CHAPTER 6

SUSTAINABLE TOURISM MOBILITY IN MALTA: ENCOURAGING A SHIFT IN TOURIST TRAVEL BEHAVIOR THROUGH AN INNOVATIVE SMARTPHONE APP FOR TRIP PLANNING

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ABSTRACT

Malta has long been a tourist destination with visitors totaling 2.6 million in 2018. A 2013 survey by the Malta Tourism Authority found that 22% of tourists opted for a rental car during their stay, whereas 76% chose public transport to meet their travel needs. In recent years, the modernization of the bus fleet, improved information provision, and the introduction of a ferry service in the Valletta harbors, have contributed to the increased appeal of public transport. However, the increase in independent tourists might give rise to an increase in the rentals of individual cars. This is a concern given Malta's high car ownership, and its ever-increasing congestion problem. As part of the CIVITAS DESTINATIONS Project, focused on tourist sustainable mobility, the University of Malta developed a Tourist Mobility smartphone application: MyMaltaPlan. The app enables tourists to plan trips and schedule itineraries between touristic sites. The app, which was launched in the summer of 2019, aims to encourage a shift toward greener travel behavior. A survey was conducted with tourists to understand current tourist travel behavior, and tourists' use of smartphone or web applications for trip planning. The vast majority of visitors own a smartphone and use it on

Sustainable Transport and Tourism Destinations
Transport and Sustainability, Volume 13, 79–95

ISSN: 2044-9941/doi:10.1108/S2044-994120210000013009

holiday to plan, access, or book transport. To test the app's functionalities, a focus group was held with a group of volunteers who shared their experiences in a group discussion. Participants appreciated the automatically created itinerary but noted that to truly promote sustainable mobility, the app should be able to provide the full picture of available alternatives.

Keywords: Sustainable mobility; tourism; travel behavior; trip planning; smartphone app; Malta

INTRODUCTION

Malta, a Mediterranean island state, is the smallest European Union (EU) member state with a surface area of 316 km^2. The Maltese Islands (see Fig. 6.1) have long been a tourist destination and visitor figures continue to rise, with 2018 seeing almost 2.6 million inbound visitors (UNWTO, 2019). In recent years, the number of independent visitors has risen, while visitors arriving on package-deal holidays have decreased. Between 2014 and 2018, the number of tourists arriving to Malta on package deals decreased from 46% of the total visitors to 34% (UNWTO, 2019), highlighting the quick rise of the independent tourist segment. A survey conducted by the Malta Tourism Authority in 2013 found that 22% of tourists

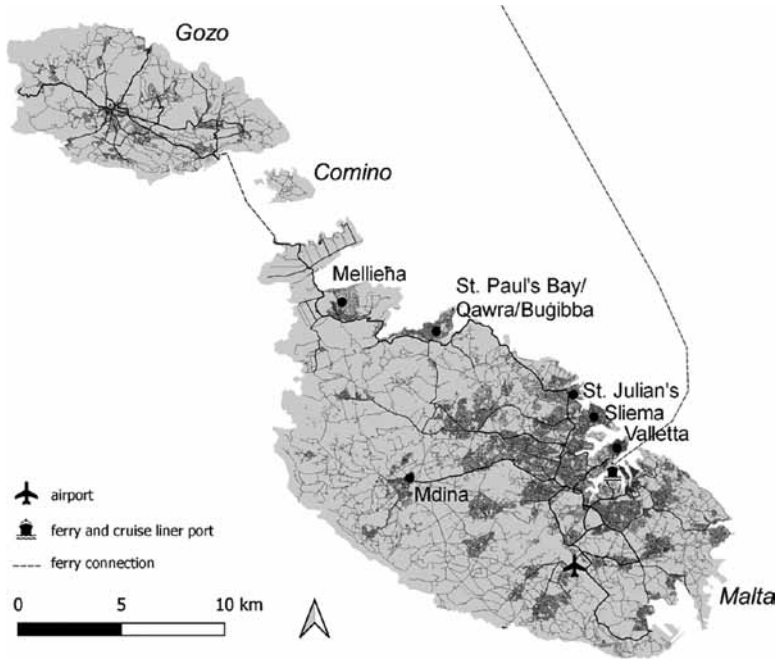

Fig. 6.1. The Maltese Islands With Main Tourist Destinations, The Airport and Ferry, and Cruise Liner Port.

visiting Malta opted for a rental car during their stay, whereas 76% chose public transport to meet their travel needs (Malta Tourism Authority (MTA), 2013).

In Malta, car ownership and use are at an all-time high with 799 cars per 1,000 population (National Statistics Office Malta, 2017) and a modal share of 74.6% (Transport Malta, 2011). Car dependence has led to congestion and parking issues, take-up of the limited public space, deteriorating air quality, noise pollution, and accessibility problems for active transport users. Like other Mediterranean coastal cities, Malta's capital Valletta, as well as the wider conurbation around the harbor areas, is characterized by its historic center and a tight spatial urban fabric that is poorly suited to the needs of car-based mobility (Cavallaro, Galati, & Nocera, 2017). The transport system and infrastructure are under pressure from the heavy reliance on the private car, and in addition to the daily movements of a standard city, such as for work, education, and leisure, the transport system has to provide for seasonal tourism, especially during the summer months. Transport is responsible for 27% of total greenhouse gas (GHG) emissions in the EU, of which almost three-quarters is caused by road transport (EEA, 2018). In Malta, transport contributes to over 20% of CO_2 emissions (Attard, Von Brockdorff, & Bezzina, 2015). Encouraging alternative modes of transport in the tourism sector, such as public transport and active transport, is one of the main ways to reduce transport emissions, air pollution, and congestion at a destination. It is not only beneficial for the quality of life of local residents, in terms of reduced air pollution and congestion, but can also increase the attractiveness of a destination for tourists and contribute to a better tourist experience (Le-Klähn & Hall, 2015).

The modernization of the bus fleet and the Valletta main bus terminus, improved information provision, and the introduction of a ferry service in the harbors around Valletta, have contributed to the increased appeal and level of service of public transport. In addition, during the past years, a number of shared mobility services, including bicycle, car, and scooter (moto/moped) sharing, as well as ride-pooling and ride-hailing services, have been introduced in Malta. Fig. 6.2 gives a visual overview of the available modes of transport in Malta.

Fig. 6.2. Different Transport Options Available to Tourists to Travel on the Maltese Islands: Public Bus, Ferry Services, Ride-pooling and Ride-hailing, and Car-, Scooter-, and Bicycle-sharing Services (Compiled by Authors, Photos From the Internet).

There are special products geared toward tourists such as the *Tallinja* "Explore" card, which offers unlimited travel on the bus for seven days. There is also the "Valletta" card, a combination ticket which includes bus fare for any bus route that connects with Valletta, two ferry rides operated by *Valletta Ferry Services*, to Sliema on the one side, and the Three Cities on the other side of Valletta, as well as access to a number of museums in the capital city (Malta Public Transport, 2019). The two available bike-sharing systems, *Nextbike Malta* and *Tallinja Bike*, as well as the different scooter-sharing schemes (*IoScoot*, *Whizascoot*, *Blinkee*), are available with a pay-as-you-go tariff, enabling use by tourists and visitors. Following feedback from users, the car-sharing provider *GoTo* has introduced a basic plan with a pay-as-you-go tariff enabling casual use, in addition to the previously launched subscription plans, and also offers a pre-paid plan specifically geared at tourists. Ride-pooling services (such as provided by *Cool*) and ride-hailing services (such as provided by *Bolt*) complement the existing public transport and taxi services. Information about bus schedules can be accessed on the *Malta Public Transport* website, as well as through their *Tallinja* app. The schedule of the ferry services is available online on the *Valletta Ferry Services* website. To register and rent any of the available shared mobility services, users need to download a dedicated app and sign up through a registration process, in order to be able to make use of these services. In addition to the information and rentals through operator-specific websites and apps, *Google Maps* provides information on public transport routes (currently limited to the bus service) and walking routes in their "directions" functionality. In 2019, the Mobility-as-a-Service (MaaS) platform *Meep* launched their app in Malta, which provides a multimodal journey planner, incorporating public transport options as well as selected shared mobility providers, and an integrated payment platform.

LITERATURE REVIEW

Travel Behavior

Travel behavior – travel choices and decisions related to transport mode, number and linkage of trips, time of travel, and whether to travel at all – is generally considered to be a derived demand, a behavior that follows decisions made with regard to location and activities (Dobson, Dunbar, Smith, Reibstein, & Lovelock, 1978; van Acker, van Wee, & Witlox, 2010). From an economic utility theory perspective, transport mode choices are expected to be based on maximization of the traveler's utility when weighing different travel options against each other. The relative (dis) advantage of the cost, time, and effort involved with traveling using a particular transport mode matters in the mode choice, with an increase in the generalized cost of travel resulting in a decreased probability that a particular transport mode will be chosen (Heinen, Van Wee, & Maat, 2010). The generalized cost of travel is the sum of the different factors influencing travel behavior (Hanson, 2004):

- *Cost*: direct monetary costs, such as fuel costs, public transport fare or parking fees.
- *Time*: travel time costs, the total time spent to complete a journey, including waiting time and time to search for parking.
- *Effort*: travel impedance, in terms of (un)safety, (in)security, and (dis)comfort.

However, travel behavior is influenced by other factors than those identified in economic utility theory. Behavioral theory identifies several constructs that contribute to a behavioral outcome. In their Theory of Reasoned Action, Fishbein and Ajzen (1975) posited that behavior is the result of rational choices, where intentions to perform a behavior are influenced by a set of beliefs and attitudes, as well as by normative beliefs and social pressure to perform a behavior or not. Ajzen (1991) later expanded on this in his Theory of Planned Behavior, by also including a component of perceived behavioral control; the perceived ability to perform a behavior. That not all behavior is rational and reasoned was put forward by Triandis (1977) in the Theory of Interpersonal Behavior and Ronis, Yates, and Kirscht (1989) Theory of Repeated Behavior, which suggest that as behavior becomes repeated, it becomes a habit. Finally, lifestyle can have an influence on behavior, through its manifestation in preferences for location and activity behavior (van Acker et al., 2010), as well as lifestyle choices, such as how work and leisure are conducted (Cass & Faulconbridge, 2016). At the individual level, behavior is thus understood to be the result of the combination of three forces: (1) rational choices, (2) habits, and (3) lifestyle.

Tourist Travel at the Destination

In principle, tourist travel behavior is governed by the same influences: cost, time, and effort. However, there may be a gap between usual attitudes and habits of tourists at home and their behavior while away on holiday. Hibbert, Dickinson, Gössling, and Curtin (2013) found that identity plays an important role in travel decisions, and that these may override financial costs or environmental concerns. Tourists tend to choose modes that reflect their identities (Hibbert et al., 2013). The use of private modes of transport by independent tourists could therefore potentially be explained by the feeling of freedom and independence that these modes could bring to them.

Transport at the destination is an important attribute of the overall visitor experience and satisfaction. In two different studies, transport options ranked among the top attributes that determine destination satisfaction for tourists (Avgoustis & Achanca, 2002; Pritchard & Havitz, 2006). A study of visitor experience quality and the relation with the transport mode used in the world heritage city La Laguna in Tenerife by Martin, Marrero-Rodríguez, Moreira, Román, and Santana (2016), found that tourists who visited the city with an organized excursion by coach experienced more satisfaction than those who traveled independently, either by public bus or by private rental car. These results show that while transport is an important factor influencing the visitor experience, providing adequate transport options for tourists is not only about the provision of mobility (i.e., to arrive at the point of interest), but also concern the broader tourist experience, in terms of their interpretation of sights, information about local attractions, and way-finding at the destination. The rise of independent tourism further necessitates the development of novel products that inform and enable the tourist to experience the touristic site to its full potential.

Most of the research on sustainable transport choices by tourists has focused on public transport, as only limited trips can be performed by active transport

modes (walking, cycling), and only at particular places or for specific activities (Le-Klähn & Hall, 2015). The main factors that influence satisfaction with public transport are related to the "ease of use" (i.e., how easy it is to use the service, to find information, to get help when encountering problems or having questions, and to buy the right ticket), as well as to the "efficiency and safety" of the transport service (i.e., if it is a fast and convenient way to travel; if it arrives on time; if there is safety on board; if users feel safe traveling alone) (Thompson & Schofield, 2007). For tourists to use public transport, the service quality of public transport should be adequate, in terms of frequency of the service, and adequate routing so that a user does not need to change bus or tram too frequently (Martin et al., 2016). Further factors that can encourage tourists to opt for using public transport as their holiday travel are the benefits of non-driving, for example, avoiding driving in unfamiliar surroundings, avoiding the hassle of parking; a desire not to contribute to traffic, congestion, or to ambient pollution, or a desire for walking or cycling; and recognizing the advantages of the public transport service, such as a faster service or a scenic ride (Le-Klähn & Hall, 2015). There are also factors that may discourage the use of public transport, such as a lack of information, inconvenience or restrictions of the service, and a personal preference for more convenience and comfort than that provided by the service (Le-Klähn & Hall, 2015).

Tourist Travel and Smartphone Technology

In recent years there has been a rapid advancement and diffusion of mobile technology. Today, a smartphone is equivalent to a small fully functional computer with access to a wide range of capabilities, including travel planning. As a result, a plethora of smartphone applications targeting tourists has emerged (Kang, Jodice, & Norman, 2019), where the smartphone provides the tourist with on-demand information and acts as a travel aid. Traveling to a new destination consists of planning, traveling, and documenting (Craig-Smith & French, 1994). A touristic mobile application provides functionalities that aid in one or more aspects. For example, Google Maps provides real-time travel information so that a tourist who is not familiar with the area is able to navigate through a new location (Pan, Crotts, & Muller, 2007). Other applications such as TripAdvisor consist of an interface that lists potential touristic activities, as well as reviews and ratings written by other tourists and local users. The rating system provides an element of trust, so tourists can assess whether the activity they choose will provide the experience they are looking for (Filieri, Alguezaui, & McLeay, 2015).

Smartphone use in travel is strongly associated with the everyday use of smartphones. Repeated use of something has led to new daily routines and habits that means users are now familiar with the use of smartphones, also for travel purposes and in new locations (Wang, Xiang, & Fesenmaier, 2014). Since most tourists are now smartphone users and are confident that they can access instant information on demand, they do not need to put in as much work to pre-plan their holidays and trips, as they can access that information once they are at the destination (Bugeja, Dingli, & Seychell, 2018; Chu, Lin, Chang, & Chen, 2011; Dingli & Seychell, 2012). When information on touristic sites is integrated with spatial information from GIS (geographic information systems) in an online

mapping platform, the information is structured in such a way that it can guide the tourist by providing travel routes or travel information, which can be very effective in heritage sites, cultural landscapes and natural areas (Dingli & Seychell, 2011; Wang et al., 2014). Cheaper mobile internet, free Wi-Fi hotspots, and the removal of roaming charges within the EU in 2017 have greatly contributed to smartphone use while traveling abroad (European Commission, 2017).

THE MYMALTAPLAN APP

The MyMaltaPlan app was developed as part of the CIVITAS DESTINATIONS project, an EU Horizon 2020 project piloting sustainable mobility measures in various Southern European island cities, including the Valletta region in Malta (CIVITAS Initiative, 2013). The CIVITAS DESTINATIONS project is implementing sustainable mobility measures and actions in Funchal, Limassol, Rethymno, Elba, Las Palmas de Gran Canaria, and Valletta, with the aim of offering intelligent sustainable transport solutions for tourists and residents alike. The MyMaltaPlan mobile app is intended to provide useful and interesting information to tourists, in order to encourage a change in travel behavior toward more environmentally friendly mobility options. The app provides information about the main tourist attractions and how to get to these attractions using sustainable modes of transport, including the public bus, inner harbor ferries, and car and (e-)bike-sharing.

The idea for the MyMaltaPlan app emerged from a desire to improve upon the digital touristic experience and develop new functionalities for tourist trip planning. Several existing tourist mobile applications were reviewed to understand what functionalities they include and what opportunities they offer. Most of the apps include functionalities such as GPS routing, search for activities (museums, churches, and restaurants), pre-planned touristic plan, and trip planners. The novel contribution of the MyMaltaPlan app lies in the creation of a random customized trip timetable, based on the user's preferences, dates of arrival and departure, and opening hours of activities.

The application works by interfacing with an API that accesses a database of activities, in the categories "cultural," "environment/nature," "shopping," "sports," "water," and "walking." The database of activities is filled and updated by the tourist operators themselves, who are rewarded with a range of statistical information based upon the app's usage and feedback about their business. The backend system ensures that the chosen activities match the user profile as well as the date and time of the activity. The date consistency is an improvement on what other applications can offer, ensuring that users are only suggested an activity or visit to a point of interest during opening hours. Although the travel time between different activities is not directly included in the planned itinerary, the latest update includes an algorithm that incorporates the relative distance between sites in the compilation of the itinerary, to ensure that the different activities are located within reasonable distance of each other.

The Data Flow Diagram (DFD) in Fig. 6.3 highlights the main modules of the system. Module 1.1 "MyMaltaPlan" is the actual mobile application and acts

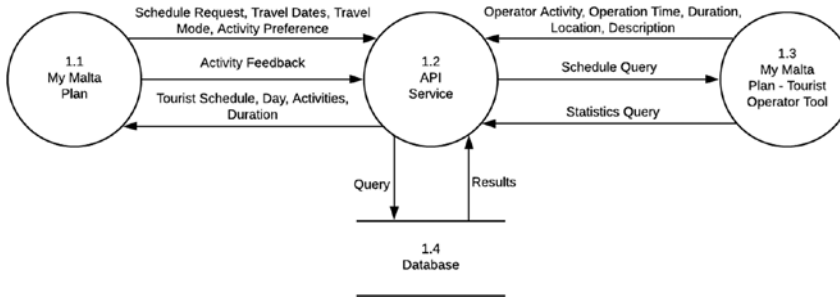

Fig. 6.3. Data Flow Diagram of the MyMaltaPlan System (Drawn by Authors).

as the front end of the system. As already mentioned, the application offers an automated trip scheduling service based on user preferences. All the user information collected by the application are anonymized ensuring that the information is compliant with GDPR (general data protection regulation) and that even in case of security breaches the data cannot be used to harm any individual using the app. The "Tourist Operator Tool" (Module 1.3) provides the operators with a standard form that they have to fill to include their touristic activities in the database. The operator tool also provides information on the demographics of the tourists, the number of tourists that have added an activity to their timetable (through the automated process or manually added), and tourist feedback on the activities (star rating). This feedback is currently only visible to the tourist operators, as when approached operators were hesitant to participate in an initiative where the feedback would be shared publicly. Module 1.2 "API Service" is the bridge between the "Database" (Module 1.4) and both the user and tourist operator front end systems.

Fig. 6.4a is a screenshot of a typical itinerary of activities generated by the API. A user can click on the information button to get more detailed information on the activity, such as a short description and a link to the website of the activity. When the user clicks on the marker icon the app will interface with Google Maps and output a route (currently limited to public transport and walking routes) that the user can follow from their current location to arrive to the activity destination, as can be seen in Fig. 6.4b. The decision to re-route the user through the Google Maps application rather than integrating the services directly in the MyMaltaPlan app was made for two reasons: (1) there are no maintenance costs attached to using the Google Maps services in this manner, which reduces the running costs of the app; and (2) this process reduces the need for maintenance, as when the Google Maps API changes or any of the functionality that are integrated inside the app change, then the MyMaltaPlan app would require a series of updates to restore functionality. With this process, the issue is removed as the routing system is completely independent of the MyMaltaPlan app. Additionally, there are other practical reasons: most users are familiar with Google Maps, most Android phones already have the Google Maps app installed, and for other users, the app will automatically re-route toward the Google Maps website and present

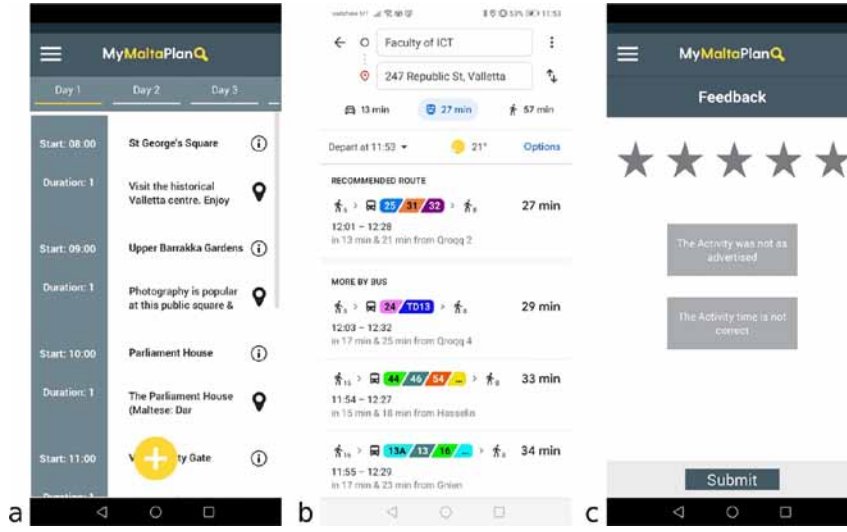

Fig. 6.4. Screenshots of the MyMaltaPlan App.

the same information. This ensures that the system is robust and can be supported for longer. Further supporting functionalities provided by the app include the ability to provide feedback to an activity, as shown in Fig. 6.4c and the ability to change the time of the activity, as long as this corresponds with the opening hours of the activity.

The weakest point of the application is the reliance on the information provided by the tourist operators. The choice of building the database from scratch and make it reliant on tourist operators inputting information about their activities was made to ensure that all information is reliable and up-to-date. In order to attract tourist operators, the app provides operators with data tools and analytics about the users, completely free of charge. Two separate information meetings were organized, where tourist operators were introduced to the app and guided through the registration process and the adding of activities. A demo of the process of adding touristic activities was presented, which is also available online to be viewed anytime an operator wishes to add or update an activity.

METHODOLOGY

A cross-sectional survey was held in April 2019, through a face-to-face questionnaire with tourists at the departure lounge of the Malta International Airport, the Valletta Cruise Port Terminal, and the Virtu Ferries Terminal (linking Malta to Sicily). In total, 339 respondents participated in the survey. The margin of error is 5.32% at a 95% level of confidence. Data collection was scheduled at different times and days in order to capture a wide variety of travelers, and inbound tourists from both EU and non-EU countries were included in the survey. Of the

tourist arrivals, the vast majority (over 96%) arrives through the airport, whereas around 3% arrives using the ferry from Sicily, and 1% with a cruise liner. The responses are weighted to reflect the distribution of arrival/departures of tourists from the different ports. The results are presented for the tourists arriving at the airport/ferry port together (weighted). Where relevant, results for the tourists arriving by cruise liner are reported separately, seeing as the type of tourism is different, that is, many cruise liner tourists visit only for one day and take organized trips to go sightseeing on the island.

The survey collects information on the frequency of travel modes used, which destinations tourists visit, how they plan their trips, and how they rate their satisfaction with the travel modes. Finally, they are asked what would make them use more sustainable modes of transport, information that can be used to inspire future sustainable mobility measures. The survey consisted of four sections. The first section dealt with demographics (e.g., age, gender, nationality) and trip characteristics (e.g., trip purpose, duration of stay, location of stay, and group size). Section 2 concerned the use of smartphones for trip planning and the awareness and use of transport information online (e.g., through Google Maps, TripAdvisor, as well as dedicated tourism websites such as VisitMalta.com, etc.). The third section then enquired about the tourists' use of different transport modes (the most frequently used mode of transport, the frequency of use of different modes of transport, and the mode of transport used to reach specific tourist destinations). Finally, Section 4 focused on the satisfaction with the different transport modes, as well as factors that would encourage the tourist to consider using more sustainable mobility, for example, public transport or active modes such as walking and cycling.

A focus group was organized with a small group of volunteers (five students, two females, and three males), in order to test the process of downloading and installing the app, setting up the account, planning a trip, and finally performing the trip following the information provided by the app. After following the itinerary around the island, there was a group discussion to address questions related to the performance and usability of the app.

RESULTS

Tourist Survey on Transport Choices and Smartphone Use

Table 6.1 presents the demographic characteristics as well as the trip purpose of the survey sample, compared to similar figures compiled for the entire population of inbound visitors in 2017, based on a total of 2,273,837, excluding those who stay overnight on a cruise liner (MTA, 2018). In terms of nationality, tourists mainly come from the UK (25%), Italy (14%), Germany (11%), Belgium (11%), and France (10%). The top two localities where tourists are staying are Sliema and St. Julian's, the accommodation location for 40% of the tourists. Other popular accommodation destinations are the St. Paul's Bay/Qawra/Buġibba area (16%), Mellieħa (11%), and Valletta (8%). The majority of the tourists travel as a couple (47%) or with their family (24%). Many visiting tourists stay for a week or longer; 22% of respondents indicated they stay for seven days, while 24% stays longer than a week.

Table 6.1. The Demographic Profile and Trip Purpose of Survey Sample and Population.

		Sample Profile ($n = 339$)	Tourism Statistics (2017) (MTA, 2018)	
Gender	Male	47%	Male	51%
	Female	53%	Female	49%
Age groups	16–29	23%	0–24	19%
	30–49	35%	25–44	38%
	50–64	27%	45–64	32%
	65+	15%	65+	11%
Trip purpose	Leisure	73%	Leisure	76%
	Family visit	10%	Family visit	9%
	Business	6%	Business	8%
	Other	11%	Other	7%

In terms of smartphone ownership and use of the smartphone for trip planning purposes, 88% of the respondents own a smartphone, and 78% use their smartphone on holiday for transport purposes, for example, to plan, access, or book transport. The vast majority of those who do not own a smartphone are over 50 years of age. The three most frequently mentioned sources of transport information online were Google Maps (84%), the VisitMalta website (54%), and the Malta Public Transport website (51%). To actually plan their trips on the islands, the three most frequently used sources were Google Maps, the Malta Public Transport website, and the Malta Public Transport *Tallinja* app. In terms of satisfaction with the information provided by these sources, Google Maps received the highest rating, with almost three-quarters of users being satisfied, whereas the information provided by the Malta Public Transport website and app only satisfied just over half of the respondents.

To determine the transport use of tourists on the islands, only the responses of those tourists who arrived via the airport and ferry port were considered, as tourists who arrive by cruise liner generally only stay for one day and make use of organized transport, or only walk around the capital city where the cruise liner terminal is located. In terms of their use of transport on the islands, the majority of tourists (56%) used the public bus. In addition, 14% used a rental car, 10% used taxis, and 9% moved mostly on foot. The remainder was made up by those who primarily used a private car (of family or friends), or the ferry as their mode of transport, and very few respondents who opted for the car-sharing service, bicycle rental, or a rented motor/scooter (<1%). Valletta, Mdina, and the sister island Gozo were the three most visited destinations by tourists, with 81%, 47%, and 46% of respondents having visited these sites respectively, with most of the trips occurring by bus, and in the case of Gozo of course in combination with the inter-island ferry service (*Gozo Ferry Services*).

Respondents were then asked what would encourage them to make more use of (a) public transport and (b) active transport modes, such as walking and cycling. Figs. 6.5 and 6.6 list the responses. In terms of public transport, "less crowded vehicles," "improved reliability," and "increased frequency of service" top the list, whereas for encouraging active transport modes, "increased road safety," "improved infrastructure," and "reduced speeds of motorized vehicles" were most frequently mentioned.

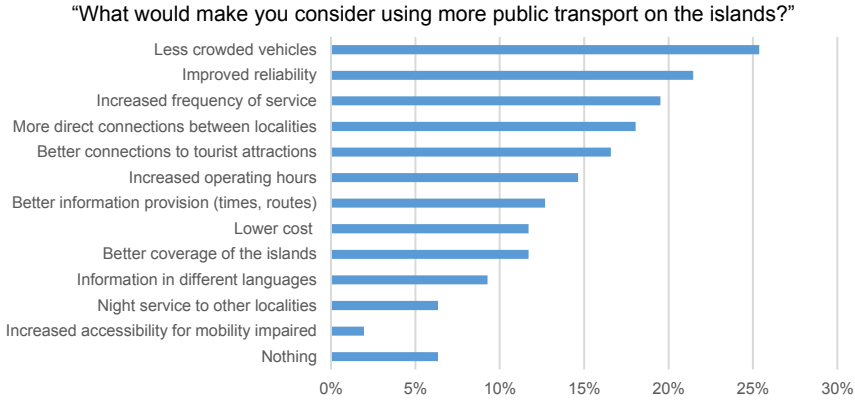

Fig. 6.5. Factors That Would Encourage Public Transport Use ($n = 205$).

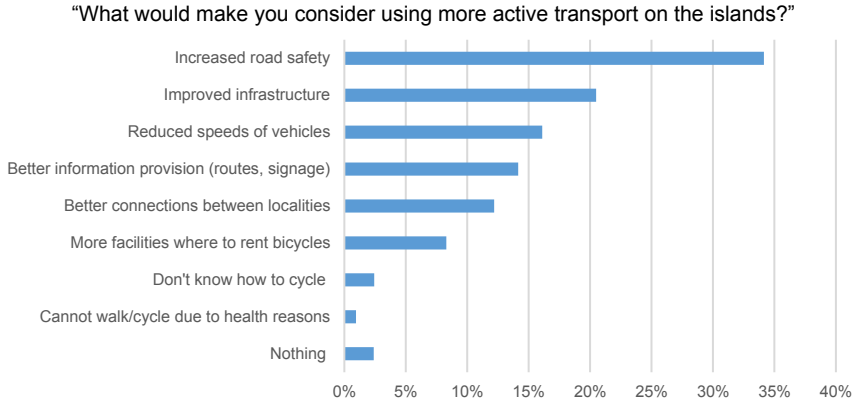

Fig. 6.6. Factors That Would Encourage the Use of Active Transport Modes ($n = 205$).

Focus Group to Test MyMaltaPlan App

Prior to the focus group, the participants were asked to search for and install the app and complete the registration. In principle, the app supports Android operating systems up to two to three years ago, and updates for new versions of operating systems will be included in periodic updates. Participants registered their personal descriptors including their country of origin, dates of their stay in Malta (fictional dates in the case of the test), and their interest in different activities, for example, cultural, environment, sports, etc. Participants were then asked to use the app to create an afternoon program to Valletta, starting from the University of Malta campus in Msida, to the Palace State Rooms and Upper Barrakka Gardens in Valletta, and thereafter back to the tour starting point. Several transport options were suggested by the app, and the group opted to follow the walking route toward Valletta, and after visiting the points of interest suggested in the itinerary, to take the bus for the way back.

Upon returning to the campus, the participants sat together for a focus group discussion, to share their experiences with planning a trip and following the itinerary, and their thoughts on the functionalities and user experience of the app. The participants welcomed the provision of an itinerary based on their preferences. One participant explained how the app helped avoiding an online search for activities they can do at the destination; that the app contributes to lessen the burden of planning a holiday. The consideration of the opening hours of the tourist activities visited was another positive aspect of the app, as noted by participants. They commented that this is a functionality they have not seen in other similar applications. It avoids the disappointment of arriving somewhere only to find it closed.

The participants also noted a number of points of possible improvements for the app. While the participants appreciated the automatic generation of daily itineraries based on their preferences and the available activities, some of them highlighted the need for further customization of the itinerary. Different suggestions included a "drag and drop" style interface to adapt the itinerary, the possibility to "favorite" activities in the list of activities so that these are given priority in the creation of the personalized itinerary, and the ability to "fine-tune" the timing and scheduling of the activities, for example, to be able to slot in a lunch break. Other suggestions were put forward too. One participant suggested the inclusion of the price of the activity, either by linking to the operator's website or at least by indicating those activities that are free. Another idea was to link the itinerary to a user's online calendar, for a more seamless and fluid integration in the overall trip planning.

There were also some issues identified by the participants. While participants found the integration with Google Maps and the directions provided there easy to use and to follow, as it is a platform most people are familiar with, they also recognized that there are some challenges with using the information provided by Google Maps. While walking from the university campus to Valletta, the participants were shown a walking route along a major road, a route without proper pedestrian infrastructure. While they found another, more suitable, walking route, it cannot be expected that tourists will recognize that a route is not fit for walking, nor that they can easily find information about an alternative route. This is a general problem with Google Maps in some locations, including in Malta. One participant in the focus group suggested that the app includes a disclaimer that states that routes may not always be up to the expected standard, especially in the case of walking routes, which are not optimized or complete in places like Malta. Additionally, information for several of the available transport options are not currently supported by Google Maps, for example, cycling routes are not included, or have not been supplied by the operator, for example, the ferry service is not included in Google Maps directions. Shared mobility options are not included either, as users need real-time information on the location and availability of the vehicles, which is only provided through the app of the respective operator. A second issue highlighted by the participants was the fact that not all possible touristic sites and activities were as of yet included in the app's list of activities. While efforts were made to include tourist operator's in the creation of the database of activities, and the app provides them with a free platform to advertise their activity, the response and action from operators were below what

was expected. One actor in the tourist sector explained that they feel they receive enough visitors and do not currently see the need to advertise further.

DISCUSSION

From the survey results, as well as from the discussion in the focus group, it was confirmed that people are clearly used to using Google Maps as a source of information for travel and trip planning. The functionalities provided by Google Maps are among the best, compared to other travel planning and mapping tools, and the Google Maps API is widely used in travel planning apps (e.g., Faraji, Azadi, & Rezaei, 2012). However, by rerouting from the app to Google Maps, the service relies on the availability and accuracy of the information provided by public and private operators to Google. For example, while the *Malta Public Transport* bus schedule is available through Google Maps, other transport providers, such as the inner harbor *Valletta Ferry Services*, have not made their information available.

While tourist operators may not directly see the need to further advertise their location or site, as they have sufficient visitor numbers, research shows that to provide an optimal tourist experience, having better information provision and guidance at a destination is paramount (Martin et al., 2016). To that end, it is in the interest of policy-makers and those actors promoting Malta as a tourist destination to ensure that such an app aids the independent traveler in their travel and exploration of the islands, to ensure they have a rich and rewarding experience. To utilize the full potential of the app and its developed functionalities, factors in the tourism industry should work together to ensure that a wide variety of tourist activities is included and kept updated.

In terms of encouraging factors, the app can play a role in facilitating some of the needs identified through the final section of the survey, on factors that would encourage public and active transport use. A number of respondents mentioned improved information provision, an obvious place where the app can play a role, by bringing together information about different transport options, for example, by including the cost, accessibility, and duration of different options to aid the person's decision-making. Seeing that crowding on vehicles was perceived as an issue by a quarter of the respondents, the app can also play a role in considering less busy times on the bus when scheduling the program for the day trip. The app also provides up-to-date information, which can help in managing and utilizing the anticipated waiting time, even though it cannot improve the reliability of the public transport as such. In terms of the factors that would encourage active transport use, the app could play a role in the information provision about routes, which could also help people find routes that are quieter and safer, away from the main roads, as road safety and vehicle speeds are mentioned as concerns by tourists in Malta.

CONCLUSION

Smartphones and mobile apps have changed the way people travel and plan for their trips. The MyMaltaPlan app was developed in order to enable tourists to

plan trips and schedule itineraries visiting touristic sites, while being guided to use sustainable mobility options. A novel addition of this app is the automatic itinerary created based on users' preferences, their arrival and departure dates, and the opening hours of different touristic activities.

In order to understand current tourist travel behavior, and tourists' use of smartphone or web applications in trip planning, a survey was conducted with tourists arriving at the airport, cruise, and ferry ports. From the survey responses, it appears that the vast majority of visitors own a smartphone and use their smartphone on holiday to plan, access, or book transport. More than half of the surveyed tourists use the bus as their main mode of transport on the islands. Factors that encourage visitors to use public transport are "less crowded vehicles," "improved reliability," and "increased frequency of service." To encourage more active transport, respondents highlight the need for "increased road safety," "improved infrastructure," and "reduced speeds of motorized vehicles."

To get further insight into the use of the MyMaltaPlan app in a real-life setting, a group of volunteers tested out one of the itineraries proposed by the app and discussed their experiences in a focus group. The participants were enthusiastic about the automatic provision of an itinerary which reduced the burden of planning daily activities. They also saw a number of possibilities for further improvements in the app, for example being able to create a more intuitive customizable timetable. The main drawbacks identified relate to the information included in the app and those provided by Google Maps for directions; not all tourist activities are as of yet included in the database and not all sustainable mobility modes are currently available for directions in Google Maps. In order to truly promote sustainable mobility, and inform tourists about the sustainable mobility options available on the Maltese Islands, the app should be able to provide the full picture of available alternatives.

ACKNOWLEDGMENTS

The authors have no competing interests to declare. This work was supported by the EU Horizon 2020 CIVITAS DESTINATIONS project: http://civitas.eu/destinations.

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