THE POTENTIAL IMPACT OF USING TRAVEL APPS AS A TOOL TO REDUCE CAR USE IN CITIES. A LITERATURE REVIEW

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ABSTRACT

64% of total trip-km are made in urban environments and these phenomena threaten urban sustainability (Van Audenhove et al. 2014). In the last decades, cities have been applying different policy measures to reduce car use. But they have notable limitations and usually produced small impacts (Sunio y Schmöcker 2017).

Smartphone has emerged as a promising alternative tool to enhance the effects of the policy interventions, because it can overcome several limitations and improve their efficient adoption of sustainable options. Travel apps can be very useful because they provide accurate and real-time information. In addition, user-created information could greatly reinforce information from operators.

A review of the literature of 98 recent papers was performed. It had two main objectives: which factors influence commuters to use travel apps; and second, what persuasive interventions supported by travel apps produce changes towards a more sustainable mobility behavior.

Some facets offered by apps are effective for changing travel behaviour: individualized advice, feedback on one's own behavior and social comparisons between users. The GoEco! experimental travel app, provided feedback and social comparisons on travel behavior among users (Cellina et al. 2019). It was found to produce a statistically significant change in individual mobility patterns.

Travel apps remain underutilized, especially in suburban travel. Scholars found factors that influence app usage: curiosity, expectations of increased utility, attractive design and performance attributes are influence factor for app usage.

In contrast, environmental motives, privacy (desire not to share information) and age (older people are less likely to adopt apps) do not influence or do so not significantly.

The findings of the literature review show that, moreover, to increase apps usage, app design and implementation requires different strategies for each segment of the population.

There are groups of people who are more likely to use apps (e.g., technophiles and young people).

1. INTRODUCTION AND BACKGROUND

This article consists of a systematic literature review on the potential impact of the use of travel apps as a tool to reduce car use in cities, specifically in the periphery.

While in the core of metropolitan areas there is an increased use of travel applications and the modal share of total sustainable travel modes is often important, this not the case in the outskirts.

Almost 50% of the population of OECD (Organisation for Economic Co-operation and Development) countries live in urban areas (OEDC 2016) due to better economic opportunities and the availability of services. Cities are facing an accelerated sprawling process, increasing travel distances, making public transport systems less competitive, and becoming suburban mobility more car dependent. As a consequence, 64% of total trip-km are made in urban environments and is expected to triple by 2050 (Van Audenhove et al., 2014).

These phenomena threaten urban sustainability (Lyons, 2018) because of their well-known impacts, not only on the environment but also on social and economic issues, such as distributive effects, equity and mobility justice (Pereira, Schwanen, Tim y Banister 2017).

Therefore, there has been a challenge for several decades to persuade commuting through sustainable travel modes. And multimodality is an attribute of travel that increases sustainability.

Measures implemented to pursue that challenge have been generally classified as hard and soft. Soft measures started to conduct by public administrations due to hard measures often requires too high investments.

Soft measures look for to change travel behaviour towards sustainability ways. Soft measures have been implemented through, what is most generally called, Travel Behaviour Change Programs (TBCP). TBCP began to be implemented approximately 20 years ago.

At the same time, urban lifestyles and mobility needs are adapting to the requirements and opportunities of the digital age, characterised by the use Information and Communication Technologies-based activities (Mokhtarian 2009). Smartphone arrival has impacted our daily life. In the transportation field, it has emerged as a promising alternative tool to enhance the effects of the TBCP interventions, due to it can overcome several limitations.

This literature review has two goals:

- Firstly, to review the state of the art and practice regarding the factors of travel apps adoption. Two main groups of elements can be identified: the internal, regarding the app itself, and the external related to the user characteristics. The internal ones include aspects such as simplicity, appearance, performance, integration of modes, ticketing, etc. The external factors are related on the user personal traits, social norms, socio-economic and geographical features, etc.
- Secondly, to conduct an exhaustive analysis of the so called 'persuasive interventions' to foster the modal transition. Recent findings suggest that real time informed decisions tend to be sensitive to sustainability and social impacts. We aim to conduct a literature review to extend their impacts as driver for persuasive interventions for motivating changes towards sustainable metropolitan mobility. Apart from public transport information, there is a growing interest to explore the link between public transport and Park & Ride facilities. This option is not properly connected with travel apps, then users do not take informed decisions when accessing by car to city centres.

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2. METHODOLOGY

A systematic literature review was carried out with the aim of working with the most complete sample of available scientific publications. For this purpose, the Scopus database was chosen due to its high scientific impact, the diversity of databases that comprise it and the versatility of the subject matter and formats or types of documents it supports (De las Heras et al. 2021). The literature selection scheme is shown in Figure 1.
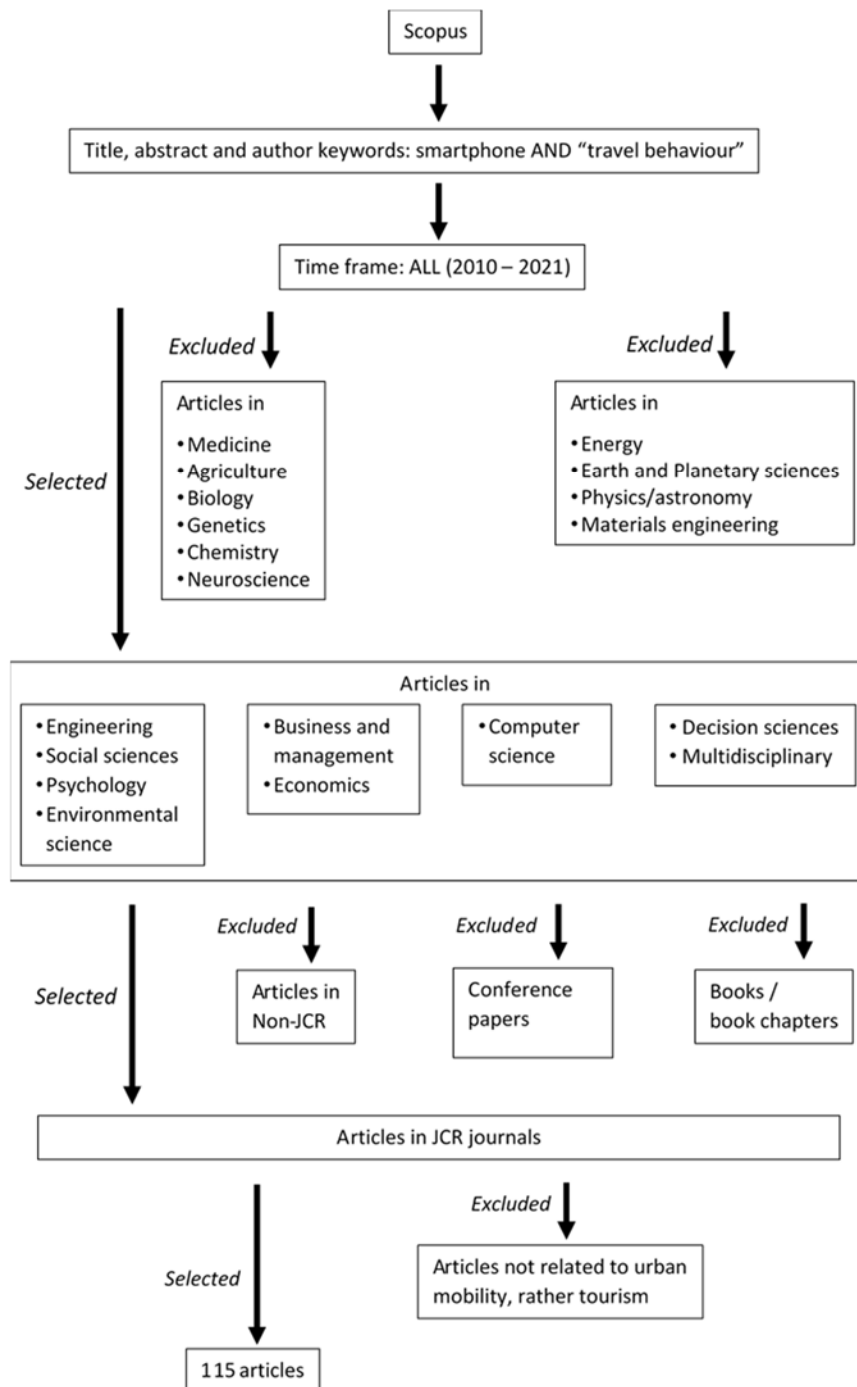
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                              ┌─────────┐
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        ┌──────────────────────────────────────────────────────┐
        │ Title, abstract and author keywords: smartphone AND   │
        │ "travel behaviour"                                    │
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                                   │
                                   ▼
                   ┌──────────────────────────────┐
                   │ Time frame: ALL (2010 – 2021) │
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Excluded ↓   *Excluded* ↓

Articles in	Articles in
• Medicine • Agriculture • Biology • Genetics • Chemistry • Neuroscience	• Energy • Earth and Planetary sciences • Physics/astronomy • Materials engineering

Selected

Articles in

• Engineering • Social sciences • Psychology • Environmental science	• Business and management • Economics	• Computer science	• Decision sciences • Multidisciplinary

Selected

Excluded ↓   *Excluded* ↓   *Excluded* ↓

Articles in Non-JCR	Conference papers	Books / book chapters

Articles in JCR journals

Excluded ↓

Selected

Articles not related to urban mobility, rather tourism

115 articles

Figure 1 – Process of selection and exclusion of papers indexed in Scopus.

The keywords used in Scopus had to be related to the influence of the use of travel apps on the reduction of car use. The keywords were: 'smartphone', 'travel behaviour'. The query string used was: smartphone AND "travel behaviour".

Author title, abstract and keywords were used as search fields. Otherwise, articles in which "smartphone" and "travel behavior" are not a key part of their content could have been considered. Further filters were used to select the most relevant articles for this research.

Regarding the subject matter of the articles, those that were considered unrelated to the research were excluded. As for the type of document, only articles published in JCR journals were considered. Finally, an important part of the papers related to 'tourism' and not to mobility were not considered. For this purpose, 'NOT tourism' was added to the query string. Finally, 115 scientific articles were selected for the literature review.

VOSviewer is a bibliometric and network analysis software (van Eck y Waltman 2013). It is a very valuable tool for a literature review and has been widely used for this work.

From the list of 115 papers, the VOSviewer software was used to find out the most relevant keywords. The software has different utilities and, in this case, attention was paid only to the keywords. It was obtained: a) a graph of co-occurrences with the keywords and, b) a list of the keywords and the number of papers (from the list of 115) in which they appear.

In order to ensure that the literature review includes the most studied concepts in the discipline, the keywords with the highest number of occurrences were selected. Finally, of the 115 papers, only those in which one of these keywords appeared (in title or abstract or author keywords) were studied in depth.
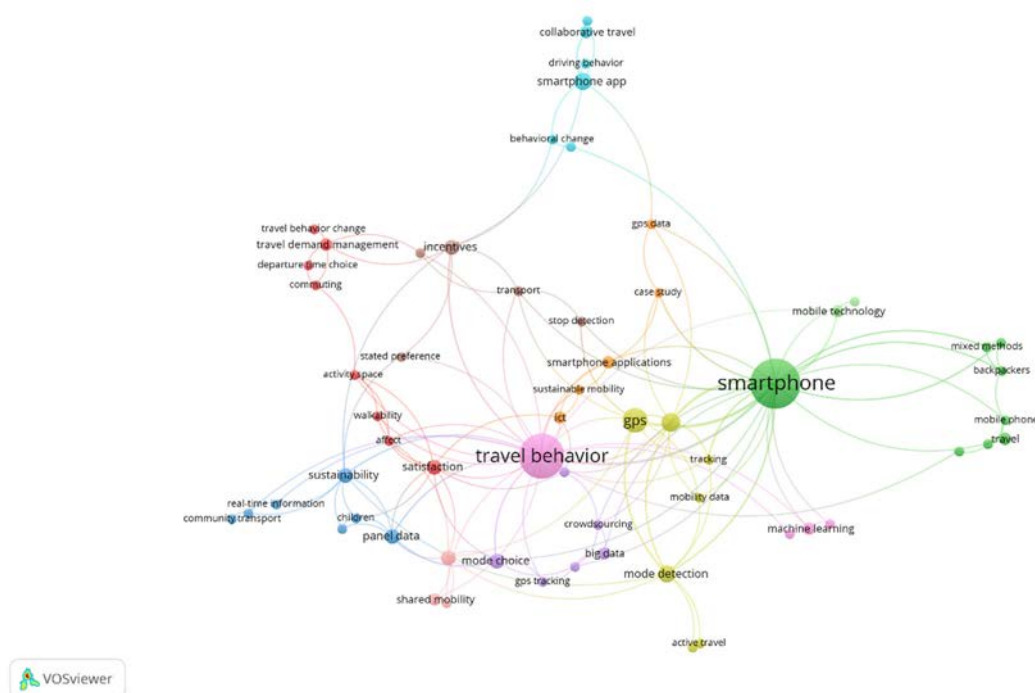

Figure 2 – Map of co-occurrences of keywords (from the title, abstract and author's keywords). Source: VOSviewer.

Figure 2 shows shows the co-occurrence map obtained through VOSviewer. The coloured balls "smartphone", "travel behavior" and "GPS" are the largest, so these keywords have the highest number of occurrences in the list of 115 papers.

Position	Keyword	Occurrences	Total link strength
1	Smartphone	29	19
2	Travel behavior	24	17
3	GPS	9	13
4	Travel survey	6	11
5	Mode detection	5	9
6	Smartphone app	5	1
7	Incentives	4	4
8	Mode choice	4	7
9	Panel data	4	7
10	Public transportation	4	5
11	Satisfaction	4	4
12	Sustainability	4	5

Table 6. Classification of the occurrence of keywords (in the title, abstract and author keys). Source: own elaboration.

Table 6 shows the number of occurrences of the keywords. "Smartphone", "travel behaviour" and "GPS" have the highest number of occurrences: 29, 24 and 9, respectively.

The keywords "smartphone", "travel behaviour" and "GPS" were selected. 98 of the 115 articles included at least one of these three keywords. These 98 articles were analysed in depth.

3. RESULTS

This section presents the relevant results of the review of the 98 selected documents that have been analysed in depth.

Cities has been planned for a massive use of the car and a lot of resources are needed to revert the situation. Due to changing the urbanization is highly cost, public administrations has been trying to look for other kind of measures to reduce the car usage. Interventions to modify the commuter travel behaviour, as TBCP, has been implemented commonly last decades.

TBCP programs help to reduce the car usage (Arroyo et al. 2018), but only produce small derived effects (Sunio y Schmöcker 2017). Smartphone arrival may dramatically help to change the travel patterns through mobile apps adoption.

Recently some TBCP programs are starting to carry out through smartphones. They are habitually called technology-based interventions.

They consist of persuasive strategies and are carried out through smartphone travel apps.

3.1 Persuasive interventions to foster sustainable mobility

At the same time, the MaaS approach is a new tool to promote smart mobility with a promising perspective (Jittrapirom et al. 2017). Comparing to interventions programs, like TBCP, MaaS projects do not exactly include explicit persuasion strategies. MaaS concept is still under development, but they are commonly developed through an app that integrates the services of multiple travel modes (public and private) with their related information and generally tries to work through packages subscriptions (Arias-Molinares y García-Palomares 2020). These attributes seem to be useful for the commuters but there is still a lack of pilot evidences.

Cost savings is an important factor influencing the decision to switch to public transportation (Abou-Zeid y Ben-Akiva 2012; De Witte, Macharis y Mairesse 2008). Some people were interested to use UbiGo mobility app (MaaS) because expected to reduce costs comparing to the car (Sochor, Strömberg y Karlsson 2015).

Another important factor to switch from car to public transportation is to have a precise and reliable information about travel modes. There are some studies that affirm a notable misperception with public transport (Abou-Zeid y Ben-Akiva 2011; 2012). One study even stated that 50% of citizens have a significant lack of information about transit alternatives (Brög, Erl y Mense 2002). The quality of public transportation service logically has increased along time (Sukor y Basri 2019).

Travel apps can easily offer multimodal, real-time and reliable information. An experiment was proposed to participants to use an existing travel app called Metropia (Li, Chen y Tian 2021). Metropia provides to user real-time traffic information, travel feedback and distributing monetary rewards. It was found that helped users save 5% - 10% of their travel time, due to avoiding traffic peak hours.

On the other hand, Park and Ride facilities are an appropriate measure to reduce car use (Duncan y Cook 2014). Regarding multimodal travel apps, pilots conducted by academics do not typically include P&R in the multimodal travel system.

Also, existing travel apps typically do not include them. Nevertheless, P&R information included in multimodal information affects travel choices (Gan y Ye 2018). Therefore, travel applications should include P&R information to encourage the modal shift from car to public transportation.

Regarding the MaaS implementation, more than a few MaaS pilot projects have been carried out. UbiGo was the first MaaS experience and consisted of a experiment mobility app. It provided an integrated mobility service (public transport, taxi, carsharing, bikesharing, rental cars) and works through a monthly subscription service. 97% of the participants wanted to continue using UbiGo at the end of the test (Sochor, Strömberg y Karlsson 2015).

Two MaaS projects that have started recently in Asia have been assessed (Chang, Chen y Chen 2019). UMAJI is a mobile platform for trip planning and payment services. The app integrates Metro, bus and public bike services in the Taipei-Yilan corridor of 40 kilometers. There is a monthly pass for using the three services. Public transportation has increased 3,2% in the first 6 months (80% of the increased trips are from the existing users). MenGo is an app of MaaS in Kaohsiung metropolitan, and integrates mass transit (city buses, inter-city buses, MRT, light rail, ferries) and shared transportation (public bicycles). There are four types of monthly service packages. Users of motorized vehicles contribute 21% of MaaS MenGo members.

Due to the positive impacts of travel applications, scholars are studying persuasion features, within travel applications, to switch to sustainable modes. For example, a prototype app with motivational features was developed for inducing sustainable travel choices: goal setting (inviting users to set weekly goals), self-monitoring, encouragement (personalized messages according the user profile and travel behavior) and social-sharing features (leaderboard of participants eco-scores weekly provided). An improvement in the use of sustainable modes of 14% was found (Gabrielli y Maimone 2013).

Social comparison is one of the strongest motivational features. Favorable comparisons to others (e.g. shorter commute time than others) enhance commute satisfaction (Abou-Zeid y Ben-Akiva 2012). It has also been featured by a persuasive travel app called GoEco! that exploits information feedback elements and promotes a social comparison of their performance, within a gamified framework. It was found to bring about a statistically significant change in systematic individual mobility patterns, reducing both energy consumption and CO_2 emissions in Ticino, where car-dependency is deeply rooted. In Zurich, where individual mobility patterns are already optimized and car-dependency is lower, no significant effects were found (Cellina et al. 2019).

Some authors concluded that including feedback information to the participants in persuasive smartphone applications is a successful factor for promoting a sustainable travel behaviour (Andersson, Winslott Hiselius y Adell 2018; Li, Chen y Tian 2021). Feedback on one's travel history can affect one's awareness of their impact on the environment, intentions to change behavior, and actual behavior change" (Jariyasunant et al. 2012)). Feedback information may include a behaviour comparison among travel app users.

The registered information of the travel application can be processed according to the characteristics of the user and provide personalized/individualized advice. It would be a step beyond simple feedback information. It is known that individualised advice is an effective persuasive technique (Cellina et al. 2019; Fujii y Taniguchi 2006). The reasons behind each person chooses to commute in a specific mode of transport are different from those of the others. (Cellina et al. 2019) experimented the use of GoEco! app that provided "bicycle and walking-friendly suggestions for alternatives and weather-aware personalized recommendations, challenges and badges". (Gabrielli y Maimone 2013) developed a prototype mobile app that sent personalized messages encouraging sustainable travel choices according to his profile and travel behavior. An improvement in the use of sustainable means of transport was observed. (Ahmed et al. 2020) developed an algorithm that determined realistic walking, cycling and public transport potential in an activity-travel routine of an individual by considering constraints related to personal, household, mobility and urban environment.

Individualised advice may be mixed with social comparison techniques. (Jariyasunant et al. 2012) carried out an experiment developing an app which unobstrusively tracked users location and with that collected data participants received feedback (in a website) with trends and comparisons with various peer groups. They observed a significant shift from driving to walking.

Some scholars have assessed planning trips as a proper alternative towards reducing car dependency. Planning a trip consists of basically to evaluate which is the best alternative to arrive to a specific destination. If a Travel Feedback Program (TFP) required participants to create a behavioural plan for their travel behaviour, it resulted in a dramatic increase in TFP effectiveness in terms of behaviour change (Fujii y Taniguchi 2006).

Recorded travel information of the commuter may be a great tool to create and suggest personalized behavioural plans. Based on the recorded travel diary of the individuals, a website was developed with pro-environmental personalized travel plans that were suggested along with pro-environmental and pro-health impacts (Ahmed et al., 2020). It was found a decreasing in car dependency and increasing in physical activity.

Experts agree that market targeting is key to effective persuasion interventions. Persuading interventions to foster public transport may be more effective for non-riders than for frequent riders (Fujii & Taniguchi, 2006). An experiment was carried out encouraging MIT university pupils with free public transportation tickets and was found that free public transportation tickets worked better for commuters more inclined to switch (Abou-Zeid & Ben-Akiva, 2012). Related to this, an study affirmed "it is not fruitful to convince Devoted Drivers to change transport mode with marketing since they oppose messages that promote sustainable transport" (Andersson et al., 2020).

Travel Feedback Programs may be more effective for new residents (Fujii y Taniguchi 2006). Though that statement could be valid for all the persuading interventions. Logically, new residents have not yet developed habits to commute, and habits strongly influence travel patterns (Pronello, Simão y Rappazzo 2017).

In addition, personal health plays an important role over some commuters and they have preference of active travel. Trips with high walking or bicycling rates have priority over public transit. The experimental web with pro-environmental and pro-healthy travel plans suggested (Ahmed et al. 2020) led to the conclusion that public transport options failed to significantly persuade individuals to shift from car to public transport, but active modes did (walking and cycling).

Regarding the sample limitations of the classical intervention programs (TFPs, TBCPs, etc.), a study explored if programs who consists of providing travel feedback information to the participant (Travel Feedback Programs, TFPs) can be replicated without a travel counselor (Jariyasunant et al. 2015). It was developed "a computational system in the mobile cloud" surrogating the travel counselor and the model showed that "the more frequent the interaction with the website, the greater is the increase in the amount of walking/biking".

3.2 Factors for travel apps adoption

Some experiments showed that smartphone apps influence to change travel choices towards sustainability patterns (Shaheen et al. 2016). A lot of research is being done recently to find out what factors influence the adoption of travel app usage. Although there is a difficulty to quantify the importance of each of the factors studied.

Self-interest was found as the primary interest of trip efficiency improvement for the travel apps adoption intention (Dastjerdi et al. 2019). The main motive (63% of survey respondents) to adopt UbiGo app was the curiosity to know the integrated mobility service could offer them. Many of the respondents stated the desire to not own a car due their work and cost. Ubigo participants expectations regarding the use of travel applications were "To reduce their travel costs, facilitate payment, gain access to more modes of transport, they expected the application to be easy to use and safe" (Sochor, Strömberg y Karlsson 2015).

The app involvement is related to the hedonic and utilitarian benefits perceived (Fang et al. 2017). Hedonic and utilitarian benefits could be classified as self-interest benefits.

Cost and time savings would be utilitarian motives to start to use an app. Real-time and reliable travel information are (also utilitarian motives) an important aspect for commuter travel choice. Travel apps could offer easily that specific information to the commuters. According to (Li, Chen y Tian 2021), "traffic information is strictly in accordance with real-time traffic conditions rather than historical data".

A survey was carried out for commuters and it revealed that apps like Google Maps do not compete with specific transit apps that include real-time information because daily commuters require that specific information of their routes (Romero et al. 2020).

Regarding the driving time estimation reliability of the apps, Google Maps underestimates the total driving trip time in urban areas when parking places are scarce (Wagner et al. 2021). The estimate does not include the specific time spent parking and walking time to the car from the origin and from the car to the destination. A time estimation model was developed to search for on-street parking (Mannini et al. 2017) and it could supplement the driving time estimate provided by travel apps.

To be entertaining, enjoyable (Gupta y Dogra 2017) and easy to use (Gupta y Dogra 2017; Dastjerdi et al. 2019; Fang et al. 2017) are important factors for using apps. Those aspects are generally called as hedonic motivation, that influences behavioral intention to use apps. These factors are related to the performance app, that is an influential factor for using apps that involves several features. Based on a hedonic motivation perspective, regarding the game elements of app including self-monitoring, information sharing and bonus point collection could be considered as game elements of the app (Seebauer, Stolz y Berger 2015).

There are also individual motivations that come from social aspects. (Seebauer et al., 2015) relate that social motivation to social comparisons and assert the possibility of competition between them if individuals share their information through social media. "In the field of social psychology, sociology and marketing, this is known as social value reflecting the (positive or negative) outcomes of the ownership and use of a product for one's (self-) identity and social status. It is viewed as the product's ability to develop social self-concept". According to (Fang et al. 2017), social interaction is a factor to influence use intention of travel apps.

Social motivation could be also related to the privacy. Maybe it should not be called social motivation, but more precisely privacy barrier. Real-time information is required by the apps, and it could be provided by the transport authorities and operators or by the users. Regarding the users, not all of them share their information or evaluation services. Privacy, safety and even security could be the cause to not share information (Magano y Cunha 2019). Regarding collaborative travel, an study was carried out and concluded that safety has a highly importance, being data privacy a core issue (location data being made available to other users) (Dickinson et al. 2017).

Related to safety, privacy and security in collaborative travel is social trust. The strength of social ties plays a marked role in collaborative travel. Successful implementation is more likely in communities where social ties are established (Dickinson et al. 2017), or in regions where social trust is high.

If the app only suggested traveling with someone who is in your circle of friends, or acquaintances, it might work. But there would be a great difficulty in defining which is each person's circle of friends. The user could define a list of friends, or at least "travel friends".

In addition, environmental-friendly attributes are another notable non-monetary aspect to app adoption (Seebauer, Stolz y Berger 2015). In the specific case of car sharing, (Mattia, Guglielmetti Mugion y Principato 2019) affirm that "Environmental drivers affect the intention to re-use free-floating car sharing to a lesser extent than the utilitarian motives".

This would confirm (Dastjerdi et al. 2019) when they state that self-interest as the primary interest to app adoption. "Environmental awareness, favorable attitude toward travel information technologies, performing conservation behavior, and a personal desire to participate in organized environmental activities, affect individuals' perceptions of the benefits of the travel app (Mehdizadeh Dastjerdi et al. 2019).

For increasing the apps usage, segmentation of the target population is recommended to better customize to user's profiles (Andersson, Winslott Hiselius y Adell 2018). It is important to know the target population, their needs and expectations, and to account for specific groups of users (Dastjerdi et al. 2019). (Dickinson et al. 2015) state the need to identify and attract potential users and illustrate how the travel app might meet their needs and benefit them.

There is an important relationship between the personality of individuals and the degree of acceptance of the technology. The idea of technophilia indicates the affinity for technology. According to (Svendsen et al. 2013),"the pattern of influence (from personality traits to technology acceptance) will differ depending on the technology or service in question". (Velazquez, Kaplan y Monzon 2018) point out that user's expectations on the app, affinity for technology (technophilia) and the previous use of other transport apps are factors that influence app use intentions. Technophilia is a statistically significative factor for explaining the willingness to use a travel app both everyday and exceptional trips (Seebauer, Stolz y Berger 2015).

Travel app developers and transport operators could focus their campaigns to strengthen the travel app involvement and transit use on the technophiles (Seebauer, Stolz y Berger 2015), due to those are easier to engage and they may convince to others. The difficulty to approach the individual's affinity for the technology might be reduced thanks to a study of (Seebauer, Stolz y Berger 2015). They have established the validity of a technophilia measure through a survey of seven questions.

 "Public engagement is important in ensuring the success of the system implementation" (Seebauer, Stolz y Berger 2015), due to "public acceptability of sustainable solutions could be triggered by public engagement". Therefore, technophiles are a proper segment to start to use the apps. Psychological involvement is related to the social benefits perceived, and the hedonic and utilitarian too (Fang et al. 2017).

Regarding sociodemographics, the age is a factor that explains the willingness to use a travel app (Seebauer, Stolz y Berger 2015). (Dickinson et al. 2017) tested a collaborative travel app, and age emerges as a smaller barrier to app adoption. In addition, (Seebauer, Stolz y Berger 2015) found that technophilia attribute allows more precise customer segmentation than its sociodemographic proxies age and gender.

According to (Fang et al. 2017), both app design and performance attributes are important factors for the use adoption. (Andersson, Winslott Hiselius y Adell 2018) agreed that appealing design is an essential factor for app usage and (Dastjerdi et al. 2019) remarks that design needs to be implemented from an user's perspective.

In addition, there are some technological factors that also influence to use the apps. Relative advantage is the name of the degree to which an innovation is perceived as being better than the previous ways of performing the same task and (Fang et al. 2017) affirm is a factor that influence potential users to app adoption. Other significant technical factor is what is called as app portability, that is related to use the app through the different mobile operating systems (Android, Mac Os, etc.) (Rogers 1995).

4. DISCUSSION AND CONCLUSIONS

In the last decades, governments have been applying different types of intervention programs in existing transport systems, besides large investments to upgrade service quality, in order to reduce car use. But these interventions have produced usually small impacts.

The advent of smartphones could overcome these limitations and travel apps are a promising tool. Some objective key aspects of travel apps that can improve the current information is manyfold:

• Apps provide a lot of information about travel alternatives (both real and non-real time). Non-users tend to have a notable misperception about public transport and travel apps could easily provide accurate, useful information. Real-time information may be a powerful tool provided by apps and this real time information may be highly enriched if it could reinforce the operators' information with information created by the very users.

- Apps provide personalized advice, based upon registered information. A plan for commuting over a period (for example, each week) is known to be an effective measure.

As a consequence of the previous aspects, apps provide travel time and travel cost savings, usually by means of combination of different modes of travel, this including park and ride.

Apps are a tool of persuasive strategies for sustainable travel behaviour in several aspects:

- Individualized advise is an effective persuasive technique. Apps ~~can~~ provide feedback information about one's behaviour, which is a successful factor for promoting a sustainable travel behaviour.
- Social comparisons can affect notably the individual behaviour.
- comparison of behavior among travel app users could reinforce adoption

Some are strong factors for adoption:

- Curiosity is an initial strong motivation.
- Appealing design, portability and performance attributes are important factors for app adoption. Being entertaining, enjoyable and easy to use are other important factors. Self-monitoring or information sharing can be considered entertainment elements of the application.
- Privacy, and even security, could be the cause not to share information. Many users do not want to share their information. Clear policies in this field are a must.
- Expectations of increased utility (reduce travel costs, have access to more travel modes, etc.) may influence the adoption of apps.
- Social motivation is related to the social comparison and there is a possibility of competition between individuals if they share their information through social networks.
- Social acceptability may be triggered by public engagement.

Environmental motives are not important factors for adoption, although some analyses point out that having a good image of oneself influences behaviour. But compared to utilitarian motives, environmental ones are less important.

In any case, app design and implementation require some population segmentation:

There are groups of people who are more likely to use apps. These groups are suitable segments to start using the applications because they could generate public acceptance or could make an interesting advertisement for the applications. Technophiles are an obvious group to start with.

Regarding sociodemographics, age is a factor that explains most of the willingness to use a travel application. Older people are less prone to app adoption.

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