Social acceptance of alternative mobility systems in Tunis

Katharina Kilian-Yasin\textsuperscript{a*}, Melanie Wöhr\textsuperscript{a}, Cyrine Tangour\textsuperscript{b} Guy Fournier\textsuperscript{a}

\textsuperscript{a}Pforzheim University, Germany
\textsuperscript{b}Ecole Nationale d’Ingénieurs de Tunis, Tunisia

Abstract

The Tunisian capital Tunis faces major traffic challenges. Traffic jams and pollution affect the environment, mobility, life quality and health of its inhabitants negatively. As a developing country, Tunisia is expected to grow economically in the next decades. Conventionally, economic growth is accompanied by an increase in pollution. This article aims at suggesting mobility solutions that contribute to less pollution to circumvent the “growth/pollution” effect, and to improve people’s mobility. We suggest an inter-suburb E-Minibus system. To evaluate the chances of successful implementation of this solution, social acceptance of innovative forms of mobility and the E-Minibus system are analysed.

1. Introduction

The metropolitan area of the Tunisian capital Tunis with its suburbs and surrounding villages - Greater Tunis, or Grand Tunis - is a region with around 2.7 million inhabitants (INST, 2014). As many large cities, and especially capitals in centrally governed countries, Tunis has very dense traffic with massive congestion occurring mainly throughout rush hours, and with high air pollution caused by innumerable vehicles’ CO\textsubscript{2} emissions. Traffic density...
accumulates in the inner city because of many persons commuting from and to the outer areas of Greater Tunis through the city centre. Traffic jams cause high private and social costs such as time loss, noise, air pollution, health and life quality impairment (Abott & Small, 1994). As a developing country below the economic development stage of emerging countries such as the BRICS states, Tunisia is expected to grow economically in the next decades. While economic growth conventionally implies an increase in environmental pollution, early action could contribute to decoupling economic growth from pollution (Von Weizsäcker et al., 2009). Our research aims at suggesting mobility solutions that contribute to circumventing the “growth/pollution” effect, and to improving the situation for people in Greater Tunis. This research is an academic first for the North African region, especially for Tunis. There are very few comparable studies. Kiermasch`s (2012) study for the German city of Oldenburg is partly comparable.

In this article, we describe current mobility issues that individuals face while circulating in Greater Tunis, and identify specific challenges as a basis for suggesting viable solutions. The main interest of our article, however, is not to analyse feasibility, to calculate costs, or to compare different suggested options, but the social acceptance of such innovative mobility solutions. It is our assumption that alternative innovative mobility solutions can only be effectively implemented if they are accepted by the potential users in their specific socio-cultural context. It is therefore crucial to find out about the potential users’ concerns and attitudes towards mobility before introducing solutions, which may be identified as very efficient factually, but might not be accepted socio-culturally. The research challenge with assessing the social acceptance of future solutions or technologies is that one has to enquire about an abstract issue the respondents do not have actual experience with. In order to minimize this limitation, we have designed our research to cover both general attitudes towards mobility and mobility innovations, and have chosen one particular innovative solution, namely an inter-suburb E-Minibus system, as one exemplary specific model the respondents can concretely picture themselves travelling with. The reason for suggesting this E-Minibus system results from an assessment of the traffic situation and infrastructure in Greater Tunis prior to data collection on social acceptance. The E-Minibus system could alleviate some traffic pressure and reduce CO₂ emissions. Representing a factually efficient and environmentally friendly mobility solution, it serves as just one solution among other possible options to assess social acceptance in the specific context of Tunisia and the metropolitan area of Greater Tunis.

In the present article we will first address the current traffic situation in Greater Tunis and describe the difficulties that people are facing now, and those that are expected to increase with economic growth in the future. Several research questions evolve from this problem definition, namely, what are the major challenges and needs for improvement, what could a mobility solution that contributes to improvement look like, and, as our main research focus, how would this solution be socially accepted?

In the next section, we will present the theoretical foundations this article is based on when referring to mobility, social acceptance, and the specific context of a developing country in economic transformation. We will then describe the applied methods, and outline our research design.

This is followed by presenting the collected empirical data, evaluation and discussion of research results, and finally a conclusion with transferable findings containing recommendations on how innovative mobility solutions should be designed in order to be accepted not only in theory, but also possibly adopted in practice.

2. Problem definition and research questions

During field work in an earlier research project in Tunisia which the first author of this paper headed, it became evident that the capital Tunis is Tunisia’s major hub for industry as well as national and international transport. The traffic situation in Greater Tunis very much affects the transport of goods, as well as public and private mobility. This situation is a major concern for all people affected due to related pollution. Clearly, with different economic, political, and social conditions, mobility research results concerning Europe or the USA cannot simply be transposed to the Tunisian context. Therefore, the issue of social acceptance of innovative mobility systems for individuals in Greater Tunis became the focus of the next research project (2015/2016) with the following research questions:

- What are the major challenges and needs for improvement concerning mobility for individuals in the metropolitan area of Greater Tunis?
- What could an exemplary mobility solution that contributes to improvement look like?
- What are the main criteria for social acceptance of innovative mobility solutions?

In the following, we will demonstrate how we proceeded to answer these questions, and present the research results.
3. Theoretical foundations

3.1. Economic status of Tunisia: a developing country

There are diverse methodologies and debates concerning the classification of countries according to their economic development status, and debates about the definition of development in general (see e.g. Nohlen & Nuscheler, 1993). The United Nations offer the categories of “Least Developed Countries (LDC)”, “Developing Countries”, “Economies in Transition” and “Developed Economies”. Here, Tunisia is classified as a developing country and has moved from the sub-list of “lower middle income” countries to that of “upper middle income” countries in 2011 (UN, 2012) and has remained there in 2014 despite the still not fully settled political transformation which had started with revolutionary upheavals in January 2011 (UN, 2014). While growth is not expected to be fast, Tunisia still has the prospects of experiencing steady economic growth resulting in growing numbers of individuals who can afford to own a private car, especially in the metropolitan agglomeration of Greater Tunis. This will lead to even more traffic density and pollution in the future, if no attractive and affordable alternatives are offered. Young academics in the capital are most likely among the aspiring consumer groups who will be in the position to afford an individually owned car. It is therefore crucial to find out about the motivations, concerns and priorities of such target groups to assess the acceptance of alternative innovative mobility solutions contributing to fewer traffic jams and CO$_2$ emissions, and to attract these target groups to such solutions. The main foremost option to consider is to improve efficiency and acceptance of public transport where fewer vehicles move more people. However, statistics show that over the last few years the usage of public transport in Greater Tunis has decreased from 68% in 1977 to 28% in 2011 (TRANSTU, 2015), with a corresponding rise in private vehicles. This shows that increasingly people can afford to own and run a car, and that this is preferred to public transportation. For the case of Tunisia, it has been established that pollution through CO$_2$ emissions is a result of and not a precedent of economic growth so that policies to reduce CO$_2$ emissions could be introduced without hampering economic growth (Fodha & Zaghdoud, 2010). In our article, we attempt to find out whether and how people can be attracted to mobility solutions with lower pollution and congestion.

3.2. Mobility

People need to have access to goods, services, activities, and other people in order to be actively involved in social life. Despite home delivery services, internet purchasing, and social media, this access mostly still requires travel (Suen and Sen, 1999, p. 97). The original definition of the term “mobility” (lat. “mobilitas”) is frequently mixed up with the term “traffic”. “Mobility” in its original meaning denotes the spatio-temporal movement of things and beings, whereas the term “traffic” captures the amount of place changes of goods, persons, data and energy within the transport network (Feldhaus, 1998, p. 43). Alongside spatial movements, mobility also includes social mobility. Combined with traffic, mobility implies the related opportunity to take an active part in social life (Petersen and Schallaböck 1995, p. 10). Suen and Mitchell (2000) offer the following comprehensive definition:

“Mobility means having transport services going where and when one wants to travel; being informed about the services; knowing how to use them; being able to use them; and having the means to pay for them.” (Suen & Mitchell, 2000, p. 1)

Access to full mobility is a great freedom and gives people the flexibility to make choices. Mobility is also an existential precondition for a good standard of living because it enables people to have guaranteed access to health care, to educational institutions, to employment opportunities, to maintaining social contacts, and to prevent or overcome isolation (BMZ, 2003, p. 8).

3.3. Innovative mobility systems

Today’s urban mobility is characterized by traffic jams and increasing CO$_2$ emissions. Especially in industrialized countries like Germany, traffic consists primarily of single individuals circulating with a combustion engine driven car. Ecological and social consequences are emerging globally: Oil scarcity, environmental and noise pollution, congestions, global climate change, and land sealing (BMU, 2010). Innovative, that is, more efficient and less pollutant ways of being mobile, such as mobility through electric vehicles, are needed for a more sustainable future. However,
innovative mobility is far more than just new engine technologies, it is rather a question of conceptualizing mobility as a multimodal set of combinable technologies and possibilities (Foćik & Proff, 2014). Electric vehicles are just one, albeit significant, element in such innovative mobility concepts. Future mobility concepts as currently discussed and researched have their focus on urban mobility, as urbanisation is increasing on all continents (Purvis, 2015). In most cities today the main traffic load is caused by privately owned combustion engine driven cars (Hüttl et al., 2010, p. 12). A seemingly paradoxical phenomenon exists in post-industrialized countries: On the one hand the car is losing its image as a status symbol among the younger generation, and there is growing interest in “cars on demand” (Rieckmann, 2011), on the other side individuals wish to be highly mobile. There is a trend towards the paradigm of “using instead of owning” (Rauch, 2013). In the light of the steadily increasing negative environmental, health and life quality impacts, and the technological possibilities for smart combination and coordination of mobility solutions, innovative mobility has become an important field for research and development.

As there is no generally agreed definition of the term “innovative mobility” yet, we will define it for the purpose of this study as a combination of three categories of alternatives to privately owned combustion engine cars: alternative power train technology, alternative mobility concepts, and alternative business models for mobility.

3.4. Social acceptance

Acceptance of an innovation is the precondition for making use of this innovation. In literature, a distinction between acceptance and adoption is made, acceptance denoting a positive intentional attitude towards the innovation, and adoption denoting the behavioural level of taking action by actually using it (Bagozzi & Lee, 1999). The negative attitude in this model, non-acceptance, is resistance, and the negative behavioural consequence of it, non-adoption, is rejection (ibid.). Acceptance does not automatically lead to adoption, but without acceptance adoption is highly improbable in areas where consumers and users have the freedom to make choices. It is therefore crucial to assess the acceptance of an innovation to predict whether it will be adopted, and to find out about the criteria for a high level of acceptance as a basis for sustainable adoption. Only then can innovations be designed in a way that people are motivated to adopt them (Jordan et al., 2015).

Acceptance describes the relation between an acceptance subject (e.g. the potential user of an alternative mobility system) and an acceptance object (e.g. the alternative mobility system). This relation is interdependent with the surrounding context it is embedded in (Lucke, 1995). Consequently, research on acceptance has to take context into account. The macro context in our study is the region of North Africa and Tunisia with its political, economic, and legal conditions, the meso context is the metropolitan area of Greater Tunis, and the micro level is represented by the attitudes and concerns behind accepting or rejecting mobility solutions according to the Greater Tunis inhabitants’ social values. We term the key aspect of our understanding of contextualized acceptance as “social acceptance” and propose a mixed methods approach to do justice to the complexity of our research subject.

4. Methodological approach

We identified three main research areas for the assessment of social acceptance of innovative mobility systems in Greater Tunis, which we assessed with various methods:

<table>
<thead>
<tr>
<th>Assessment methods for social acceptance of innovative mobility systems in Greater Tunis</th>
<th>Research focus</th>
<th>Research method</th>
</tr>
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<tbody>
<tr>
<td>Tunisia/Greater Tunis</td>
<td>Desk research, expert interviews, participant observation</td>
<td></td>
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<tr>
<td>Greater Tunis infrastructure, topography, traffic flows, public transport networks</td>
<td>Desk research, expert interviews, participant observation, exploration (riding on several collective taxi lines to explore routes, stopping points, schedules)</td>
<td></td>
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<tr>
<td>Individuals’ social acceptance: general tendencies, specific motivations</td>
<td>Broad-scale overview of social acceptance tendencies: Quantitative questionnaire survey, In-depth insight into motivations and concerns: Semi-structured qualitative expert interviews</td>
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While technology or innovation acceptance research is dominated by quantitative survey studies (Wu, 2012), the nature of our research questions implies quantitative and qualitative aspects. Deductive quantitative survey research has the strength of representativeness, generalizability, uncomplicated evaluability, comparability of results, and decreased complexity through data reduction (ibid.), while qualitative methods such as in-depth interviews, informal conversation, and participant observation offer insight into contextualized “Why” and “How” of social acceptance (Denzin & Lincoln, 2011).

We decided therefore on a mixed methods approach in which not only one of the research paradigms compensates for the limitations of the other, but both paradigms’ methods are continuously used for mutual refinement in an iterative process of research design development, and to mix methods within one research instrument, e.g. by inserting open-ended qualitative questions into the quantitative questionnaire, or combining a deductive and an inductive approach in a semi-structured interview guideline. Synergies between both paradigms are utilized for enhanced in-depth interpretation of data and to obtain contextualized comprehensive findings. The aim of the study was not to achieve quantitative representativeness but to reach a certain quantity of responses to embed the qualitative findings in a more general context. Vice versa, in our mixed methods approach, we used qualitative data not only to support and deepen but also to extend the quantitative data and hence to increase the validity of the results.

5. Research design

In the starting phase of the research project, a draft questionnaire and guideline for a semi-structured interview about expectations towards mobility in Greater Tunis were used with four persons to both specify the research subject of the project, and to test the questions in order to refine them for the later questionnaire and interview guidelines.

The next step was to conduct desk research to gain an overview of the environment of Tunisia and Greater Tunis. The research focus was on collecting and synthesizing relevant information on political, economic, legal and socio-cultural environment conditions related or relatable to mobility in the metropolitan area of Greater Tunis, and to obtain a clear picture of the infrastructure, topography, traffic flows and public transport networks. Identification of the problem followed from this, defining the main critical points causing massive traffic jams during peak hours, and high amounts of CO₂ emissions in the city.

At this research stage we could demarcate the target group of potential users of innovative forms of mobility, and hence, the target group for our research on social acceptance. As it is mainly the group of academically educated younger people between 20 and 35 who do not yet possess but are the most likely to find adequately paid work and afford a private car in the future, we identified this group as the one with greatest potential and flexibility to be possibly attracted to environmentally friendly alternatives.

Afterwards, a previously non existing comprehensive public transport map, including collective taxi routes, was drawn to gain an overview of the public transport routes. This map made visible where there is a need and potential for adding attractive public transport solutions to alleviate congested areas. To complete this map, active exploration of collective taxi routes became necessary, because until then, no schedules and network of routes of collective taxis had been documented. The map revealed that there is a concentration of public and private mobility systems in the inner city, whereas there is a lack of connections between the suburban areas of Greater Tunis.

Therefore, an inter-suburb E-Minibus system responding to the identified needs was conceptualized. The E-Minibus is an electric engine driven vehicle with twelve passenger seats. It circulates on connecting routes between the suburbs of Greater Tunis to cover the needs of people wanting to get from suburb to suburb without having to cross the city centre.

At this stage, a refined guideline for semi-structured preliminary interviews was employed with a further four persons to deepen our insight into social acceptance, and to be able to specify the questionnaire survey questions.

The online questionnaire contained forty questions, to be answered in approximately twenty minutes. It was offered in English or Tunisian Arabic. The answer options were designed as single and multiple choice questions, ranking questions and matrix questions. This method of collecting standardized data was supplemented by offering free fields for answering open-ended questions in addition to three of the standardized questions. Here, respondents could use the language of their choice.
The questionnaire included four clusters with different research attributes. At the start, simple questions about current personal mobility behaviour (A) were asked. This cluster was used to gain general information about individual mobility behaviour such as choice of mobility systems for certain routes, distances to daily destinations, but also the attractiveness of the currently used mobility systems. Afterwards, questions regarding alternative mobility systems (B) including carpooling, scooter, bicycle and public bicycle rental were asked. This cluster contains short and easy questions to identify how familiar the respondents are with alternative mobility systems. To ensure that the alternative mobility systems were understood in the same way by respondents and researcher, definitions and pictures were integrated. Furthermore, one question on the topic electric/hybrid/natural gas was included. Afterwards the main part of the questionnaire about social acceptance of the E-Minibus system (C) followed. starting with a description and a picture of an E-Minibus.

This cluster was especially designed to answer the following hypotheses, which were formed in connection with the E-Minibus system:

- **H1:** A visible formal examination certificate and identification of the driver increases social acceptance.
- **H2:** Safety has a stronger influence on social acceptance than availability.
- **H3:** An electrically driven alternative mobility system increases social acceptance more than a conventionally driven mobility system.
- **H4:** An electrically driven alternative mobility system increases social acceptance more than a CNG driven mobility system.
- **H5:** A female driver increases the social acceptance among the female Tunisian users more than a male driver.

In order to evaluate which attributes are most important for the respondent, a conjoint analysis was implemented in the questionnaire. The last cluster includes personal data questions (D) like age, gender, work or living area. To guarantee that only inhabitants of Greater Tunis participated, questions about the living area were asked in cluster D.

Various channels were used for distribution of the questionnaire, such as social media (8 Facebook groups with 30,000 members), expert networks, email lists of El Manar University, and companies’ email lists.

Parallel to the online survey semi-structured interviews with a further refined guideline were conducted with four experts in the field of mobility in Greater Tunis. The goal was on the one hand to obtain technical knowledge, e.g. data, facts, relevant information and “insider knowledge” on the current mobility situation in Greater Tunis, and process knowledge, that is, insight into organizational constellations and new mobility projects the interviewees are involved in. On the other hand, the aim was to gain expert opinions on our suggested E-Minibus system, and to acquire expert valuation of social acceptance of such a solution. The guideline consequently contained questions about the following subjects: current mobility system in Tunis, alternative mobility systems, including the E-Minibus system, and assessment of social acceptance, and future of mobility in Tunis. The experts chosen were “IP UGTT”: the head of the General Federation of Transportation department of Union Générale Tunisienne du Travail, “IP University”: a Professor of Geography and Urbanization, University of Tunis, “IP TRANSTU”: the commercial director of Société des transports de Tunis, the public transportation company, and “IP TUS”: the President General Director of Transport Urbain & Suburbain, a private bus company.

All semi-structured qualitative interviews were conducted with the technique of asking both “Grand Tour” and “Mini Tour” questions (Spradley, 1979), keeping a balance between letting the interviewee speak freely about self-chosen related topics, and getting answers to the prepared questions. The interview guideline served as a guidance through the interview, however, it was possible to vary the order of the questions and to ask new questions depending on the interviewees’ answers. (Gläser & Laudel, 2010, p. 42)

Additionally, participant observation was conducted by the second and third authors by riding buses through Greater Tunis accompanied by informal conversations with bus users, which were systematically documented through field notes.

Descriptive statistical methods like tabular and graphical preparation of the data as well as location parameters were used for the analysis of the quantitative data. All data obtained was analysed with the help of the statistical tools SPSS and Microsoft Excel. A clustering in categories based on the topics of the interview guideline was conducted, correlated and evaluated for the analysis of the qualitative data.
6. Evaluation and analysis

At the time of writing this paper, the survey conjoint analysis and the systematic evaluation of the informal conversations, preliminary interviews and participant observation are still in progress, therefore we are concentrating on the evaluation and interpretation of the survey results (excluding conjoint analysis) and the expert interviews in this article.

6.1 Evaluation of questionnaire survey

In total, 155 questionnaires were answered and represent the sample, chosen from the population of Greater Tunis. The gender distribution of the sample is relatively balanced with 43% male and 57% female respondents. The employees and students user groups are represented with 48% and 43% respectively. Furthermore, 72% of the respondents are aged between 20 – 35.

The questions of cluster A – mobility behaviour, allowed information to be gained about individual mobility habits of the respondents. The results reveal that 44% of the sample own a car, 56% do not. The main reason for not owning a car is because it is too expensive (64%), only 2% prefer public transportation. Referring to mobility behavior it is remarkable that those who own a car not only use it daily, e.g. to go to work or university, but also for regular destinations like children transfers and family visits. In contrast, those people who do not own a car are dependent on the private and public bus, metro and train, individual and collective taxi mobility systems. However, 84% of the non-car owners would like to own a car. Figure 1 shows the ranking of the attractiveness of the mobility systems.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Mobility systems</th>
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<tbody>
<tr>
<td>1</td>
<td>Car</td>
</tr>
<tr>
<td>2</td>
<td>Taxi</td>
</tr>
<tr>
<td>3</td>
<td>Metro / Train</td>
</tr>
<tr>
<td>4</td>
<td>Group Taxi</td>
</tr>
<tr>
<td>5</td>
<td>Bicycle</td>
</tr>
<tr>
<td>6</td>
<td>By foot</td>
</tr>
<tr>
<td>7</td>
<td>Bus</td>
</tr>
</tbody>
</table>

Figure 1: Evaluation of attractiveness of mobility systems between the suburban areas of Tunis

The results also show that the metro, train and bus mobility systems cannot offer attributes like comfort, speed/time, reliability and safety. They are rather used for affordability or lack of alternatives. The very emotional comments predominately show the low image of these mobility systems. Further, individual taxis function as a daily mobility system, different from the occasional taxi rides in European cities.
In cluster B, the carpooling, bicycle, public bicycle rental and scooter alternative mobility systems were introduced with defined questions. The most important criteria when choosing a mobility system were found to be comfort, speed/time and safety. However, there are differences between user groups, e.g., safety is more important for women than for men. The price and CO₂ emissions attributes are ranked in the last two places. Furthermore, respondents consider it very relevant to have adequate information, like a timetable and a map with zones, and a system which could offer these would be preferred to another. In total, 81% of the respondents had already heard of carpooling. In general, 42% can imagine participating in carpooling with people they do not know, however 31% cannot. Figure 2a shows the reasons.

In contrast, far more people – 81% - can imagine participating in carpooling with people they know. In general, 49% can imagine riding a scooter and it seems to be especially popular among students, age 20-35, and men. In contrast, only one-third of the female respondents can imagine riding a scooter. Figure 2b shows the reasons. The results of the questions related to bicycles showed that Tunis is not a bicycle city. Thus, only 8% of the respondents ride a bicycle very often, 57% sometimes ride a bicycle and 31% do not ride a bicycle at all. Figure 2c shows the reasons. Again, gender differences can be recognized and considerably more men than women ride a bicycle. However, when it comes to public e-bicycle rental as an alternative mobility system, 54% of the respondents state they would use it, even 51% of the car owners. Further, the respondents were asked if they consider electric, hybrid and/or natural gas vehicles to be a present topic in Tunisia. Thus, natural gas vehicles are the most present topic in Tunisia (45%), followed by electric (19%) and hybrid (10%) vehicles. This result can also be explained due to the high natural gas reserves in Tunisia and already realized projects with individual taxis and buses. Hybrid mobility does not seem to be well known among the respondents.

In cluster C, the concept of the E-Minibus system was presented. In general, 84% state they would use the Minibus, only 6% would not. Even 75% of the car owner group would use the Minibus. 90% of the female respondents answered that the gender of the driver has no influence on their decision, 9% prefer a male driver. In comparison, 73% of the male respondents answered does not matter for me, and 10% prefer a female driver. Furthermore, availability, flexibility and safety were ranked as the three most important attributes of the E-Minibus system. 75% of the respondents see it as an advantage if the Minibus driver is specially trained and not allowed to drive faster than the signs allow. 77% of the respondents consider it as advantageous if the driver of the Minibus is registered and has a card with his/her name and the identification number visible in the Minibus. Furthermore, a security guard was evaluated as positive by 59%, especially women (66%) would appreciate a security guard. A price of 1,000 Tunisian Dinar (TND) is seen as appropriate for a distance of 10 km. An electric engine for the Minibus was voted in first place by 62%. Finally, there was the option to choose between the alternative mobility systems introduced and to vote which one is preferred between the suburban areas of Greater Tunis. The E-Minibus is in first place with 55%, followed by carpooling with 23%, public bicycle rental with 12% and scooters with 9%.
6.2 Evaluation of expert interviews

Four expert interviews were conducted. IP TRANSTU explained that the public transportation system is not satisfactory for the mobility needs of the population of Tunis. The insufficient number of vehicles leads to overcrowded buses and metros, especially during rush hour. Additionally, there is a lack of efficient administration and organisation, which results in the absence of timetables and information. IP UGTT stated that people do not consider public transportation as common property and therefore vandalism is very high. This contributes to a very negative image. All four experts consider the topic mobility in Greater Tunis as urgent and state that improvement is needed. Table 2 shows measures to increase social acceptance of public transportation in Tunis suggested by the experts.

Table 2: Suggested measures to increase the social acceptance by the experts

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Measure</th>
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<tbody>
<tr>
<td>Awareness</td>
<td>Peoples’ identification with public mobility systems</td>
</tr>
<tr>
<td>Security</td>
<td>Increasing security by decreasing overcrowding in buses and metros.</td>
</tr>
<tr>
<td>Intermodality</td>
<td>Developing an intermodal approach by improving connections between individual and collective transportation systems.</td>
</tr>
<tr>
<td>Common vision &amp; cooperation</td>
<td>Common vision and structure of Greater Tunis urbanisation, allowing assessment and foresight of the population’s mobility needs. Cooperation of the governorates on mobility issues</td>
</tr>
<tr>
<td>Electronic information system</td>
<td>Electronic information system to analyse mobility behaviour.</td>
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</table>

Mobility systems need to be developed especially in and between the suburban areas of Greater Tunis. Due to geographical and planning issues, the traffic flow goes through the inner city, while urbanisation takes place in the suburban areas, with increasing mobility demands. To raise acceptance, an alternative mobility system needs to offer comfort, reliable timetables, high availability and technical functionality. The experts see these attributes as crucial for a positive image of public transportation. Social acceptance is considered low regarding carpooling due to the fact that there is no sharing or ‘co’ mentality (IP TUS).

Bicycle rental and scooters are considered as dangerous because other traffic participants like car and bus drivers do not pay attention, which involves very high risks of accidents. If there were specific bicycle and scooter lanes on public roads, this issue could be solved. However, a change in mentality is still seen as necessary (IP University). Moreover, riding a bicycle is still associated with poverty by many people, which decreases social acceptance (ibid.). In contrast, our suggested inter-suburb E-Minibus system was considered a “real solution” under the condition of reliability through defined travelling times and identifiable stop stations. Furthermore, the potential of the E-Minibus was evaluated as high because it is not disadvantaged with a negative image. In order to establish a positive image of the E-Minibus system, IP UGTT stated that it should be privately instead of publicly managed. The identification and examination of the driver attributes are seen as contributing to a positive image. Furthermore, intermodality and connection to other mobility systems, especially public ones, should be implemented.

According to IP University, the market of transportation of potential users can be divided into three classes: car fanciers (approx. 5-10%) who see the car as a luxury good and status symbol, the middle class (approx. 30-40%), who cannot afford their own car, but have access to one or more cars within the family (these people do not see a car as a status symbol and are potentially willing to switch to an alternative mobility system), and the lower class (approx. 50%), who are dependent on an affordable mobility system. However, approximately 20% of the lower class could afford slightly more and possibly switch to an alternative mobility system.
7. Discussion of the results

The privately owned car is currently the preferred mobility system among the population of Greater Tunis. This is linked to the fact that public transportation neither covers mobility needs nor offers attributes like comfort, speed/time and availability. The main reason why people do not drive a private car is affordability. The results also showed that the population of Greater Tunis and even the car owners are generally open to alternative mobility systems, and there is a desperate need for alleviating street congestion and overcrowding in public transport vehicles. A large portion of the respondents does not see a car as a status symbol, which enhances the flexibility of car owners to switch to alternative solutions. The inter-suburb E-Minibus is considered to be a real mobility solution between the suburban areas of Greater Tunis. It has been, until now, an opportunity for environmental protection that so many people cannot afford an own car. To attract them and (potential) car owners to alternatives like the inter-suburban E-Minibus, it must therefore be designed, conceptualized and marketed as highly attractive, covering the main must-have priorities of acceptance: speed, availability, affordability, and as features of attraction: flexibility, reliability, safety (also in regard to serving the specific needs of female users), cleanliness, “coolness”, good reputation, stylishness.

Regarding the hypotheses, it was confirmed that a visible formal examination certificate and the identification of the driver enhance social acceptance (H1). The safety and availability attributes both have a strong influence on social acceptance, and an electrically driven engine seems to have a slight positive influence (H2 & H3). The acceptance of an electrically driven engine appears to be higher than a natural gas driven vehicle, due to prior negative experiences with gas engines (H4). The hypotheses that the gender of the E-Minibus driver influences social acceptance was not confirmed (H5). It became apparent that for most inhabitants of Greater Tunis environmentally friendly features currently do not enhance social acceptance. However, it is a good time and opportunity to attract the non-car owners to affordable environmentally friendly alternatives.

Finally, the intensive usage of the open question fields in the questionnaire indicates that people are eager to be heard, and that the topic of mobility is extremely important to them.

8. Conclusions, limitations and outlook

Due to the economic perspectives of Tunisia, it is expected that an increasing number of young consumers will be able to afford to buy a car. As Greater Tunis is the economic centre of Tunisia, increase in traffic will be concentrated there. At the same time, a significant portion of the population will still not be able to afford to buy their own car. The infrastructure of Greater Tunis is not suited to absorbing more traffic through an increase in privately owned vehicles transporting single individuals in the future as the city centre is presently already overloaded with traffic. In the categorization of megacities suggested by Priester et al., Greater Tunis would be ranged as a “traffic-saturated city” (Priester et al., 2013). Thus, for both groups, the potential car owners and those who cannot afford a car, using public transportation is the obvious solution, but massively decreasing numbers of users show declining social acceptance over the past years. Inter-suburb public transport routes would relieve the inner city.

To represent a real alternative for potential car owners, which motivates them to use public transport rather than a car, the alternative has to be attractive enough, satisfying users’ wishes for availability, comfort, speed and safety. Additionally, rides have to be reasonably affordable for this group, and if so, they could also attract the upper layer of the economically weaker group.

As our research has shown, public transport in Greater Tunis can currently not cover the needs of the population of Greater Tunis, and without changes will be even more inadequate in the future.

We have suggested a socially accepted, environmentally friendly and traffic efficient option with the inter-suburb E-Minibus system. It is clear that an inter-suburb E-Minibus system, including the more expensive e-vehicles and a network of charging stations, requires more investment than e.g. a simple enlargement of the fleet of conventional buses. One of the limitations of this article is that we have not presented a comprehensive cost calculation and comparison of several scenarios, which would be a subject for further research. But within a cost calculation, one would also have to consider the fact that with less CO₂ emissions, lower costs for the individual than with private car circulation, and a decrease in traffic density and time loss for all traffic participants, the higher investment would eventually pay off in terms of private and social costs. Less time to circulate through or around Greater Tunis for individuals and goods would positively contribute to overall economic efficiency.
Regarding the present traffic congestion and inadequacies public investment in people transportation will nevertheless be necessary. Using the insights of our research there is reason to make this investment for a solution which covers 1) the environmental necessities of reduction in CO\textsubscript{2} emissions, 2) peoples’ specific mobility needs, and 3) the criteria for social acceptance for a large group of inhabitants of Greater Tunis. The potentially higher investment for establishing the system and getting it started could either be covered by state subsidies in order to encourage sustainability, or by an intelligent public-private partnership model with the chance for a private investor to earn money with a socially accepted, attractive, and innovative e-mobility brand. If such a pioneering model is successful, it could serve as an example to be transferred and multiplied, contributing to decoupling economic growth from environmental pollution, and further enhancing social acceptance of innovative mobility. Furthermore, the mixed-methods approach of this first-time empirical study in Tunis can serve as a model for research about comparable metropolitan areas in transformation countries.

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List of Expert Interviews:

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