plain is located was a bay in the early Holocene period and transformed into a lagoon with the alluvium brought by Eşen River. During this period, the sites of Letoon become land. The sea retreated a few meters down during the Bronze Age and this had an impact in the alluvium filling of the plain. Toward today the sea level rose again but the shoreline could not penetrate inward as before. The sondages dug at Letoon brought to light a layer of ash, which might have been caused by an eruption of the volcano at Santorini (Thera) about four thousand years ago. Today Letoon lies about six kilometers inland from the sea (Atik Korkmaz 2015, Letoon Excavation Archive 2017).

Social and Economic Structure of Letoon and its Surroundings

Letoon is located within the boundaries of the town of Kumluova. It is a rural settlement with a municipal organization. For this reason, economic activities, infrastructure facilities, and social facilities are developed in the settlement. Kumluova is administratively connected to Muğla District, but in commercial and social terms it has close relations with Fethiye district center. In Kumluova, especially the economic activity site based on greenhouse agriculture is quite wide. Therefore, immigrants mostly settle in the town in order to make this economic activity. In addition, there are also people who migrate temporarily during the production season and return to their villages at the end of the production activity. These are collaborators or workers in greenhouses. The main sector in the local economy is agriculture. The main crops grown in the town are cotton, wheat, sesame, legumes, vegetables, citrus, peanuts, and olives (UNESCO National Commission of Turkey 2009).

Management Structure of Letoon and its Surroundings

Letoon is located within the borders of Muğla Province. Therefore, on behalf of the Republic of Turkey Ministry of Culture and Tourism Muğla Governorship and Fethiye Museum Directorate are responsible for the site. It is in the administrative site of the town of Kumluova. On the other hand, the World Heritage Site is in the Patara Special Environmental Protection Area. Therefore, In addition to the Republic of Turkey Ministry of Culture and Tourism, the Republic of Turkey Ministry of Environment and Urbanization, and the Special Environmental Protection Agency are also authorized. Letoon is under the

responsibility of the Muğla Directorate of Cultural Heritage Protection Regional Board (UNESCO National Commission of Turkey 2009).

Features of the Letoon Sanctuary

The Letoon Sanctuary; its influence on the Lycian and subsequent Western architecture and well-preserved inscriptions that allow partially enabling the decipherment of the Lycian language are its values (Letoon Excavation Archive 2017). The famous trilingual inscription, dating back to 337 B.C., features a text in Lycian and Greek as well as an Aramaic summary and was discovered near the temple of Apollo. In the sanctuary of Letoon, three temples are dedicated to Leto, Artemis, and Apollo. In addition, the site includes the ruins of a nymphaeum dating back to Hadrian, built on a water source that was considered sacred (UNESCO 2020).

Main phases of the layout of the sanctuary are:

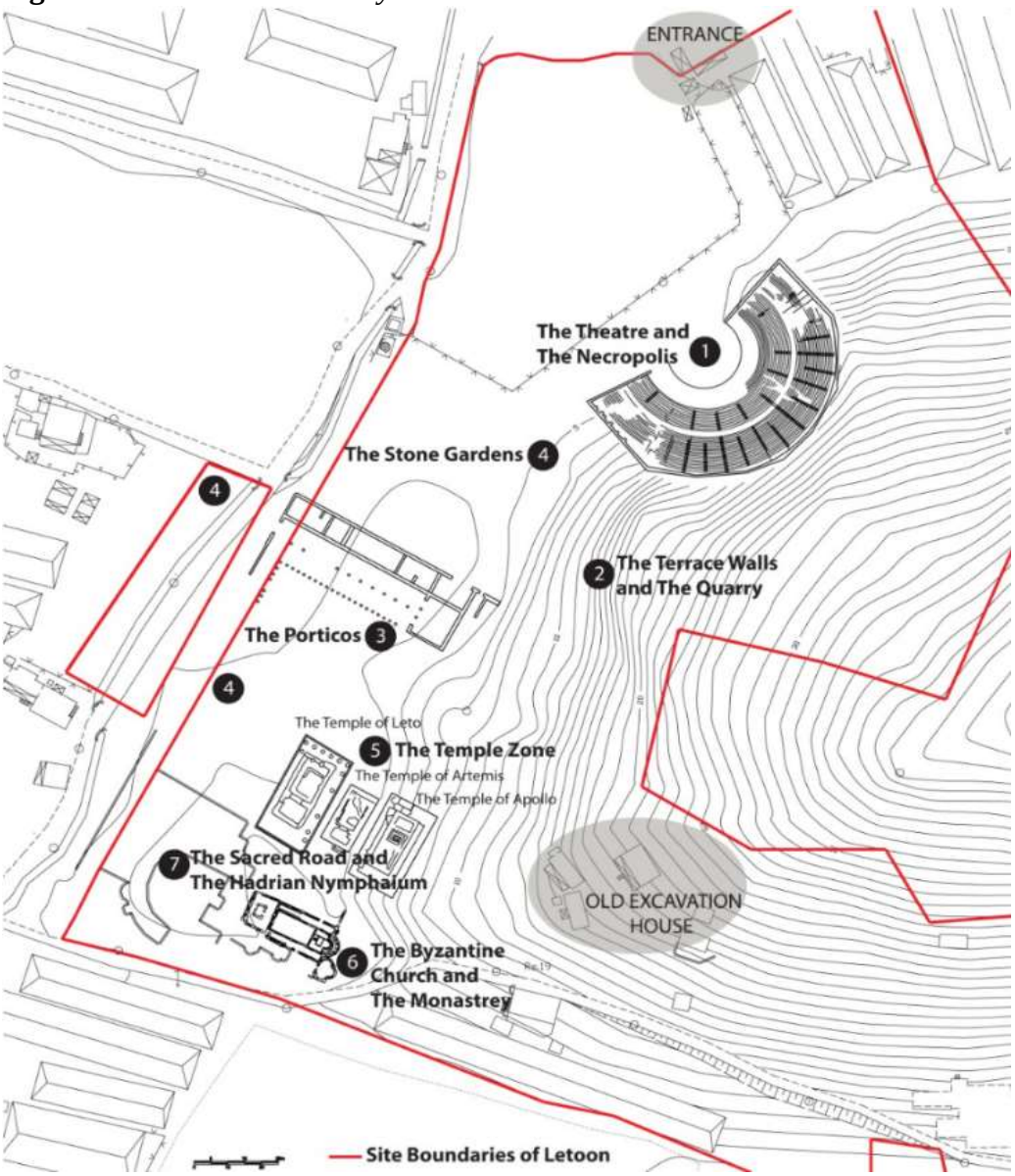
- In the Classical period, some isolated edifices were built on terraces laid out between the hill and the Sacred Spring.
- In the Greek period, temples and porticoes were erected in a regular grid.
- In the Roman period, the Nymphaium was redesigned in baroque style.
- In the Byzantine period, a basilica was built on the altar's terrace, which dominated a site progressively covered by water.

The sanctuary was once bordered by large porticoes, where pilgrims could rest and which closed off the site. The three temples were erected on podiums, which is typical of Lycian architecture. They offered a spectacular view to pilgrims walking up the The Sacred Road from the Propylon (a monument gateway leading to the sanctuary) which was located down the platform where the temples and altars were built (Lycian Turkey 2020a) (Figure 9).

The Theater

The building was built during the Hellenistic period, around the second century B.C. The total capacity of the theater is about 7,800 people. The cavea was greater than semicircle. The middle unit of the cavea was carved into the bedrock. The cavea is divided into two parts with a diazoma and has 36 sitting rows. The theater entrances or exits for the audience to or from the cavea are made with vaulted passageways or paradoi. The northwest vaulted passage is surrounded by Doric frieze; tyrigliph and metopes and lonic architrave above. The metopes are sculptured with 16 theater masks and faces. The southeastern vault features a Doric temple façade with triangular pediments (Letoon Excavation Archive 2017) (Figure 10).

Figure 9. *The Letoon Sanctuary Location Plan*



Source: Letoon Excavation Archive and Aybike Yenel's Personal Archive 2019.

Figure 10. *The Theatre and the Necropolis in Letoon*

Source: Aybike Yenel's Personal Archive 2019.

The Terrace Walls

The terraces lie along the south slope of Tümtüm Tepe in two rows. The first terrace begins from the southeastern vaulted passageway of the theater. The terrace wall lines off in the east of the terrace, which after made two angles at two points and goes to the direction of the sanctuary. The first construction phase probably belongs to the Hellenistic period. The workmanship in this era is in roughly carved and bossaged polygonal technique. Some parts of the wall have been renovated at the Roman and Byzantine periods (Letoon Excavation Archive 2017) (Figure 11).

Figure 11. *The Terrace Walls in Letoon*

Source: Aybike Yenel's Personal Archive 2019.

The Quarry

The whole rocky area of Tümtüm Tepe was used as a stone quarry during the Roman period. For stone extraction from the bedrock, using various methods such as levering, splitting, channeling (carving) is understood from the wedge and chisel marks on the rocks (Letoon Excavation Archive 2017).

The Porticos

The porticos (stoas-collonade) surrounded the Temple shrine in the North and East. The porticos are planned in two-part; L planned north portico and west portico. The porticos, planned in Doric order, were built in the Hellenistic period. Expanded with Roman period additions during the reign of Emperor Claudius to create a double-corridor structure in lonic order with a chamber in the northern section designed for the imperial cult. Heavily damaged by earthquakes during the Roman Imperial period, this structure was repaired by a donation of 30.000 denarii by Opramoas, the famous benefactor from Rhodiapolis (Letoon Excavation Archive 2017) (Figure 12).

Figure 12. *The Porticos in Letoon*

Source: Aybike Yenel's Personal Archive 2019.

The Stone Gardens

The stone station in archaeological sites is the areas where the collapsed architectural elements of a building are exhibited; after they have been identified and numbered for an inventory before restoration. In Letoon, eight stone situations have been arranged. Six of them belong to the Temple of Leto, in which 80% of the architectural elements still exist on the side, the Hadrian Monumental Fountain, the Temenos Wall, and the Byzantine Church (Letoon Excavation Archive, 2017) (Figure 13).

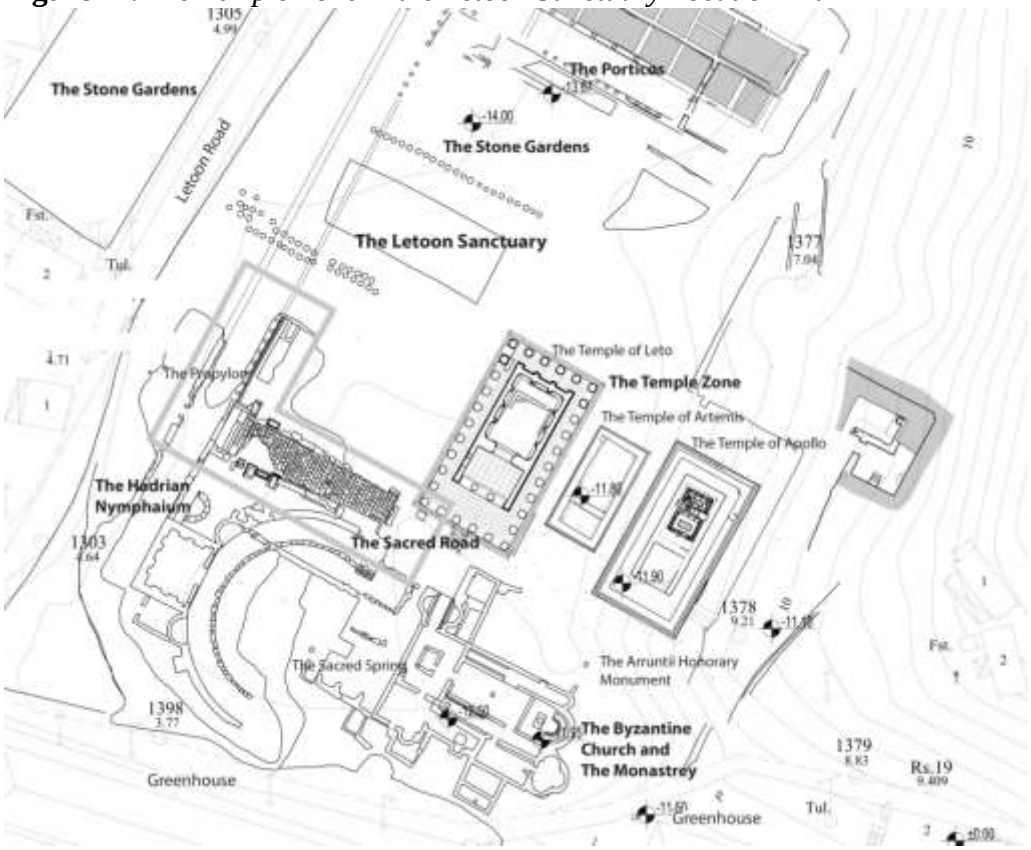
Figure 13. *The Stone Gardens in Letoon*

Source: Aybike Yenel's Personal Archive 2019.

The Temenos

The hearth of the known ruins of Letoon comprises the sacred spring and the temenos, which contains the temples built for Leto, Artemis, and Apollo. From other areas, stoas in the north and west were separated by huge bedrock trimmed in the east and the Hellenistic wall, and the entrance to the area was provided with propylon in the west (Letoon Excavation Archive 2017) (Figure 14).

Figure 14. *The Temple Zone in the Letoon Sanctuary Location Plan*



Source: Letoon Excavation Archive and Aybike Yenel's Personal Archive 2019.

The Temple of Leto

The Temple of Leto is one of the best-preserved temples in the world, as the 80% of its architectural blocks has reached our time. It is the largest temple of the area with dimensions of 15.75x32.25 meters and is located nearest to the sacred spring. It is a peripteros with a deep pronaos (entrance) surrounded by 30 columns in the lonic order. The Corinthian semi-capitals which were used on the plasters (half columns) are added on interior cella walls during the Roman period (Letoon Excavation Archive 2017) (Figure 15).

Figure 15. *The Temple of Leto in Letoon*

Source: Aybike Yenel's Personal Archive 2019.

The Temple of Artemis

The structure, measuring 9.5x18.5 meters located in the middle is the worst preserved among the three temples. Constructed in the Ionian order, the structure is considered to have a layout of templum in antis and attributed to Ertemiti/ Artemis based on the two inscriptions found at its entrance. The Ionic element of the structure has outstandingly elegant stone workmanship. Based on the inscription of Erbbina/Arbinas, the second construction phase of the structure is dated to the early fourth century B.C. (Letoon Excavation Archive 2017) (Figure 16).

Figure 16. *The Temple of Artemis in Letoon*

Source: Aybike Yenel's Personal Archive 2019.

The Temple of Apollo

The Temple is located right next to the spectacular cliff smoothed by carving on the easternmost side of the temenos. The temple at 27.95x15.07 meters, it rises on a crepidoma with three-stepped krepis. The final phase is a peripteros with 6x11 columns. An early temple of 4.9x7.6 meters, built of wood on a stone foundation found here before the construction of the temple, is still in situ in the temple of the Hellenistic Temple (Letoon Excavation Archive, 2017) (Figure 17).

Figure 17. *The Temple of Apollo in Letoon*

Source: Aybike Yenel's Personal Archive 2019.

The Byzantine Church

Early Christian Church of Letoon is set on the sacred site as a part of the monastery. The basilica which has three naves was built using local limestone and spolia blocks. Floors of the middle and side naves are decorated with botanical and geometrical mosaics which includes animal motives as well. On the southeast corner of the church, a baptistery is located with a trikonkhos (three-leaved clover shaped) plan (Letoon Excavation Archive 2017) (Figure 18).

Figure 18. *The Byzantine Church and the Monastery in Letoon*

Source: Aybike Yenel's Personal Archive 2019.

The Sacred Road

A propylon in the north of the Hadrian Fountain lies on towards the sanctuary from the west. The archaeological remains still are remarkable today. The stone-paved the Sacred Road lies from the propylon to the Arruntii Monument. At this point, it is lined off by many inscriptions and sculpture bases at both sides. It goes on in front of the temples and across between bedrock and Apollon Temple along the terraces (Letoon Excavation Archive 2017).

The Hadrian Nymphaium

A monumental fountain dedicated to Emperor Hadrian is on the southwest side of the sanctuary. The building was built during the Roman period. The fountain has a semi-circular pool surrounded by a portico. Its upper structure mostly preserved. In the middle of the portico, there is a square planned niche dedicated to the Emperor Hadrianus. In the east of the pool, there is a sacred spring on the same axle with square niche. The elements that signify the worship area include the sacred spring associated with the spring cult goddesses, who were first called "ali(ya)" in Luwian, then "eliyana" in Lycian, "hwrnys" in Aramaic and finally "nymphs" in the ancient Greek. The spring’s used for the ritual cleansing feature since ancient times (Letoon Excavation Archive 2017) (Figure 19).

Figure 19. *The Sacred Road and the Hadrian Nymphaium in Letoon*

Source: Aybike Yenel's Personal Archive 2019.

The Old Excavation House

The Xanthos excavation team stayed in the old village houses in 1951 on the southwest side of the sanctuary. The old excavation house, which is within the first degree protected area, has a property problem situation and does not have a title deed (Figure 20).

Figure 20. *The Old Excavation House in Letoon*

Source: Aybike Yenel's Personal Archive 2019.

Discussion

Current Status, Opportunities, and Problems of the Letoon Sanctuary

Within the scope of the study, the strengths and weaknesses, opportunities and threats of the site were uncovered by SWOT analysis conducted to determine the current situation in the Letoon Sanctuary and its surroundings. In order to determine the potentials; literature collection, observation in the field, interviews with Fethiye Museum Directorate, documents and data obtained from web sites and archives were used as material. Planning and design proposals will be developed by taking into account the results of this analysis (Table 8).

Table 8. *SWOT Analysis of the Letoon Sanctuary and its Surrounding*

Strengths	**Weaknesses**
-Historical cultural richness -Having original archaeological structures -The Letoon Environmental Design Project -Visitor reception center, parking and road arrangement -No serious security issues -Determination of sightseeing routes -Making promotional materials and information boards	-Although it is on the World Heritage List, has no recognition in Turkey -Lack of management plan -A low number of visitors and tourists -The groundwater level of the area is high -The boundary of the area with greenhouses, residences, and businesses -No significant investment in tourism is available in Kumluova -No museum where the finds from the excavations in the area can be exhibited
Opportunities	**Threats**
-Being on the UNESCO World Heritage List -Being on the Lycian Way route -Effecting on Lycia and later on Western architecture -Having well-preserved inscriptions that allow partial understanding of Lycian	-Risk of groundwater coming to the surface -Greenhouse activity in the region

In the Letoon Sanctuary, an environmental design project including a multi-purpose hall, cafeteria, sales shop, toilets, box office, tourniquet, as well as many functions such as sightseeing routes, walkways, and recreation areas, has been prepared in 2014. The Letoon Environmental Design Project was completed during the tourist season in 2016 (KVMGM 2015) (Figure 21).

Figure 21. *The Letoon Environmental Design Project Location Plan*

Source: KVMGM 2015.

The necessary infrastructure work (parking lot, road arrangement, visitor reception center) was carried out with the Letoon Environmental Design Project, and it was emphasized that the area is on the World Heritage List. Parking is available for visitors to Letoon, and there are signs providing access to the area. The boundaries of Letoon have been determined and surrounded by wire mesh. The area has no serious security problems. The promotion of the area, which indicates that the area is on the World Heritage List, is made in Turkish and English. There are information signs on the walkways that guide transportation and a route arranged so that visitors can navigate within a certain plan and program. The facilities available for visitors and tourists at Letoon are sufficient (Figure 22).

Figure 22. *Visitor Reception Center in Letoon*

Source: Aybike Yenel's Personal Archive 2019.

Kumluova is a rural settlement. There is no significant investment in tourism in the region, where the World Heritage Site is located. Local people are reluctant to deal with tourism due to the income generated by greenhouses. The area borders with greenhouses, residences, and businesses. Due to the high groundwater level in Letoon, the base of a part of the area is filled with water. As a result of this situation, some of the works unearthed during excavations in Letoon are underwater and a large section is covered with plants. Although the Letoon Environmental Design Project has attempted to solve this problem, the problem still remains in the area even though the accumulating water level has decreased (Figure 23).

Figure 23. *Groundwater Level of Letoon*

Source: Aybike Yenel's Personal Archive 2019.

In addition, there is no museum where the finds found in excavations at the World Heritage site can be exhibited. Therefore, the finds are exhibited in Antalya and Fethiye museums. One of Letoon's outstanding universal values is the Trilingual inscription-trilingue was written in Lyki, Aramaic and Ancient Greek, which was found in 1973 and is exhibited in the Fethiye Museum today (Atik Korkmaz 2015, Letoon Excavation Archive 2017) (Figure 24).

Figure 24. *Letoon Trilingual Inscription in Fethiye Museum*

Source: Aybike Yenel's Personal Archive 2019.

In accordance with the international obligations arising from the World Heritage Convention, signed in 1972, Letoon periodic reporting is made to be submitted to the World Heritage Center every six years. However, no program has been prepared to monitor, control the effects of existing applications and determine whether they are successful or not (UNESCO National Commission of Turkey 2009).

Conclusion

In the light of surveys conducted in the Letoon Sanctuary and the Lycian Way surroundings, a number of suggestions have been developed within the scope of the thesis to increase the tourism potential of these areas and to ensure the conservation and presentation of archaeological structures.

- The Lycian Way will be staged for the revitalization of Letoon.
- Environmental Design Project and the visitor route within the boundaries of Letoon Archeological Site will be revitalized according to the analysis.
- An architectural program belonging to the vernacular buildings and building groups existing within the boundaries of the site will be re-functioned.

- The strategies and projects will be developed to increase the consciousness of the local people which do not have enough information about the World Heritage Site.
- The strategies and projects will be developed to ensure that the local people have economic benefit from the World Heritage Site.

Although the Letoon Sanctuary contains important archaeological remains and it is on the Lycian Way, it is not much known and not frequently preferred by local and foreign tourists, because it is not widely promoted nationally and internationally. So, Site management strategies in Letoon as UNESCO World Heritage Sites should be:

- Targeted with an interdisciplinary approach to various issues related to the protection, presentation, and management of cultural heritage.
- Cooperation between institutions and field presidency.
- Planned, taking into consideration the maintenance; excavation and restoration works in the area, as a part of the site presentation.
- Determined according to the cultural infrastructure and educational level of the visitors coming to the site. In order to ensure the proper presentation, the integrity of the site should be considered as the most appropriate way to make the site inviting.

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"Stories of Montanistika" in the World of Virtual Reality

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The main objective of the interdisciplinary research was a virtual reality (VR) interpretation of natural heritage, i.e., natural stones, that decorate the interior of the Montanistika building, which also houses the Department of Geology (Faculty of Natural Sciences and Engineering, University of Ljubljana). The aim of the study was to interpret and narrate stone heritage in 360 storytelling and VR. The VR solution was made for Oculus GO headgear. With a user centred approach for VR interactivity, VR gives the user an insight into the mysteries of the Montanistika building. 360-degree presentation of spaces contains information about geological characteristics of stones, their appearance and significance. Narration and screen play were designed considering individual premises of Montanistika building. 360 storytelling was implemented based on spatial orientation of the physical building and its premises. The result of the research is a VR solution that offers to the visitors a 360-degree experience, virtual and interactive walks through the building and learning about rocks from the presentation canvas. Moreover, the experience enables the immersion in the stories of Montanistika's stones and an attractive insight into the world of Slovene natural heritage.

Keywords: *natural heritage, virtual reality (VR), interaction design, 360 storytelling, Montanistika building*

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Introduction

The notion of inheritance is extremely broad and encompasses everything that previous generations have preserved for the present generation, and seems to be worthy of a larger share to be protected by our successors as well. Originally, the term heritage meant the legacy of the deceased, but later it was given various designations, such as cultural, natural, spiritual, archaeological etc. heritage. Today, very often the term heritage is first thought of as cultural or natural heritage (Jezernik 2005, Muršič 2005, Troha 2019).

In the Official Gazette of the Republic of Slovenia, the heritage is divided into material and living or intangible heritage; material heritage consists of movable and immovable heritage. Movable heritage is considered movable property or collections of movable property with heritage values. One of the types of tangible heritage is also stones and geological artefacts incorporated as a natural heritage in objects of cultural heritage (walls, furniture, buildings etc.) (ZVKD-1 2019).

Awareness of the importance of preserving heritage and its necessity for determining our identity emerged only in the modern age. Based on the preserved heritage, we can understand the development of past civilizations and, whether it is in terms of architecture, urbanism, live style, social and political organisation, customs, art and culture or any other area of heritage (Troha 2019).

A very big part in preserving the heritage has the UNESCO organization that emerged after the end of World War II to raise awareness of the importance of protecting cultural heritage (Žarnić 2012).

The digital preservation of cultural heritage is very important both from an educational and preventative point of view. One of the main motivations is certainly the protection against the dangers and risks to which cultural heritage goods are exposed. These threats can be of natural or socio-social origin. Natural impacts on the heritage can be long-term effects caused by weather and climatic factors, biological organisms, geological conditions and other stresses. Moreover, heritages can also be devastated by sudden natural disasters. Socio-social impacts include risks related to misconduct, wars, vandalism, wrong decisions, etc. (Žarnić 2012).

The digital preservation is of a great benefit for the museum collections in the form of an additional supportive presentation mode of heritage or even for virtual museums. Digital information (reconstructions and reproductions) is used as replicas intended either for exhibitions for the purpose of preserving originals, for the reconstruction of damaged objects or for the production of souvenirs. Often, cultural heritage originals are difficult to access or even inaccessible or removed from museums for a longer period due to restoration work. Such collections with geometric information and texture properties are therefore very convenient as they can be displayed or replaced in various ways and provide a quality and interesting alternative for educational purposes (Gomes et al. 2014, Pieraccini et al. 2001, Troha 2019).

Virtual Reality and Cultural Heritage

Extended realities (XR), i.e., virtual reality – VR, augmented reality – AR, mixed reality – MR), etc., have completely found their worth in the virtual heritage field. These interactive technologies and presentative modes are strongly collaborative also with 3D technologies, web platforms, user interfaces, animations and computer (dynamic) simulations. As implementation of 3D technologies in cultural heritage also XR persistently gain attention of the researchers and the professionals. Some of the positive aspects of their usability are that with their constant development they are gaining accuracy and accessibility, they are reliable and non-invasive, and go hand in hand with sustainability. Moreover, XR solutions are attractive and they augment user experience (Ioannides and Quark 2014, Gabrijelčič Tomc et al. 2019).

In the museums and galleries the implementation of VR enables the heritage artefacts and objects to be better contextualized and multisensorial presented, they also provide an experiential space where personal and social experiences emerge in relation to artefacts. Virtual experience technology is also becoming more and more mature to facilitate learning about cultural heritage. We are increasingly moving away from traditional experiences where in a museum or gallery a visitor just watches an exhibition and is not fully engaged in the experience (Ch'ng et al. 2017a, Ch'ng et al. 2017b).

Paladini et al. (2019) demonstrated that the advantages of the implementation of VR in cultural heritage beside the attractiveness, simulation and perspicuity, is especially the effectiveness for observations of details of heritage objects, recognition of the materials and state of conservation. The VR presentations enable also the contribution to greater understanding of features and dimensions of objects of heritage. When VR content is presented in games, the interest for the heritage and the awareness about its preservation increase. Nevertheless, VR presentations benefit also research work and can be used as working and researching tool (approach), helping especially conservation experts. With the use of interactive technologies such as VR, there was a shift in the perception about the role of museums and galleries in the society and these spaces have opened up to a new audience. Technology and tourism are the key components in promoting this process. The trend is seen as an increase in the number of tourists seeking adventure, culture, history, archaeology and interaction with local people (Ulisa et al. 2015, Ozebek 2019, Digital meets Culture 2019).

One of the most successful projects for presenting cultural heritage through VR technology is the Rome Reborn project. From its beginnings, which included 3D reconstructions of the buildings of ancient Rome, the project has evolved into a truly interactive experience that takes the VR user into the world of ancient Rome. The process has been very broad and has been carried out through research work involving experts from different fields (architects, archaeologists, historians, 3D technologists, computer graphic designers, developers, etc.). Users of the free Roma Reborn VR app can immerse themselves in the ancient city, walk through the streets of the virtual city, enter buildings and experience the life of the inhabitants of ancient Rome while listening to the comments of renowned experts

in archaeology and other fields (RomeReborn 2020). Inception is the project work of a large group of experts who have also developed this solution for the introduction of 3D technologies and XR in the field of cultural heritage by performing 3D reconstructions of cultural heritage artifacts, buildings, settlements and social environments of archeological or historical significance. The application that is originally aimed mainly at scientists, engineers and researchers in the field of 3D technologies, architecture, history, social sciences, etc., includes several modules and is also aimed at users of museums and galleries. The application includes sophisticated arithmetic solutions for the acquisition of 3D objects, the integration of geospatial information, includes both global and local positioning systems such as GIS, GPS, IPS etc., everything is assembled by modules into a complete solution with efficient functionalities and a user-friendly graphical interface. The Inception application also includes an interface for (VR in addition to AR and MR), where 3D models of the architectural heritage and artifacts are accessible to all users (including vulnerable groups) in an attractive way, as well as to different hardware (Giulio et al. 2016, Maietti et al. 2018a, Maietti et al. 2018b, Karadimas 2019).

Research carried out by Shehade and Stylianou-Lambert (2020) revealed that professionals practice, experience and perceive the implementation of VR in the museums with seven categories of perceived advantages and nine categories of perceived challenges. One of the biggest challenges for VR technology is the social aspect, which is still marginalised in the solutions currently used in museums. Researchers in research invite developers and designers of VR solutions to focus more on this in the future: interactivity and social VR applications. The research also notes that there is still a lack of knowledge about these advanced technologies (use, benefits of use) among museum staff for successful use of VR technologies in museums, that there is a lack of high quality equipment and that the potential of these technologies and their use is insufficient, researched to ensure that it can be fully exploited in museum presentations.

The object of our project was the Montanistika building, which is the building of the Faculty of Natural Sciences and Engineering, one of the faculties of University of Ljubljana. From an architectural point of view, the Montanistika is a remarkable building and is inscribed in the register of cultural heritage. Although the building itself may not be the most original, its peculiarity is reflected in its inside construction, with imaginative and quality craft details in wood, wrought iron and stone. The interior decoration of the building with the natural stone emphasizes its monumentality, carries important information on the extraction and use of natural stone in the past and enables experienced and narrative learning of rocks. Various polished natural stones were used to decorate and construct certain elements, which emphasized the monumentality of the buildings.

The aim of the research was a presentation of geological material, i.e. natural stones that decorate the interior of the Montanistika building in an interactive educational presentation with 360-degree storytelling. The goal was to implement the VR solution that presents geological stories and according to user-centred design communicate about the Slovenian stone heritage. With the design of VR experience we planned to engage the participants that want to experience this

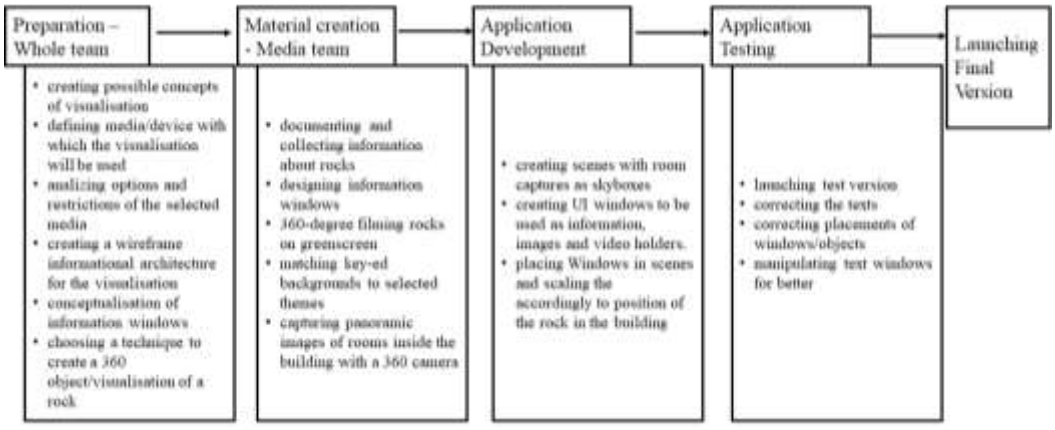
building and the information about the stones in digital reality and the participants that cannot physically access the building and interact with it remotely.

Experimental Part

The methodology in the experimental part included the below listed phases that are presented in Figure 1:

- an overview of the geologically important rocks that make up the Montanist building;
- a selection of representative rocks for the virtual presentation, documenting and collecting information about rocks;
- user-centred planning and design (UCD) of VR application (strategy level, information architecture, wireframes)
- graphic and interaction design;
- 360 narration and screenplay design;
- content creation - planning, production and post-production (text writing, digital documentation and presentation of rocks, photographing, 360 video production);
- development of VR application in Unity;
- testing of VR application;
- exhibition of the final results at academic and national level.

Figure 1. *Workflow*



Stone Selection and Documentation

From a geological point of view, the hallways and lobby of the Montanistika represent a special geological museum, which thus combines natural and cultural heritage.

The interior of the building is decorated of mostly local architectural stones (Slovenian and Croatian) and two newly built foreign, but geologically interesting rocks (Figure 2). The rocks used are also interesting because they cover

representatives of all three basic rock types and can thus be used as a tool in the presentation and teaching of geological content. Sedimentary rocks are represented by very diverse limestones, metamorphic marble, and some examples of intrusive igneous rocks. Interpretation and presentation are possible from several perspectives that give as the facts for narrative learning. The composition (minerals, fossils), color and other properties of rock describe the processes and environments of their formation, their architectural names can usually be linked to the excavation sites (locations of quarries), and the use can be compared with our own experience already seen. Such representations can lead to a greater degree of interest, understanding and knowledge sustainability.

Figure 2. *Rock Decorations in the Walls, on the Floor and in the Stairs of Montanistika Building*

Source: Photos by Tina Živec.

User-Centred Planning and Design

VR solution was designed and implemented with the user-centred design (UCD) approach, which phases involved the definition of the strategy and the scope, designing the structure and skeleton level and in the last phase planning and developing the surface and sensory level of VR.

In *strategy level* target groups, needs and product objectives were defined. The partners in the process were the employees of the Department of Geology that is situated in Montanistika building. The problems to be solved with interactive solution were from the technical point of view digitalisation and preservation of natural heritage (stone walls) that is constructed in the interior of Montanistika and from the communicative and educational point of view promotion of and education about the building with the immersive technologies. Target groups included representative academia (students, teachers, researchers), visitors and tourists, and representatives of national institutions and cultural organisations (national Parliament, museums, galleries, etc.).

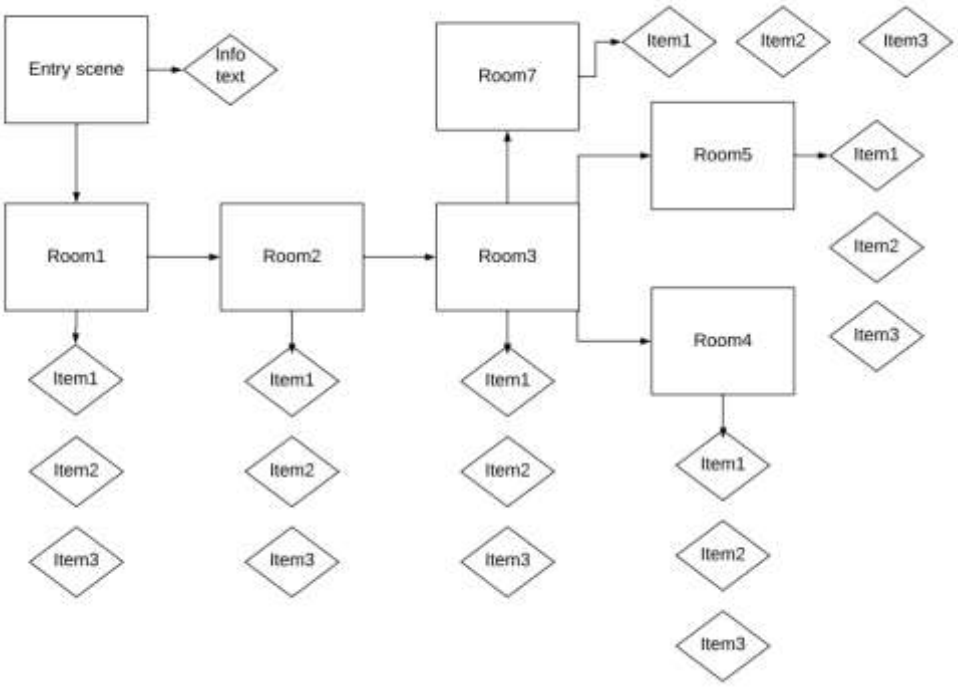
In *scope level* functional specifications and content requirements were defined. Functionalities were limited to VR touring. Defined content elements were: text descriptions with the explanation about the natural heritage, image elements with

the facts about the stones, 360 recordings of the rooms and 360 recordings of representative stones.

In *structure and skeleton level* information architecture was defined that led to interaction and information design including development and design of 360 viewing and interaction of entering in the rooms.

Information structure (Figure 3) is showing the organisation, hierarchy and links between each part of VR solution. The user is guided through the VR solution via text boxes and subtle graphic elements. In each room user can see more information about specific rock he/she is observing via 360-degree photography/VR view and navigate with the clicks on small bluish buttons. In that way the user is presented with video, pictures and more information (item 1, 2 and 3) about specific rock.

Figure 3. *Information Architecture of VR Solution*



Last phase of UCD was the developing of *surface and sensory level* of VR with the colour pallet presented in Figure 4.

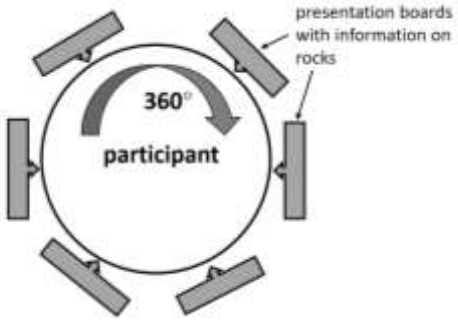
Colour scheme consists of four colours. Main colour is light yellow and is used for the main menu, neutral texts etc. Light blue represents sedimentary rocks, soft orange is for metamorphic rocks and light red for igneous rocks. The last three colours are used for video and text background when representing specific types of rocks. There is only one font used (in different sizes) and that is Liberation Sans.

Figure 4. *Colour Scheme of VR Solution*

360° Narration

Wireframes of virtual reality were planned and designed along with a 360° storytelling. Narration and screen play were designed considering individual premises of Montanistika building and planned participants' experience, i.e. immersion in the virtual Montanistika building and learning about information of stones, their origin and geological characteristics. 360-degree storytelling was implemented based on spatial orientation of the physical building and its premises (Figure 5). Content was prepared including geologically significant texts, graphic presentations, informative canvas, 360-degree video presentations of stones and premises of the building.

Figure 5. *Planning of 360-Degree Storytelling*



Content Creation

360 Recordings of Stones

The Department of Geology provided us with the samples of representative sedimentary, metamorphic and igneous rocks used as decoration in the building (Figure 6). We chose samples that, due to their form and characteristics, enable the presentation of various contents. Thus, leached fossils, weathered rock surfaces,

samples with well-expressed characteristics were filmed. With these samples, we wanted to further visually present the geological content in the digital world.

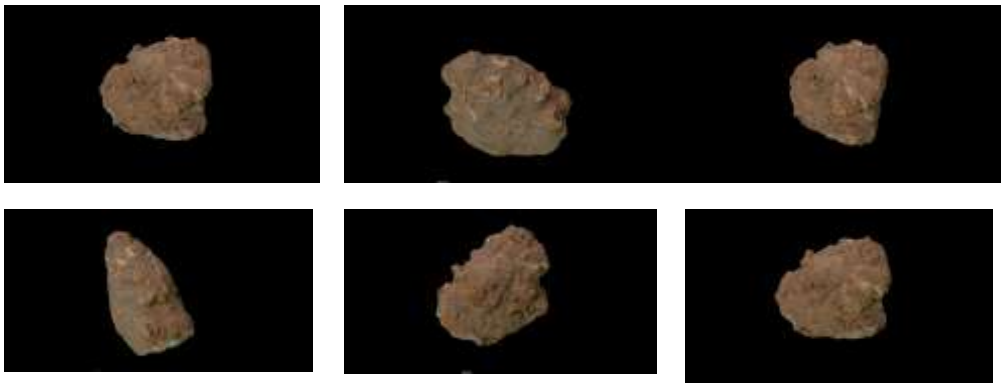
Figure 6. *Selected Rocks*

Presentation boards were designed to include 3D reproductions of rocks. Photogrammetry was excluded after preliminary experiments, as high-resolution polygon meshes of objects (rocks) would be needed to achieve sufficient reproduction quality, which would slow down the operation of the application for real-time use. Instead, the records of stones rotating in 360-degree took place in the photo studio, which allowed the appropriate fast and efficient rendering of stones from all angles. The stones were placed on the green screen and on the turntable that enable the recordings from different angles (Figure 7). Each stone sample was filmed, with camera Sony a7sii and Sony 24-70 2.8 lens, when rotated for 360-degree simultaneously.

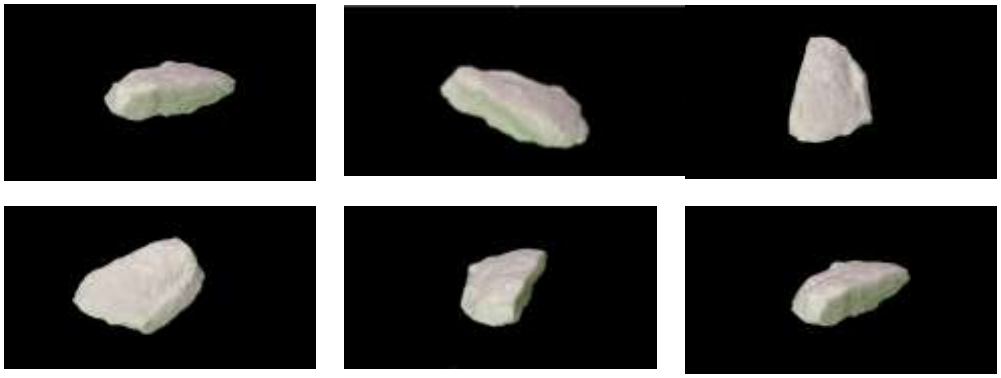
Figure 7. *Students during the 360-Degree Photography and Video Production with the Setting of the Green Screen and Recording Equipment*

In post-production the green background of each rock was changed according to the colour scheme of the VR solution (sedimentary rocks blue, metamorphic rocks orange, igneous rocks red). The colour key effect needed to be used multiple times in order to change the colour of the background. The last step was exporting videos to loop when played. The results of the 360-degree recordings and 360-degree video database are shown in Figure 8.

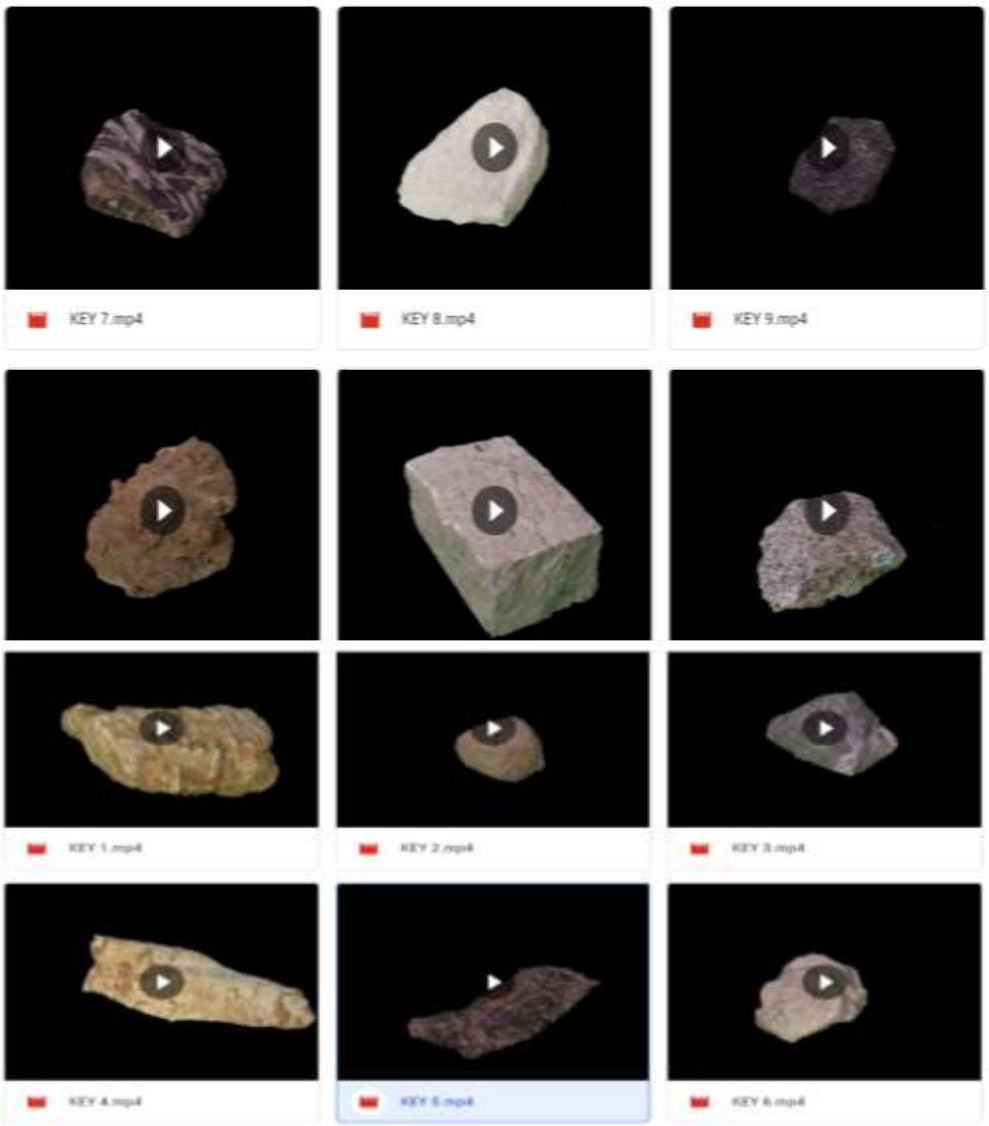
Figure 8. *360-degree Recordings of Rocks and 360-Degree Video Database*



Weathered Limestone with Fossils



Marble



Database of All Rock Samples

360-Degree Recordings of Building's Interiors

For spherical images (Figure 9), a Ricoh Theta SC camera with two lenses was used. While shooting, it is important to keep in mind that when photographing it is necessary to pay attention to the light source. It can happen that the camera illuminates only one side of the image sensor, if it is pointing directly at the source. Consequently, the result can be an unevenly lit image. The images were processed in a photo editing software, where the visible parts of the camera stand were removed.

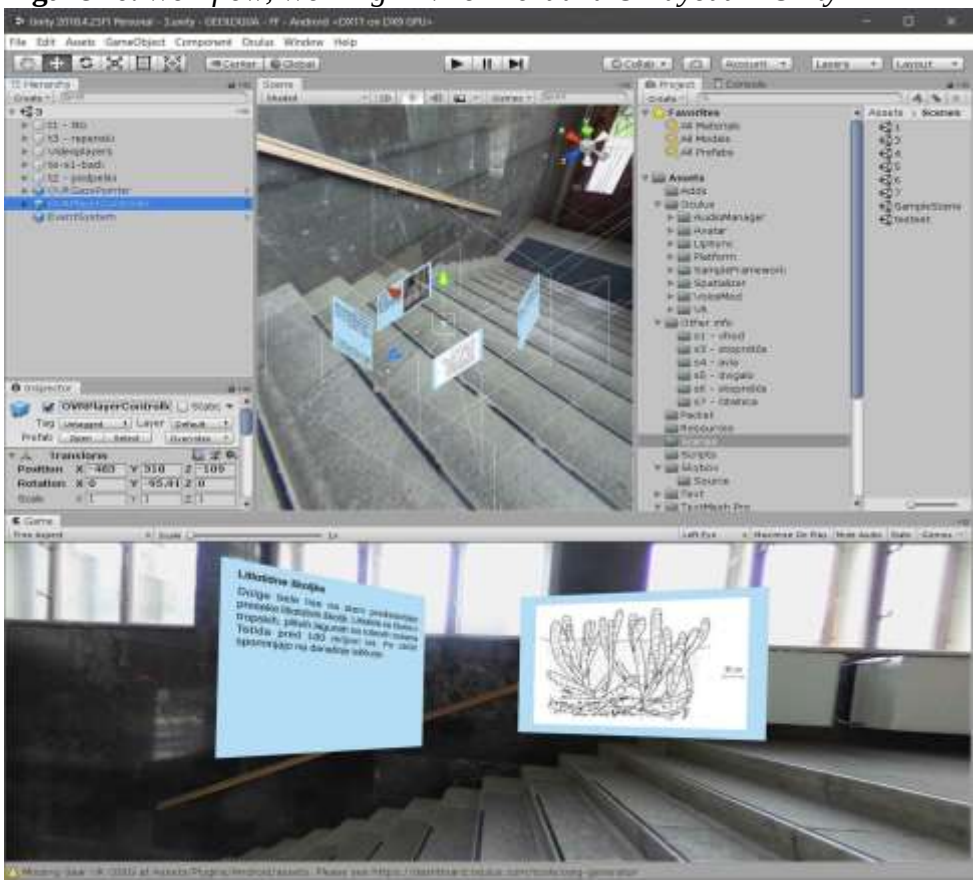
Figure 9. *Example of 360-degree Photo Sphere*

Development of VR Solution

For the development of VR solution, the chosen VR device was Oculus Go. We've chosen to work on open game and application development platform Unity in combination with Adobe Create Cloud. At first the idea was to develop using Unreal Engine due to its accessibility for VR, later on it has shown that Unity will serve better for our purpose due to bigger community support and free guides/tutorials for troubleshooting which we needed since none of us had any experience with developing a 3D application for android. Inside Unity workspace we've created a 3D project with final media Android VR.
Working environment or user interface (UI) layout in development consisted of 5 active windows (Figure 10) that allowed an effective workflow in Unity:

- *Hierarchy* - contains a file overview of every element in selected room (scene).
- *Inspector* - shows detailed information, which can be manipulated with either numerical values or tick boxes.
- *Scene* - is a 3D visualisation of the work environment where every element is displayed in the selected room.
- *Project* - contains a file explorer located in the projects folder on computer. It is mostly used to travel between scenes and add pre-made assets made in external software.
- *Game* - displays the 3D visualisation through the camera (user-controlled device) that allows the user to freely look around the room and interact with the object. Game window is in fact a simulation of what the user is seeing once he opens the VR application on his headset.

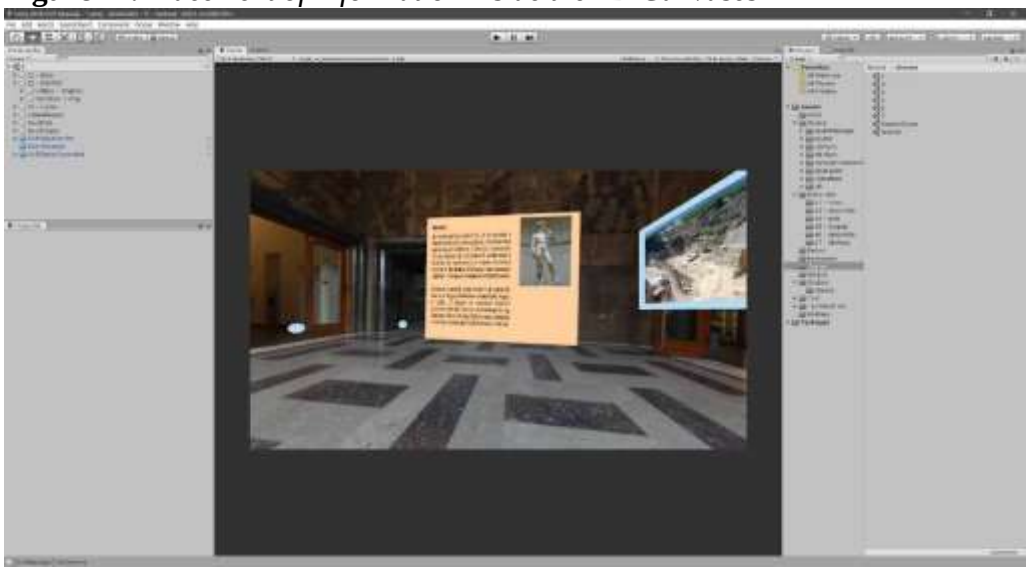
Figure 10. *Workflow, Working Environment and UI layout in Unity*



Developing the app required us to use 360-degree images as *skyboxes* and arrange them through the *scenes* according to information architecture. Additionally, to achieve the highest user immersion and application quality, the skybox setup requires some additional manipulations to remove seams done at image border merging.

Inside the scenes we have used text, photographs and videos. That material was used inside the user interface on so-called 2D canvases arranged through the user's 3D worldspace (Figure 11). When placing the canvases forced perspective came into use to achieve perceived distance between user camera, buttons, text and other visual media. That was used since if an object is too far from the player camera, at certain view-angles the content becomes cut out of the view area, as the camera renders only what it sees, and we get loose user immersion. Canvases also include "keyed" 360-degree recordings of stones through *rendered texture* function since the video playback requires real-time rendering and not just a static image texture.

Figure 11. *Placement of Information inside the 2D Canvases*



After the scenes were finished, we had to arrange movement (through buttons) according to information architecture and setup the *controller* with which the user views the rooms and move among them. Figure 12 presents placement of visual content inside of 360-degree panoramic shots inside Unity.

Figure 12. *Placement of Content Inside 360-Degree Panoramic Shot Skyboxes with user Camera*

With the final VR reality settings, it was necessary to perform several testing phases, which enabled the correction of technical and performance errors such as cutting, button unresponsiveness, layout optimization, text styles and the use of more appropriate image content.

Results and Discussion

From the research and project work and on the basis of the results of a 360-degree digital representation and interpretation of the Montanistika building and the digital reproduction of representative stones, we can draw some essential insights which can serve as recommendations for further work.

We found that content creation for 360-degree media and VR environment is different from content creation for other media (especially when compared to media played on flat screens). The texts, as are shown in Figure 13, should be short and concise (even shorter than for traditional digital and interactive media). 3D elements must be perfected from all angles. The photos must be placed and arranged in a 360-degree space according to the participant's movement and experience, so that the target and the sequence attract the attention. Navigation must be simple (see navigation buttons in Figure 13), but still take the participant's sensory perception fully into account, as the user must know at all times (space) how he or she got into this space and where to go from this space.

For the 360-degree narrative, we found it challenging both in terms of pre-production and content production. In our case, however, postproduction was less demanding (mainly due to the use of 360-degree footage). In pre-production, it proved to be very important to plan the management of the virtual reality participant, i.e. how to guide him or her through the specific room and between rooms with the content displayed on the presentation boards, so that the experience is satisfying, pleasant and educational for the user. With the increase in the number of content types (video, graphics, text) and interactivity (transitions between rooms, interactive content), the complexity of planning increases even further. In addition, the number and complexity of the content elements should be adapted to the entire virtual environment, as shown in Figure 13, by displaying the graphic elements (presentation boards) on the 360-degree background in a meaningful way.

During production, we realised that the quality of the 360-degree camera shots is crucial, for which it is best to shoot in at least 4K or even 8K quality. We did not use this quality, so the background of the Montanistika was shot with a slightly lower resolution. A higher 360-degree video resolution would result in higher quality virtual rooms of Montanistika, but this would complicate the process of post-production and video processing in the Unity platform.

Furthermore, the Unity platform has proven to be a highly credible set of techniques and tools to achieve results when implementing different types of content in 360 space. Despite the fact that it was the first time that the students met with both 360-degree content production and virtual reality, they acquired enough knowledge in a relatively short time (one semester) to implement a planned virtual

environment in Unity with interactivity, attractive content and consequently an optimal user experience.

Figure 13 presents final scenes and stories of Montanistika in the VR environment.

The final VR experience comprises 7 scenes (6 rooms and the entry scene) and covers all the important information about natural stone in the building. Different types of content presentations placed on the real scenes of the building allow the user the experience of geological stories of the natural stone of Montanistika in the virtual world. With VR experience the natural heritage of the building, which is usually hidden, is now visible and accessible from the general public (also vulnerable ones). Besides, the geological contents are presented interactively and experienced also outside the building which enriches the learning of geology. In the workflow the user-centred design was implemented that was found to be a valuable methodology for the effectiveness, usefulness and likeability of the VR solution and learnability about the heritage of Slovenian stones. VR presentation that includes Stories of Montaniatika was presented to the audience as part of the main project event European Researchers Night in September 2019, a pan-European project aimed at bringing research work closer to the general public. With a strong emphasis on the impact and importance of research in everyday life, it encompasses many smaller events (also project named Humanities Rocks!) that enable researchers to present their research work and innovation.

The audience accepted the VR solution enthusiastically and rated the experience as a perfect upgrade to a physical walking through Montanistika building. In addition, the developers were offered some further research opportunities in terms of implementing VR technologies on other buildings of national importance, which also include the heritage of stones in interiors or exteriors.

Figure 13. *Final Scenes and Stories of Montanistika in the VR Environment*

Conclusion

The results of this research prove that a 360-degree virtual representation of a Montanistika building is a rich immersive experience of the architecture of the building's interior and the natural heritage and thus the stones for the participants.

Workflow definition, design and development of the presented VR solution was also evaluated in terms of a starting point for further improvements. The project was performed by the students of graphic design and interactive communication, who during this project first encountered this type of technology. It is estimated that major upgrades to the solution could be carried out at the level of interactivity and use of different VR device, which would include besides the transitions between Montanistika rooms, additional interactions of experiencing rocks (interactive virtual rotation, etc.). In addition, we believe that the implementation of the audio narrative would increase the accessibility. However, the results of the research and development of VR Stories of Montanistika with the contents of natural heritage of rocks are in Slovenia the first example of the exceptional value of these technologies for digital preservation, presentation and, nevertheless, considering the geological value, a greater recognition of Slovenian stones in architecture.

In the current process of upgrading the presented results is the translation of content into English and the transfer of the solution to the social network YouTube. By including this social network as a communication channel, the presentation of the Montanistika building and the natural heritage of the stones stored in it will be accessible to a wider audience. In this way we will include a very influential contact point in the digital strategy of the VR solution, on the basis

of which it will be easier to achieve the goal of spreading the recognition of Slovenian architectural heritage and the use of VR technology.

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