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The role of **Wi-Fi networks** to understand **visitor behaviour**

O papel das **redes Wi-Fi** na compreensão do **comportamento dos visitantes**

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Abstract | In recent years, we have seen an increasing use of mobile devices to access the Internet, allowing individuals access to tourist platforms at all stages of their trip. The European Union and Turismo de Portugal are aware of changes in consumer behaviour and have encouraged local authorities to implement or expand free Wi-Fi networks in areas of high tourist interest. Data from Wi-Fi access points in tourist areas allow for understanding how tourists navigate and utilize spaces, identify popular attractions, and detect peak times of visitation. This information can help optimizing resource allocation, improving visitor experiences, and managing visitor flow. The objective of this study is twofold: to analyse the use of Wi-Fi networks in tourism and to understand the intermunicipal strategy regarding this issue, as well as to assess the perception and experience of municipalities on the use and usefulness of free Wi-Fi for understanding visitor behaviour at the local level. A mixed research methodology was used, involving the application of questionnaires to Portuguese tourists over three different

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years and conducting interviews with the Intermunicipal Community and three municipalities of Alto Alentejo. This study has practical implications for tourism organisations, allowing them to understand the user profile of the Wi-Fi network and its usefulness for visitors in enjoying tourism at a given destination, as well as understanding the practices of data usage to support decision-making by local governments.

Keywords | smart tourism technologies, Wi-Fi network, consumer behaviour, Portugal

Resumo | Nos últimos anos, tem-se assistido a um uso crescente dos dispositivos móveis para aceder à Internet, permitindo que os indivíduos acedam a plataformas turísticas em todas as fases da sua viagem. A União Europeia e o Turismo de Portugal estão conscientes das mudanças no comportamento dos consumidores e têm incentivado as autoridades locais a implementar ou a expandir redes Wi-Fi gratuitas em áreas de elevado interesse turístico. Os dados dos pontos de acesso Wi-Fi em áreas turísticas permitem compreender como os visitantes navegam e utilizam os espaços, identificar atrações populares e detetar os horários de maior afluência. Esta informação pode ajudar a otimizar a alocação de recursos, melhorar as experiências dos visitantes e gerir o seu fluxo. O objetivo deste estudo é duplo: analisar o uso das redes Wi-Fi no turismo e compreender a estratégia intermunicipal relativamente a esta questão, bem como avaliar a perceção e a experiência dos municípios sobre a utilização e utilidade do Wi-Fi gratuito para compreender o comportamento dos visitantes a nível local. Foi utilizada uma metodologia de investigação mista, envolvendo a aplicação de questionários a visitantes portugueses ao longo de três anos diferentes e a realização de entrevistas com a Comunidade Intermunicipal e três municípios do Alto Alentejo. Este estudo tem implicações práticas para as organizações de turismo, permitindo-lhes compreender o perfil dos utilizadores da rede Wi--Fi e a sua utilidade para os visitantes no usufruto do turismo num determinado destino, assim como conhecer as práticas de utilização dos dados para apoio à tomada de decisão dos governos locais.

Palavras-chave | tecnologias inteligentes do turismo, rede Wi-Fi, comportamento do consumidor, Portugal

1. Introduction

Currently, wireless connectivity is highly valued by tourists. According to Anuar & Yulia (2017), the quality of the Wi-Fi service is the strongest factor influencing tourist experience and satisfaction. Additionally, Reyes-Menendez et al. (2018) highlight that Wi-Fi can promote customer loyalty in tourist service, mainly in the restaurant sector. Wi-Fi networks can be a key differentiator in the strategies of tourism organisations and destinations and should therefore be prioritized in sector strategies and policies. The involvement of European and national organisations has been significant in recent years. The European Commission created the WiFi4EU initiative to provide free, high-quality Wi-Fi in public spaces for residents and visitors within the European Union (European Commission, 2021). In Portugal, Turismo de Portugal approved a support line in 2016 for investment in projects to provide high-quality Wi-Fi access in historic centres and public spaces with the highest influx of tourists (Valorizar - Regulatory Order No. 9/2016, dated 10/28).

In line with Normative Order No. 10/2016, the implementation of Wi-Fi networks in suggested locations will guarantee faster and easier access to informative content for both tourists and local populations. Additionally, it will create conditions for the emergence of new digital-based businesses and enable intelligent management of tourist destinations. Furthermore, the data collected by organisations can be leveraged to comprehend consumer behaviour in tourism, aiding in decision-making and crafting products and experiences tailored to visitors' needs and profiles.

Despite recognizing the significance and benefits of Wi-Fi networks for both tourists and stakeholders, researchers and public organisations have largely neglected studying Wi-Fi network usage among the Portuguese population, especially in the context of tourism. Moreover, there's been a dearth of analysis regarding the usefulness of the obtained data for understanding consumer behaviour and defining destination tourism strategies. As highlighted by Rafailova & Hadzhikolev (2020), one of the main takeaways from their study is the necessity to determine whether tourists seek information in advance or upon arrival about places with free Wi-Fi availability.

The aim of this study is to understand the usage of free Wi-Fi networks by users within the scope of a tourist trip and to analyse how municipalities are utilizing Wi-Fi data to inform their decisions regarding destination management. This paper is organised into five sections. The introduction, the first section, outlines the significance of the topic and the research objectives.

The second section provides a literature review on Wi-Fi networks in tourism and the use of technologies to enhance visitor experiences. Following this, the third section describes the methodology employed in the empirical research. The fourth section analyses and discusses the findings of the empirical research. Finally, the fifth section presents conclusions, along with the study's limitations and suggestions for future research.

2. Tourism and Digitalization

The tourism sector plays an important role in the economy, particularly in the European and Portuguese economy, representing 10% of European GDP (Pernice, 2023) and 9.5% of GDP in Portugal (Turismo de Portugal, 2024). Information and communication technologies have had a substantial influence on tourism, according to Cunha (2017) they have an effect on demand and supply, because they allow action and interaction between tourism agents and visitors. Technological tools allow the tourist experience to begin even before the visitor arrives at the destination. Regarding the relationship between tourism companies and visitors/tourists, the fact that they have a presence in the digital world allows them to achieve global visibility and enables the establishment of relationships with customers in real time, satisfying specific needs and overcoming language barriers or from different cultures.

The European Commission (2010) recognizes the importance of the digital society and the need for countries to invest in high-speed Internet, to have a greater capacity for innovation, knowledge and commercialization. It is in this context that the Europe 2020 Strategy establishes three priorities: smart, sustainable and inclusive growth. It is within the scope of intelligent growth that Europe plans to act at the level of the digital society, through the Digital Agenda for Europe, in which the objective is to act in the digital single market and contribute to promoting widespread access to broadband by 2013 and access to the internet at speeds above 30 Mbps by 2020.

In Portugal, the 2014-2020 Partnership Agreement (2014) signed with the Commission states that, despite the Information and Communication Technologies (ICT) sector being one of the most competitive economic sectors in the country, it is important to significantly improve the sophistication of ICT and internet use at both the business and public administration levels. However, the document highlights the persistence of network coverage gaps, particularly in rural areas, which need to be addressed. Additionally, the Portugal 2030 Strategy (2020) defined

Digitalization, Innovation, and Qualifications as Drivers of Development in its thematic agenda 2.

Regarding the national tourism authority, it is notable that the Action Plan for Tourism Development in Portugal, Tourism 2020 (2015), mentions that one of its strategic objectives is to improve access to ICT, as well as its use and quality, both in businesses and public administration. The Tourism Strategy 2027 (2017) highlights a weakness in the sector: the insufficient digital presence of tourism companies. To address this, the strategy envisions programs aimed at improving offerings and providing free Wi-Fi access throughout the country to enhance the experience of enjoying national heritage (p. 57).

It is also important to mention that the European Agenda for Tourism 2030 (2022) invites Member States to "facilitate the digital transition in tourism and support the tourism industry and sustainable destination management" (p. 7). In this context, the European Union launched the WiFi4EU initiative, aiming to promote free Wi-Fi in local communities, in public spaces such as parks, squares, public buildings, libraries, health centres, and museums across Europe. Municipalities and municipal associations were the primary recipients of the initiative. According to data from ANACOM (2020), Portugal benefited from 277 WiFi4EU vouchers

In Portugal, within the tourism sector, the program to support investment in the qualification of the tourist destination Portugal, overseen by Turismo de Portugal, was created under the name Valorizar (Regulatory Order No. 9/2016, dated 10/28). The objective of this program is to promote the continuous qualification of destinations through the regeneration, requalification, and rehabilitation of public spaces of interest for tourism, as well as the enhancement of the country's cultural and natural heritage. On the same date, Regulatory Order No. 10/2016 - Support Line for the Availability of Wi-Fi Networks - was published, aimed at creating conditions to provide high-quality Wi-Fi networks in historical centres and public spaces with high tourist influx, and promoting the intelligent management of tourist destinations. This aligns with the vision of tourism as a leading activity in the development of smart cities, as outlined in Article 2 of the decree. The support line had an initial allocation of 1 million euros, which was later increased to 3.5 million euros, highlighting its importance. This significance is further supported by the participation of municipalities; according to data from Turismo de Portugal (2018), between 2016 and August 2018, 122 municipalities benefited from this support line.

The analysis highlights the influence of the European Union on the actions of countries and their respective territories. The regulation and actions demonstrated reveal the existence of a relationship between European and national public policy measures, underscoring a multi-level system of action for implementing the digital strategy. It is evident that new action logics have emerged, where local actors assume new roles and municipalities are called upon to oversee and manage their territories (Covas, 2018; Balão & Saragoça, 2023), assuming a spatial and relational proximity with residents and, increasingly, with visitors to their territories. Digitalization stands out as one of the trends in tourism, with ICT playing a crucial role in travel, from preparation to execution. ICT serves as a facilitating tool for obtaining information and commercializing various tourism products (Mendes, Portugal & Moniz, 2023). Online access is also an important tool for promoting, publicizing, and commercializing local products that would not be accessible to visitors through traditional communication channels. This access facilitates and encourages the economic and social sustainability of businesses, which in the tourism sector are mostly micro and small enterprises (Banco de Portugal, 2022; European Travel Commission, 2022).

3. Tourist behaviour and smart destinations

Tourist flows can be studied through two distinct dimensions: inter-destination tourist flows, which encompass the journey from the tourist's residence to the tourist destination; and intra-destination tourist flows, which involve travel within the area of the tourist destination (Fang, Gao, Zhang, 2023). Within this classification framework, Caldeira and Kastenholz (2020) suggest that intra-destination tourist behaviours encompass how tourists move around and manage their available time to visit attractions within the tourist destination. On another perspective, Kang et al. (2018) argue that tourist behaviours are influenced by demographic and socioeconomic characteristics, as well as their motivations and travel preferences. The authors believe these factors significantly contribute to the complexity and dynamics of tourist behaviours within a specific destination, making the analysis of these behaviours more intricate compared to tourists traveling between different destinations.

Consumer buying behaviour has always been an aspect that has been much studied and discussed by scholars and researchers from different areas of knowledge, from economics, sociology, marketing, psychology, among many others. In tourism, too, a great deal of research has been carried out in order to obtain data and information that will bring advantages to the

management of tourism, so understanding the movements and factors that influence the behaviour of tourists is of paramount importance for the development and management of a tourist destination (Edwards & Griffin, 2013).

Initially, research related to tourism was based on traditional data collection tools such as questionnaires, travel diaries and others of a less rigorous nature. Since the end of the 20th century, more technologically sophisticated tools with greater reliability and greater capacity for more advanced and reliable analyses have played a leading role in data collection, allowing market segmentation with different behavioural patterns, which is of great importance for tourism (Versichele et al. (2014). With the advent of the internet and the consequent emergence of Information and Communication Technologies (ICT) (Poushter, 2016), the tourist industry has gained a great ally in collecting information and analysing data (Tribe & Mkono, 2017), which allows it to understand and predict tourist behaviour.

Furthermore, with the increasing influence that word-of-mouth has on consumer decision-making in general, and tourists in particular, there is a need to give more importance to the recommendations and evaluations that tourists make on online platforms created for this purpose - TripAdvisor, booking, Airbnb, among others - where they express their views and opinions, and evaluate services on various parameters (Chatterjee, 2019), influencing other consumers to purchase or avoid certain products or services.

Technological innovation has led to the proliferation of mobile devices with Wi-Fi connectivity (Li et al. 2023) and, at the same time, has promoted the development and growth of public-use wireless networks. The complementarity and synergy between these elements has been paramount for easy and affordable data collection.

Wi-Fi has been an unprecedented forerunner in terms of obtaining data in various dimensions. Its usefulness stems from the fact that it is very easy to connect once users have connected to a Wi-Fi network. It also adds to the fact that obtaining this data is cheap and easy, due to the number of users of devices with Wi-Fi technology.

The data obtained through Wi-Fi connectivity has been used in many different dimensions and environments. For example, social interactions within educational establishments have been analysed (Wang et al. 2017), flows at borders between countries (Poucin et al., 2018; Wang et al., 2019), movements in shopping malls (Kaur et al., 2018), real-time estimation of the use of urban roads (Kontokosta & Jonhson, 2017; Kulshrestha et al., 2020; Soundararaj et al.,2020);

the study and analysis of mobility patterns when visiting tourist attractions (Wang et al., 2019; Zhou et al., 2020; Li et al., 2021; Li et al., 2023), among others.

In the field of tourism, this connection provides a huge source of information, both on the location and connection time of tourists' devices, which is extremely important and useful for analysing consumer behaviour and establishing patterns of tourist activity (Li et al., 2023). Technological advances have led to smart technologies being expanded and materialised into applications that promote tourists' travel experience (Shen, Sotiriadis, & Zhang, 2020).

Specifically in tourism, technological development has facilitated the emergence of Smart Tourism Technologies (STTs) that provide real-time data to facilitate more informed decision-making by destination stakeholders. STTs comprise a variety of technologies including the Internet of Things (IoT), cloud computing, artificial intelligence (AI), mobile communication, virtual reality, big data, Wi-Fi, augmented reality, chatbots, QR codes, radio frequency identification (RFID), social networks, among others (Huang et al. 2017; Gajdošík & Orelová, 2020; Shen, Sotiriadis, & Zhang, 2020). When analysing the various smart tourism technologies (STTs) in the five smartest cities in the USA, Jeong & Shin (2020) highlighted the most prominent ones: Google Maps, ride-sharing programmes, apps with city guides and maps; and others that make it possible to make payments or facilitate car parking.

STTs have been the subject of study, essentially with regard to the advantages of their use conferred by their attributes. In this context, Buhalis and Amarangganan (2015) proposed a conceptual approach to STTs that focuses on four attributes: information, interactivity, accessibility and personalisation. In recent years, various studies based on these attributes have been carried out and their conceptualisation has been developed. With regard to Accessibility, Um & Chung (2021) define it as the ability and ease with which tourists can obtain tourist information online. Lee et al. (2018) described the information attribute as the characteristic that comprises the quantity, reliability and frequency of the information obtained. The interactivity attribute is described by Huang et al. (2017) as the ease with which tourists can obtain information about the tourist activity and personalise their experience based on this information, thus concluding that the personalisation attribute is related to interactivity (Buhalis & Amaranggana, 2015).

In studies based on the attributes of STTs, No & Kim (2015) and Lee at al. (2018) concluded that the attributes - information, accessibility, interactivity and personalisation - are fundamental to the tourist's exclusive and memorable experience. Yoo et al. (2017) concluded

that the attributes to consider in the tourist experience were information and interactivity. Specifically, Jeong and Shin (2020) concluded that the attributes interactivity and personalisation are fundamental to enhancing the travel experience and building a loyal relationship with the destination, which translates into the intention to visit the destination again, and with regard to the attribute information, the authors concluded that the quality and reliability of STTs are important for tourists to enjoy their trip with freedom and independence, allowing them to take part in exclusive and memorable trips, improving their travel experience.

In this context, Huang et al. (2017) also propose the security attribute as an integrator of STTs. In this vein, Jeong and Shin (2020) concluded that the attribute of security and privacy also influences the relationship between the previous attributes and the tourist's memorable experience. In their study on the impact of smart tourism technologies on tourists' experiences, Zhang, Sotiriadis and Shen (2022) concluded that the main attributes of STTs that influence an improved experience are accessibility and interactivity.

Smart technology helps tourist destinations optimise the management of tourism resources while promoting their sustainable development. In much the same way, Sustacha, Banos-Pino and Valle (2023) state that smart destinations are based on technological infrastructures that ensure the sustainable development of the destination, while promoting the interaction and integration of tourists and enhancing their tourist experience. Reinforcing the importance of STTs in enhancing the tourist experience, Shoval & Birenboim (2019) point out that the fact that tourists interact with the destination through various means and technological tools allows them to personalise products and services, resulting in a more intimate and memorable experience (Soliman et al. 2021).

4. Methodology

In this study, a mixed-method approach (quantitative and qualitative) was applied, as "one methodology can complement the other at different stages of the research" (Sarramona, 2022, p. 39). This option was made based on the research objectives, which aim to analyse the use of free municipal Wi-Fi during tourist trips in the years 2020, 2021, and 2022, as well as to understand the opinion and experience of municipalities regarding the use and usefulness of Wi-Fi in destination management.

There was a need to triangulate the data collection techniques and the following research tools were used — a questionnaire and a semi-structured interview. These options were directly

linked to the research objectives, namely recognising the significance and benefits of Wi-Fi networks for both tourists and stakeholders and analysing how municipalities are utilising Wi--Fi data to inform their decisions regarding destination management.

As far as the interview is concerned, a semi-directive interview was chosen, based on a script (with a certain degree of flexibility) that allows for the collection of in-depth information.

Three questionnaires were administered, one each year, which, although distinct, contained similar main and specific objectives.

The questionnaires are mostly made up of closed questions, organised according to the following dimensions inspired by the theoretical framework on the subject- sociodemographic characteristics of the participants (gender, age, municipality of residence, educational qualifications, and net monthly income), use of municipal Wi-Fi on the last tourist visit (device used, access points, purposes of use), and the advantages and importance of the existence of a municipal Wi-Fi network during tourist trips. After the questionnaires were structured on the basis of commonly used criteria (objectivity, simplicity, clarity, accuracy, relevance and interpretability) (Hill & Hill, 2012), their content was analysed and validated by a team made up of three experts in the field of tourism. The preliminary version of the questionnaires was then pre-tested with a small group of potential participants to see if there was any need to improve this data collection tool.

For data collection in each year, snowball sampling was used, which allowed us to obtain a greater number of responses from connections between respondents (Neuman, 2011). 89, 246, and 304 responses were obtained in 2020, 2021, and 2022, respectively. Each questionnaire was constructed on the Google Forms platform and distributed through social networks, namely Facebook and Instagram, with data collection taking place between the months of December and January of each of the three years. With the results, an analysis was carried out to understand and characterise the use of Wi-Fi networks in Portuguese tourist trips in 2020, 2021, and 2022. The data were analysed using SPSS 27.0 software. As randomness of the sample relative to the population was not guaranteed, the results of each questionnaire underwent statistical treatment focused on univariate and bivariate analyses (contingency tables) of a descriptive nature.

Additionally, three semi-structured interviews were conducted with municipalities that have implemented Wi-Fi infrastructures in Portugal, namely in Portalegre, Castelo de Vide and Marvão in Alto Alentejo Region, to understand their opinion and experience regarding the use

and usefulness of free Wi-Fi. The interview was planned with the research objectives in mind, based on the theoretical framework on the subject, especially regarding tourist destinations and national and European programs on wireless Wi-Fi, also bearing in mind the information produced by the National Communications Authority, ANACOM.

The interview aimed to gather information about the past, i.e. the explanations for implementing the network, but also about the future: new projects and priorities associated with the wireless Wi-Fi network. To complete the study, an interview was conducted with the Intermunicipal Community of Alto Alentejo, the entity responsible, along with Turismo do Alentejo e Ribatejo ERT, for the application to the Valorizar program by Turismo de Portugal. Table 1 provides information on the focus of the interviews.

Table 1 – Focus of the interviews

Script	General interview focus	Focus of the questions	Informant	Date
1	General characteristics of Wi-Fi network implementation and use of the network by visitors and data to support decision-making	Access points Motivation Advantages and disadvantages Network usage Usefulness of the data obtained through the network Future projects	I1	26/04/2024
2			I2	28/04/2024
3			I3	07/05/2024
4	Framework and capabilities of the wi-fi network project	Application to the valorise project Potential of the network Difficulties	I4	30/04/2024

Source: Own elaboration

5. Results

The results obtained from the survey show that the majority of respondents are young people, although there have been some fluctuations in the age groups. In 2020, the majority (58.6%) were aged between 18 and 34, while in 2021 there was a higher frequency of people aged between 18 and 34. In 2022, 60.9 per cent are aged between 18 and 34. This is not surprising, given the relationship between younger age groups and technology.

Over the three years during which the questionnaire was distributed, it was observed that female were the most responsive group. In 2020, 60.5% of the respondents were female; this figure increased to 70.6% in 2021, and in 2022, the majority of responses—nearly two-thirds—were from female, with only 29.6% of the respondents being male. Regarding the geographical origin of the responses, it is evident that the majority of respondents reside in Alentejo (Portugal). In 2022, the highest value was reached, with 218 individuals (71.71%) who responded to the questionnaire living in this region, followed by residents of the Centro region (13.82%) and the Lisbon Metropolitan Area (10,5%). In 2021, Alentejo and Lisbon were the two regions with the highest number of respondents, accounting for 44.9% and 36.7% of the responses, respectively.

The role of the internet and social networks in tourism is clearly evident in the responses obtained: those surveyed in 2022 revealed that the first contact with tourist destinations, as well as the choice of destination, is operationalised through search platforms (such as Google, Yahoo, Bing), and social networks (examples: Facebook, Instagram, X, Youtube, Myspace, Badoo, among others), with around 53% of the responses. The presence of tourist destinations on the internet is essential for travellers to be able to make initial contact with the tourist destination.

When asked about the importance of Wi-Fi when travelling, around 95% of respondents (295 valid answers) said that this factor was important or very important, and 97.7% said that they thought it was necessary to have Wi-Fi in the accommodation where they were staying, once again highlighting the relevance of Wi-Fi for choosing a destination, but also a highly important factor for choosing tourist agents. These findings align with data from ACEPI (2024), which indicate that, in 2024, 81.8% of Portuguese people use mobile phones to access the internet. They also support the points mentioned earlier in the theoretical framework of the study, where information, accessibility, and interactivity are highlighted as essential components of the tourist experience. The aforementioned attributes are also stated in the interviews conducted with the municipalities, in which it is stated that the wi-fi network allows people to "connect and benefit from online information and services, stimulates tourism, as providing free wi-fi can attract more tourists to the city, as many travellers consider connectivity to be an important factor when choosing destinations to visit" (I2, 2024). “The Wi-Fi network is extremely important in the strategy defined for the development of tourism in the territory,” and the reasons that led the municipality to implement the Wi-Fi network are related to “bringing information closer to people, facilitating free access to services, and promoting social and institutional relationships” (I3, 2024).

Regarding the provision of tourist information, once again, digital information is in high demand. This statement is based on the fact that respondents mention seeking information through the use of mobile data and also through the use of free Wi-Fi, as these are the most commonly used methods. According to the responses obtained, the interaction between residents and visitors/tourists, despite its increasing appreciation in terms of social sustainability, is not a significant choice when it comes to obtaining information about tourist attractions.

As is well known, the European Union has been emphasizing the importance of the digital society, creating initiatives supported by instruments to promote free Wi-Fi in local communities. These initiatives serve as mobilizing tools for the development of territories, both in terms of supply and demand. In this context, municipalities have seen these support instruments as an opportunity to advance the implementation of free Wi-Fi in public spaces such as parks, squares, public buildings, libraries, health centres, and museums (WiFi4EU). This is a way to demonstrate "a commitment to technology, innovation, and the improvement of the quality of life of residents, facilitating communication, access to online services, and remote work, among other benefits" (I2, 2024, p. 2). Another municipality mentions that the reasons for implementing the Wi-Fi network were "to facilitate free internet access on the streets for the population and tourism" (I1, 2024, p. 1).

The responses obtained in 2022 reveal that a significant portion of respondents (80.9%) agree with the vision expressed by the European Union and the municipalities, advocating that the free Wi-Fi network should cover the entire locality and not just the tourist sites. In 2020 and 2021, the majority of respondents accessed the free Wi-Fi network in historic centres (39.2% and 23.5%, respectively), followed by public gardens. However, there are also those who accessed the free Wi-Fi network in other areas, particularly in the outskirts of towns and cities (Table 2).

Table 2- Access points to the wi-fi network

	2020		**2021**	
Access Points	**Nº**	**%**	**Nº**	**%**
City Council	6	11,8%	17	9,3%
Historic Center	20	39,2%	43	23,5%
Gardens	18	35,3%	38	20,8%
Peripheral areas	5	9,8%	9	4,9%
Others	2	3,9%	76	41,5%
Total	**51**	**100**	**183**	**100**

Source: Own elaboration

Regarding the use of the Wi-Fi network and the type of searches conducted, the analysis of Figure 1 reveals that in 2022 (296 responses), the most frequently searched information relates to restaurant and accommodation services. However, tourist attractions and leisure spaces are also commonly sought after using the free Wi-Fi network during travel.

Figure 1- Type of searches through the Wi-Fi network

Source: Own elaboration

In 2020 and 2021, internet access was primarily used for social media, followed by searches for tourist information and maps (Figure 2). It is important to note that social media serves as a tool for preserving travel experiences, where visitors share content about their journeys (Dolan et al., 2019).

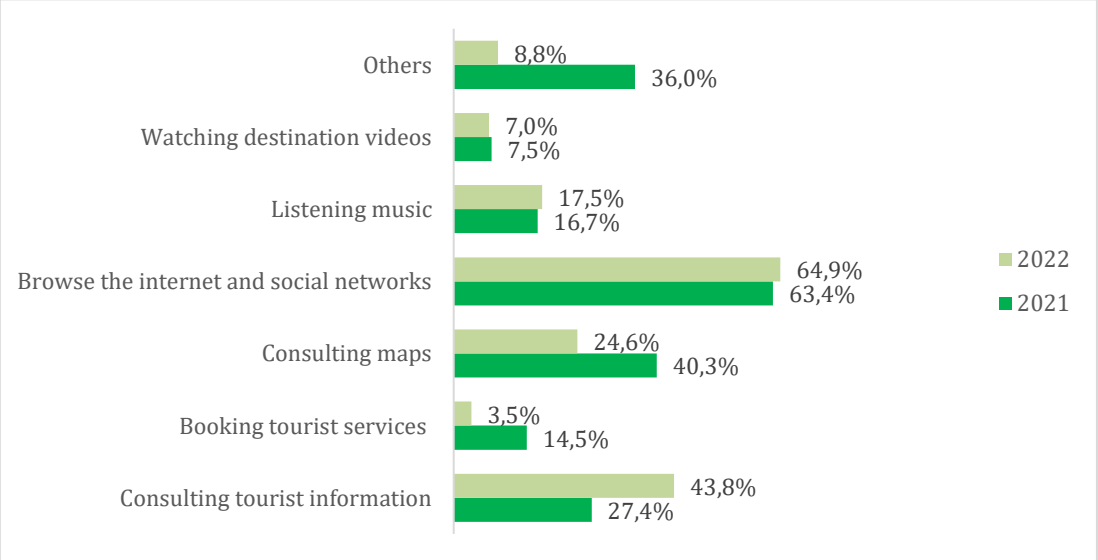

Figure 2- Purpose of using the municipal Wi-Fi network

Source: Own elaboration

Cross tabulation is employed to analyse visitor behaviour, specifically to determine whether the purpose of Wi-Fi usage varies depending on the access point. Observing Figure 3, it is noted that in 2020, respondents used the Wi-Fi network in the historic center primarily to obtain tourist information, search for maps and schedules, and book tourist services. In contrast, access to social media and email was more frequently mentioned by those accessing the network in public gardens.

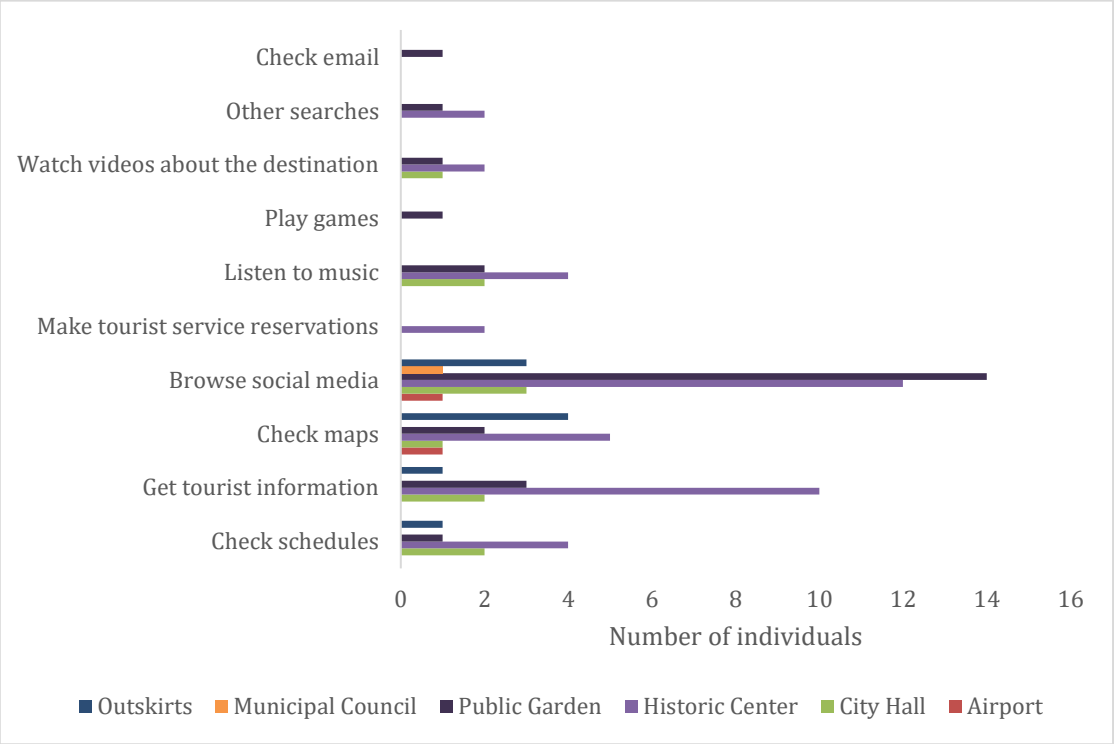

Figure 3 - Wi-Fi usage vs access point (2020)

Source: Own elaboration

In 2021, the respondents primarily used the Wi-Fi network to browse the internet at various access points. The historic centre is the most mentioned access point by tourists for consulting maps and searching for museum schedules (Figure 4).

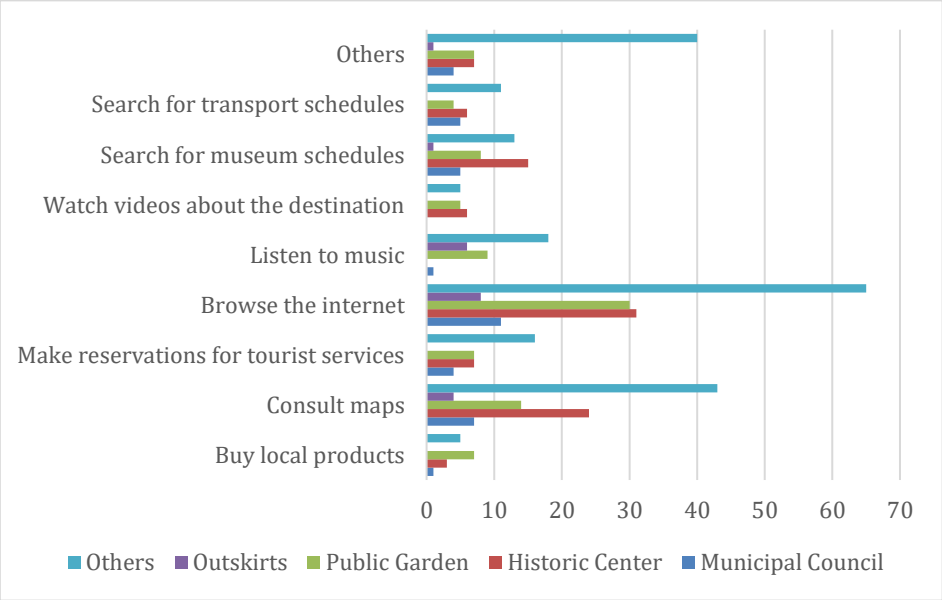

Figure 4 - Wi-Fi usage vs access point (2021)

Source: Own elaboration

Regarding the benefits of the free Wi-Fi network, the respondents who participated in this study highlighted the importance of this network for researching digital content that provides knowledge about tourist locations, whether it is more general information or specific locations. Over the various years under analysis, there is evidence supporting this fact. Thus, it can be inferred from the responses that free Wi-Fi can be a tool to encourage longer stays in the areas, as it allows real-time access to information about tourist sites that might not otherwise be available to visitors (for example, if there is no Tourist Information Office in the area or if it is outside operating hours). Another highlighted benefit is that this network, being free, allows greater access to knowledge about the locality being visited, as well as the local community and culture. The gratuitous nature of the network has been prominently noted in the various years this research was conducted. Additionally, respondents consider it beneficial to access information about tourist agents, their offerings, their locations, and the evaluation of the services provided through the free Wi-Fi.

Analysing Figure 5, it is evident that being free and ease of communication are the most highlighted benefits of the Wi-Fi network among respondents aged 18 to 24, while easier access to information was more frequently indicated by individuals aged 45 to 54.

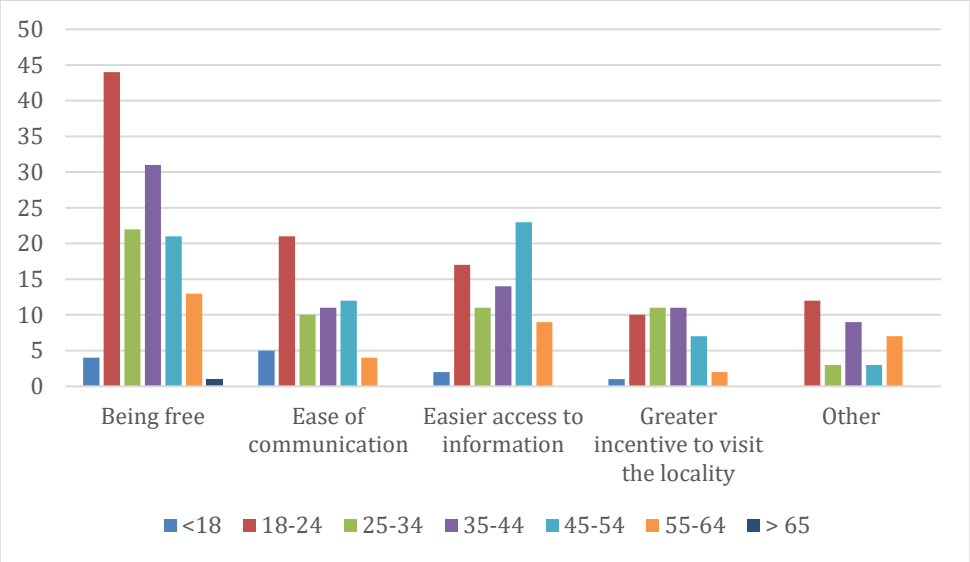

Figure 5 - Wi-Fi benefits vs age (2021)

Source: Own elaboration

In this study, in addition to the questionnaire surveys, interviews conducted with municipalities also revealed various benefits associated with the free Wi-Fi network, namely: "easy and free access to the internet for residents and visitors (...) can attract more tourists to the area, as many travellers consider connectivity an important factor when choosing destinations to visit (...) can make the city more attractive to residents, visitors, and investors (...) demonstrates a commitment to modernizing infrastructure and improving quality of life" (I2, 2024). I3 also mentioned "the time saved in accessing tourist information and services available on the municipality's website (...) and the social aspect, allowing users to connect with each other. “The municipalities also pointed out disadvantages, highlighting privacy issues, network overload, dependency on technology (I2, 2024), network vulnerability (I3, 2024), and maintenance costs (I1, I2, 2024).

Interviews with municipalities revealed that the free Wi-Fi network is not a static reality; it evolves over time to meet the needs of both residents and visitors, including the development of new tourist products. As noted by the interviewee from I2 (2024): “Since its implementation,

there have been changes to the network. One of the most significant changes was the expansion of coverage to include Parque Malato Beliz, an area farther from the town center. This expansion was carried out due to its importance as a meeting place for residents (...). Another network expansion is related to the Project for the Implementation of the Wi-Fi Network in the Casa da Inquisição, with the installation of 16 indoor access points to support the Augmented Reality application (...). Through the Wi-Fi network, visitors can access the Augmented Reality application available on their mobile devices, allowing for an interactive exploration of the points of interest in the Casa da Inquisição, thus enriching their visit and promoting learning." I3 mentioned that "through the free network, it is possible to enjoy a wider range of content for visiting tourist and cultural spaces. We are taking greater advantage of the Wi-Fi network (...) currently, it is already possible to enjoy a visit to the Municipal Museum and the José Régio Museum through QR codes, and we want to extend this to the Tapestry Museum, the S. Mamede Natural Park, and the Convent of S. Clara (...). We are also developing the Literary Route and the Tapestry Route, which will be available through applications accessible via the Wi-Fi network."

Research in 2022 also revealed that a significant portion of respondents (97%) believe that all municipalities should provide free Wi-Fi. According to I4, the Intermunicipal Community of Alto Alentejo and Turismo do Alentejo e Ribatejo, E.R.T. submitted a joint application to the Valorizar project of Turismo de Portugal, I.P., "the beneficiaries of which are the municipalities of Alto Alentejo, although not all of them participated in the project." Among the municipalities studied, Portalegre did not participate in the application; however, according to I3, "the city, specifically the historic center, has been covered with free Wi-Fi since 2019, as a result of the implementation of the Lora project." The goal of the project application was to create Wi-Fi access conditions for tourists in historic centres, and "that objective was met in technical and technological terms" (I4).

When asked whether the municipality collects data on Wi-Fi usage and uses it to understand visitor behaviour, I2 responded affirmatively: "Through the existing metrics in DNA Spaces, which collects anonymous data, we can understand which visitors are recurring (…). On a broader scale, we can identify peak seasons and events for tourist influx and the origins/nationalities of these visitors." I3 responded that the municipality also collects data, particularly about the type of users. We can thus state that "in the last three months, 12,300 residents, 2,485 first-time visitors, and 1,451 repeat visitors accessed the free Wi-Fi network, averaging approximately 4,000 accesses per month." Additionally, the data enables the

municipality to “monitor the evolution and trends in user access, identify usage peaks, and detect increases and decreases in the number of connections” (I3), which are important indicators for understanding visitor behaviour. I2 has not been utilizing the available data, mentioning that “we do not have access to this type of information as it is managed by Intermunicipal Community of Alto Alentejo /Turismo do Alentejo e Alentejo.” However, according to I4, “the municipalities have the autonomy to access and use the data as they see fit,” adding that “they can even submit local information or offers.” This submission can also be made by private agents, although the content needs to be validated by the municipality or another entity. There is a “lack of human resources to update the content” (I4) and to “dedicate more time to data analysis and explore it more effectively” (I3). This finding aligns with the barriers identified by Novotny et al. (2023), which hinder the effective adoption of data-driven decision-making practices among Canadian DMOs.

6. Conclusion

Smart tourism technologies have a positive impact on both the tourist experience, by promoting personalization and making it memorable, and on destination management, potentially making it more competitive and sustainable. Thus, tourism organisations should be receptive to these technologies, leveraging existing dynamics and financial incentives for their implementation, and consider the use of digital data in the decision-making process for managing tourist destinations.

This study aimed to understand visitors' opinions and usage of Wi-Fi networks during their tourist travels and to analyse how municipalities are implementing Wi-Fi in their regions and using the data to inform their decisions regarding destination management and understanding consumer behaviour. Through the application of questionnaires in 2020, 2021, and 2022, and conducting three interviews with municipalities in Alto Alentejo and Intermunicipal Community of Alto Alentejo, it was found that Portuguese people consider the existence of Wi--Fi networks in municipalities important, even suggesting that it should cover areas. A large portion of respondents in all periods reported using Wi-Fi networks during their travels, mainly to search for tourist information and access social networks. One of the main advantages of Wi--Fi, particularly relevant for younger individuals, is the possibility of free access, allowing users to stay constantly connected. Historic centres and areas with high tourist traffic are the primary

access points for respondents, which are also the areas receiving the most investment from public tourism organisations.

Interviewees recognize the importance and advantages of Wi-Fi, noting that the network has already contributed to providing other services to visitors. However, they also admit that not all potential benefits of the network are being utilized, mainly due to the lack of qualified human resources who can dedicate time to content generation and data analysis for understanding consumer behaviour and managing the destination. Additionally, there is evident difficulty in defining a joint strategy among all municipalities and sharing data between public and private agents. This study has some limitations related to the fact that the sample is not representative and that the interviews were carried out only in some municipalities, in an exploratory manner. In future investigations, it is suggested to extend the questionnaire and conduct interviews with tourists and local organisations, respectively, that have implemented Wi-Fi infrastructure in the main tourist attractions.

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