



UaaS App – University as a Service App: exploring the acceptability of a MaaS-like concept for a University community

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Abstract

This paper introduces the concept of UaaS App, i.e. “University as a Service” App, based on the well-known Mobility as a Service (MaaS) concept, and explores the acceptability and willingness to use a digital application capable of providing transport (and other) services offered to a university community. The case study is the University of Catania (Italy), with about 40,000 students and 2500 employees. An online survey was conducted to analyse potential user mobility habits, propensity and preferences towards different services proposed by the app. A Multiple Correspondence Analysis was also performed to find clusters and correlations among variables and derive useful information on the target users of a MaaS-like service for a University community. Results show a general interest but also highlight some weaknesses that should be addressed to improve the efficiency of the services offered by a MaaS-like application.

Keywords: Mobility as a Service; shared mobility; University mobility; user preferences.

1. Introduction

The increasing rate of urbanization of cities is exacerbating old problems and leading to new challenges that need to be addressed by an appropriate city planning (Tira et al., 2018). From a transport planning perspective, guaranteeing an adequate level of accessibility to different urban functions and services should be a priority for policy-makers also considering recent studies in the field of the 15-minute city to evaluate the livability of an area (Rossetti et al., 2020; Borghetti et al., 2021). New technologies can play a fundamental role towards sustainable and smart transport systems. In the sharing

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and gig economy era, new transport services pushed by technologies are rapidly emerging in our cities and changing mobility habits (Shaheen and Cohen, 2020). In this context, the concept of MaaS (Mobility as a Service) can be a cornerstone from a transport point of view, being a user-oriented digital platform that integrates traditional and new transport services offered both by public and private operators for door-to-door mobility solutions. The essence of MaaS is represented by the concept of integration at different levels, from information, payments, service offer up to societal objectives (Sochor et al., 2018). The great promise of MaaS is to reduce car ownership by offering bundled services and mobility packages able to satisfy user needs, and thus reducing the need of owning a private car (Esztergár-Kiss and Kerényi, 2020). Besides, public transport is often considered as the backbone of MaaS, complemented by different services able to bridge the first-/last-mile gap (Calabrò et al., 2022). Despite its promise and potential, and many applications that are rapidly emerging, we are still far from a full implementation of this concept at its most advanced level (Le Pira et al., 2021). This can be ascribed to some barriers regarding MaaS implementations, like regulations, application programming interfaces (APIs) and investments needs (Polydoropoulou et al. 2020) and to the debate around its actual impact on the overall transport system, e.g. on the reduction of private car ownership and transport-related emissions or the use of the space (Storme et al. 2020).

Universities can represent ideal use cases where to test innovative and emergent transport solutions. Attard et al. (2020) developed the technology for a demand responsive transport (DRT) system which is tailor-made to the mobility needs of the University of Malta. Giuffrida et al. (2021) developed a spatial approach to investigate the feasibility of a crowdshipping service with students performing the delivery using public transport or active modes in the context of the University of Catania (Italy). Marcucci et al. (2017) performed a survey to university students in Rome to understand their propensity to act as crowdshippers or to use a crowdshipping service as receivers. Le Pira et al. (2020) examined different e-grocery solutions applied and applicable in the university community. University students are typically early adopters of innovative solutions and, in general, the university community is quite homogeneous with similar interests and needs. Besides, it is easier to test solutions in campuses that can act as small cities, reached by students with different transport modes and with analogue mobility issues (Inturri et al., 2021).

Based on this premise, the aim of this paper is to investigate student perceptions towards a MaaS-like application for the University. The concept of UaaS App, i.e. “University as a Service” App is here presented and proposed to University students by exploring their acceptability and willingness to use a digital application capable of providing different transport (and other) services offered to them.

2. The UaaS App concept

UaaS App is based on the development of a smartphone application that provides useful technological services to the university community and it is also able to collect data related to their mobility. It is inspired by MaaS but goes in the direction of “City as a Service” where the city, conceived as a service, guarantees access to complete data and information and real-time services in order to improve citizen life (Clohessy et al., 2014). Many of the services included in the App were inspired by the restrictions imposed by the Italian government due to the Covid-19 pandemic (e.g. reduced capacity in classrooms and on public transport), but they can be considered valid and useful even after the end

of the pandemic. UaaS App is configured as a system able to manage the various services offered with a focus on university community.

The business idea involves two types of services, briefly described below.

1. A digital application, called UaaS App, whose main features aimed at users of the university community are:
 - a) Information and booking of university services: this includes information on the crowding of classrooms, reservation of seats in the classroom, study room, canteen and in all the educational and recreational facilities;
 - b) Journey planner and smart ticketing: by indicating the origin and destination (from/to university), the application will generate the routes available to reach the university and will also allow ticket purchase.
 - c) Access validation to urban transport services for university students with a subscription: the application will allow access to metro turnstiles and on-board identification on buses, through the implementation of a NFC (near-field communication) module. This service is optional and provided only in the case of public transport passes that have an agreement with the university.
 - d) Service Rating: users will be able to rate the quality of the services they use and add useful information for the community.
2. A data package, derived from user profiling, which includes the user's location, the activity performed, the mode of transport used as well as the reservations, and the ratings assigned to various services; all data will be anonymous recorded and will be segmented on the basis of the socio-demographic information entered by the user during the registration.

The main customers are the universities, whose community (professors and researchers, postdocs and doctoral students, students and administrative staff) constitutes the users of the application. However, the business idea is scalable towards other entities that may form similar communities (e.g. schools, companies, public entities). Users will be able to access the services offered by the app by entering with their university or institution credentials. A section for guests will also be added in order to guarantee access even to users who may not have these credentials (e.g. Erasmus students, Visitors, etc.). The final customers to whom the data packages can be sold are: transport companies (who want to know the quality level of their services); public administrations that could benefit from the data in the territorial planning processes; other private companies interested in the geolocation of the user segment taken into consideration in the design of UaaS App.

Given the novelty of such a concept, a survey was performed in one Italian University to understand the propensity of potential users to use the app. In this respect, from a market analysis it seems that while different universities have digital apps providing services to students, there are no cases of a MaaS-like application.

Next section will present the case study and the survey, including the methods to analyse the results.

3. Data and methods

In order to analyse the propensity of users to use the app, a survey was conducted via an online questionnaire to the university community of Catania (Italy). The University of

Catania (UNICT) is composed of about 40,000 students, 1,200 professors and 1,200 technical-administrative staff employees. It has several buildings scattered in the city, with some poles in the city centre (related to Humanities and Economics) and a big scientific campus in the northern part of the city attracting many users. UNICT is devoted to address issues related to sustainable mobility, adopting different strategies aimed at promoting the use of public transport and shared mobility. It is one of the few academic institutions to have tested the policy of fare-free public transport for students with unlimited access to public transport services (both bus and metro) (Inturri et al., 2020).

The idea of UaaS App for UNICT community goes in the direction of continuously improving transport services towards sustainable mobility by having a supplier of integrated services capable of satisfying the needs and requirements of users. Due to the novelty of these concepts, it is crucial to investigate the attitude of users and verify possible compatibility of their travel habits with UaaS App services. To do this, an online questionnaire was designed and disseminated for one week, from 01/10/2020 to 08/10/2020, where users were asked to provide information on their travel habits and to give a rating to questions related to the propensity to use university and transport-related services, expressing a preference on a scale from 1 to 5 (where 1 corresponds to “Strongly disagree” and 5 corresponds to “Strongly agree”).

The questionnaire was structured as follows:

- First part: socio-economic characteristics and travel habits;
- Second part: level of agreements with some sentences related to the willingness to use services offered by UaaS App;
- Third part: selection of the most important app features.

A total of 228 answers were collected and the sample was divided into university students, professors, researchers and technical-administrative staff, even if the 90% of the sample was made up of students.

Data were analysed through descriptive statistics and the Multiple Correspondence Analysis (MCA) method (Greenacre and Blasius, 2006). MCA is a multivariate exploratory statistical analysis technique aimed at analysing the existence of association patterns between qualitative variables. More in detail, MCA is used to represent and model datasets as “clouds” of points in a multidimensional Euclidean space. All features needs to be discretized and categorized. Results of this analysis are reported in a two-dimensional graph and its interpretation is based on the relative positions of the points and their distribution along the two dimensions: the closer these points are, the greater the probability that there is a correlation between the imported information. MCA has been widely used in various transport research field: risk perception and assessment (Giuffrida et al., 2018), vehicle-pedestrian crashes (Das and Sun, 2015), user’s satisfaction, accessibility and travel behaviour (Inturri et al., 2021). In this study, it was used to infer on possible patterns of users and the propensity towards such MaaS-like service.

4. Results

In this section, the most significant results from the survey are presented and discussed. The first part of the questionnaire regarded information related to travel habits. As can be seen from Fig. 1a, the trip distance is almost homogeneously distributed, except for long-

distance trips (> 10 km), which have a higher percentage (38%). From a modal share point of view, the private car is the most used mode of transport, highlighting a need to intervene in order to discourage its use. This result is most likely affected by the current pandemic situation implying both an increase in teleworking and remote teaching and a higher use of private cars due to the restrictions in the capacity of public transport imposed by the government and the fear of contagion. In this respect, data collected in 2019 (the year when the fare-free public transport was introduced) show that public transport share was 46.3% against a 26% for private transport (Inturri et al., 2020).



Figure 1: (a) Trip distances and (b) modal share of respondents.
Source: Own Setup.

In the second part, users were asked to state their level of agreement with sentences related to the propensity to use the UaaS App-related services (Table 1). Some interesting and encouraging results emerge. Most of respondents (24.9% + 39.3%) agree or strongly agree with the sentence “I would be willing to abandon the private car if I had an app that would provide reliable information about the transport system”. Besides, almost all of them are willing to use multiple modes in combination if the app provided efficient transport solutions based on their preferences. However, the 42.8% of the sample is neutral regarding statement B about environmental concerns when planning the trips. In this respect, the intention to abandon private cars is not directly linked to some sustainability concerns but probably to transport efficiency. Regarding the characteristics of the UaaS App service, a great majority of respondents would be willing to use it if it would allow to book and pay the transport services, provide information in real time, book other services for the University community (e.g. book a seat in a study room). Besides, they are willing to provide anonymous information about their activities even if the majority of them (32.3% + 22.9%) does not usually keep GPS signal active, which can be a problem since this is a tracing pre-condition. Finally, it is interesting to note that UaaS App could also allow the possibility to send some parcels via the University community, i.e. a crowdshipping service. In this respect, there is a quite good propensity to be a “crowdshipper” (32.3% + 25.4%) enabled by the app in exchange of some incentives.

Table 1: Level of agreement with different sentences related to UaaS App services.

Question	Number of users for each rating				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
A. I would be willing to abandon the private car if I had an app that would provide reliable information about the transport system	5 (2.5%)	10 (5.0%)	57 (28.4%)	50 (24.9%)	79 (39.3%)
B. When I plan my trip, I take into consideration the impact it could have on the environment	31 (15.4%)	51 (25.4%)	86 (42.8%)	38 (18.9%)	22 (10.9%)
C. I would be willing to travel with different combined transport modes if the app provided efficient solutions based on my preferences	5 (2.5%)	16 (8.0%)	29 (14.4%)	85 (42.3%)	93 (46.3%)
D. I would be willing to use the app to buy travel tickets if I could seamlessly book and pay for different transport services (e.g. public transport, car sharing)	9 (4.5%)	12 (6.0%)	32 (15.9%)	51 (25.4%)	124 (61.7%)
E. I would be willing to use the app if I received information in real time and could book services for the university community	0 (0.0%)	2 (1.0%)	32 (15.9%)	64 (31.8%)	130 (64.7%)
F. I would be willing to provide anonymous information on my activities to improve services to the university community	7 (3.5%)	15 (7.5%)	37 (18.4%)	60 (29.9%)	109 (54.2%)
G. I would be willing to anonymously share information about my position to check the level of crowding of the shared areas of the universities and the means of transport used to make the trips	10 (5.0%)	20 (10.0%)	40 (19.9%)	57 (28.4%)	101 (50.2%)
H. I always keep the GPS signal active on my smartphone	65 (32.3%)	46 (22.9%)	41 (20.4%)	21 (10.4%)	55 (27.4%)
I. I would be willing to provide information to other users that may be useful for planning their activities (e.g. delayed bus)	6 (3.0%)	11 (5.5%)	40 (19.9%)	87 (43.3%)	84 (41.8%)
L. I would be willing to act as a " crowdshipper ": a courier that "ships" small packages (such as books) from one location to another while making a trip to (or from) a university venue with some incentives	31 (15.4%)	28 (13.9%)	53 (26.4%)	65 (32.3%)	51 (25.4%)

In addition to the previous questions, a list of app services was shown to respondents, and they were asked to choose the three most important ones. Results confirms the importance of having real-time (but also static) information on the transport system, as well as the level of crowding of the shared spaces of the university community and public transport. Once again, it must be emphasized that the questionnaire was administered

during the pandemic, so the results related to the crowding of the classrooms should be carefully interpreted. In general, users are more interested in receiving than providing information. Besides, even if most of respondents would be willing to act as crowdshipper, they see this app functionality as the least important. However, this can be ascribed to the novelty of such a concept, which should be deeply investigated both from a service design and user propensity points of view (Giuffrida et al., 2021; Marcucci et al., 2017).

Table 3: Most important functionalities of UaaS App selected by users.

Own setup.	
<i>Functionality</i>	<i>N. times the service has been selected</i>
Real time information on transport system	183
Information on the level of crowding of shared spaces in the university community and public transport	136
Static information on transport system	116
Possibility of booking combined transport services	79
Possibility to pay in advance combined transport services	77
Possibility to give feedback on services	35
Possibility to provide information on services based on the personal experience	31
Receiving incentives for being a crowdshipper	44

Finally, an MCA was performed to find some correlations and patterns regarding general characteristics of users and their travel habits, and including two questions related to the willingness to perform multimodal trips via the app (Question C) and to the willingness to book and buy travel tickets via the app (Question D).

Fig. 2. shows the joint category plot with the distribution of the coordinates referring to 6 variables (age, gender, type of occupation, mode of transport, location of the university building and its distance from the respondent's home), questions C and D, categorized according to the answers. The MCA analysis revealed four clusters.

Cluster 1 is related to the highest willingness to use the app (for multi-modal trips and for payments as well) and includes those who usually travel for long distances (> 10 km) by private cars. This type of users would benefit the most from the UaaS service, encouraging a modal shift towards other available transport options.

Cluster 2 is somewhat bigger and sparser with respect to the previous one. It includes those with a medium-high propensity to use the app (older male students), travelling for medium-long distances (ranging between 2 and 10 km) to reach the university campus that is in the city outskirts.

Cluster 3 and 4 consist of respondents with a medium-low willingness to use the service. They combine young active mode travellers, who usually travel short distances to reach the university, and those who use public transport. Presumably, they do not see a huge advantage in using the app, since they currently rely on sustainable transport modes.

We can infer from the MCA that travel distance is positively correlated to the willingness to use MaaS solutions. Indeed, the underlying intention of respondents seems to find effective alternatives to private transport, which has currently the largest cut of the

modal share among university students. This is an interesting and encouraging result that would confirm the role (and big promise) of MaaS to reduce private car use and ownership.

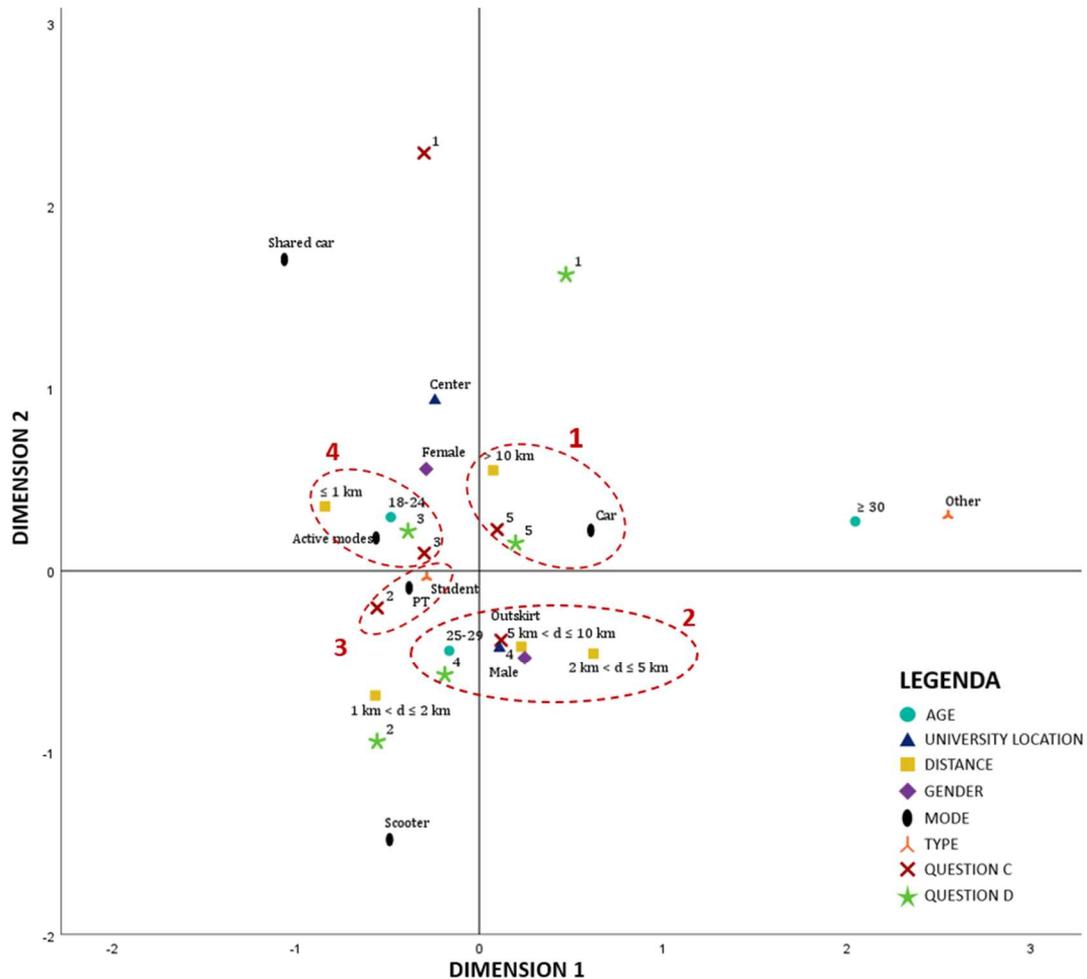


Figure 2: MCA involving general characteristics and travel habits of users and Question C and D

Source: Own Setup.

In summary, results demonstrate a propensity of the university community towards the use of UaaS App, and allowed highlighting the weaknesses that require intervention in order to improve the efficiency of the services offered by the app.

5. Conclusions

This paper presented the concept of UaaS App, a mobile application based on the Mobility as a Service paradigm aimed at improving the service quality of a university community, allowing to take advantage of combined transport (and other) services. The university community can be considered a good testing ground for such an innovative solution; furthermore, there is an added social value in the attempt to raise the awareness of the community towards more sustainable behaviours. In order to evaluate the feasibility of such a concept, a preliminary survey has been conducted to assess the propensity of

university members towards the use of the service in the case of the University of Catania (Italy). In general, results from the survey show a general interest towards the application and a willingness to change own mobility behaviours (especially to abandon the private car), if a reliable alternative is proposed. Besides, respondents showed a general willingness to collaborate by providing information (both anonymously and interactively) for the improvement of the services offered to their community. The data coming from the application can be of support to universities, public transport companies and local administrators: through the analysis of the user behaviours and choices, decision-makers can design solutions to improve the services offered. However, problems related to the unwillingness to be traced via GPS can arise and should be adequately managed. In general, information (both static and dynamics) are considered the most important characteristics of the service. Besides, from a cluster analysis performed via the Multiple Correspondence Analysis method, it results that users travelling longer distances by car would be more willing to use the app.

These results, despite preliminary, are encouraging to support the design and implementation of UaaS App as a tool for Universities to change the mobility paradigm of their communities and improve the quality of the services provided.

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