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Listening to users' personal privacy concerns. The implication of trust and privacy concerns on the user's adoption of a MaaS-pilot

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ABSTRACT

Mobility as a Service (MaaS) refers to the concept of integrating new mobility services electronically, thereby enabling users to access various public and private transport services via a single digital platform. Through MaaS, service providers aim at developing an integrated service that caters to various demands by mobility users. Personal data such as travel behavior is key in this context, because it allows the development, customization, and personalization of mobility services. Hence, for MaaS to become successful, service providers need to collect users' personal information, and users need to accept data collection. In turn, privacy concerns represent a potential hurdle for the success of MaaS. Therefore, understanding privacy concerns from the users' side can help MaaS providers to increase the users' willingness to share their information. This study aims to add on to earlier research findings on privacy concerns by shedding light on new dimensions emerging from the MaaS service. Understanding privacy concerns from the users' side is key in that regard, as it may enable improved service and system development. A sequential mixed-methods approach is used to collect, analyze, and "mix" both quantitative and qualitative research methods. The primary findings are as follows: (1) Privacy concerns specific to the mobility data collection context exist; (2) users are not necessarily personally worried about their privacy even though they claim privacy is an issue; (3) in contrast to traditional privacy thinking, users' trust in mobility service providers may override their privacy concerns. The study's results indicate trust is the key to MaaS adoption. Policy recommendations are explored in the end.

1. Introduction

Mobility as a Service (MaaS) integrates different forms of mobility, for example electric bicycles, bus, ferry, and shared cars. Via a digital platform or interface it enables users to plan, book, and pay for multiple types of mobility needs. Ideally, in order to offer user centric mobility services, MaaS allows for personalization and customization (Alyavina et al., 2020; Utriainen and Pöllänen, 2018; Jittrapirom et al., 2017). However, despite numerous potential benefits and advantages, progress from MaaS pilots to large-scale implementation has been relatively slow (Karlsson et al., 2020). Data-related issues are a key barrier to the new technologies (Rohunen & Markkula, 2019). Particularly, it is the users' technology acceptance that largely determines the development of MaaS (Jittrapirom et al., 2017). In order to develop mobility systems that are responsive to end-user expectations, the underpinning technologies and data platforms must be acceptable to users. In considering this, information privacy is an area of particular relevance and interest to both end-users and service providers (Jittrapirom et al., 2018).

With the development of communication technology, the internet of things (IoT), and the increasing collection of personal data for Internet-based services, information privacy has evolved into an active socio-technological research area. However, there are gaps in the literature concerning information privacy, particularly in the area of mobility. While existing information privacy research is extensive and covers personal information privacy concerns related to personal data collecting services, the studies done in the context of data-based mobility services are scarce (Rohunen & Markkula, 2019). The literature on privacy concerns has traditionally focused on e-commerce and social networking services (see Nemec Zlatolas et al., 2022). Accordingly, this privacy research mainly focuses on the perceived risk related to disclosure of personal information while using websites or transactions. The importance of privacy considerations in the MaaS context has been raised by scholars such as Jittrapirom et al. (2018). They identified privacy as a potential constraint to meeting MaaS objectives, but privacy concerns raised by the end-users have not yet been addressed yet.

As Matembaab and Li (2018) argued, the adoption and usage of services that require personal data disclosure depend on the users' willingness to share data. Similarly, whether a MaaS system can become

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effective also depends on the users' acceptance to disclose personal data (Rohunen and Markkula, 2019). While MaaS has the potential to develop mobility services to meet users' expectations, this development relies upon users' personal information. However, users are not always willing to share their information with others; if that is the case, MaaS service providers may have difficulties developing optimized mobility systems. For example, when dealing with voluntary data disclosure related to data-based mobility services, users' privacy concerns can imply refusal of information disclosure, or limiting data collection (e.g., turning off the data collection), and thus non-adoption of MaaS solutions. Similarly, perceived risk of information privacy may cause users to provide false information or omit specific data, decreasing the quality of the data (e.g., Horne et al., 2007; Metzger, 2007; Son and Kim, 2008).

In view of the above, this study addresses the following questions: What are the dimensions of privacy concerns related to MaaS services, and what factors support or decrease users' intention to adopt MaaS service. An open question in that regard is whether users' privacy concerns directly affect their intention to use MaaS service, or whether other factors are more influential regarding users' intention to use MaaS services. Against this background, this study addresses two questions. First, it explores some of the dimensions related to privacy concerns for MaaS adoption. Second, it explores what factor best explains the intention to use MaaS. The study is organized as follows. Section two summarizes the discussion around MaaS adoption and theoretical or conceptual literatures of privacy concerns related to MaaS. Section three presents relevant models to study privacy concerns. Section four elaborates on the research design and methodology of study. Section five presents the findings and analysis, which is followed by a discussion in Section six. Finally, section seven presented the conclusion and suggestions for future research.

2. Literature review

Research about MaaS solutions started around 2016, and since then, the relevant literature has been growing continuously (Esztergár-Kiss et al., 2020). This literature covers different subjects. One of the hot topics is to explore barriers to MaaS implementation, such as i) the legislation and regulatory frameworks (König et al., 2016); ii) taxation (Karlsson et al., 2020); iii) lack of appropriate business models (Li and Voege, 2017); iv) uncertainties regarding market potential (Karlsson et al., 2020; Kamargianni et al., 2015) a lack of cooperation between key stakeholders and funding (König et al., 2016). Zhao et al. (2020) provide a good review of the critical barriers to MaaS development and implementation. However, these studies are predominantly based on the perspectives of experts/stakeholders.

There are a few studies that are user-focused and consider the users' perspective on technical features and other relevant functionalities of MaaS applications. For example, Arnaoutaki et al. (2019) deals with designing and offering suggestions for an optimal MaaS plan that matches the user's personal needs. However, rather than the user experience, the study by Arnaoutaki et al. focuses only on the packages. Schikofsky et al. (2020) focus on motivation in MaaS adoption, such as efficiency and performance, ease of use, the choices based on preferences, feeling of control, and the anticipated enjoyment. However, they overlooked the technical features of Maas applications. Based on the listed literature, a lack of research on the user's perspectives on MaaS can be identified. Potentially, this subject is of great importance to the implementation of MaaS solutions.

The current research progress enriches our understanding of how MaaS can develop and change urban mobility. However, the relevant research on the willingness of users to accept MaaS was insufficient. This study establishes a model through a survey to find out what can explain users' acceptance, and the results will provide suggestions for future promotion of MaaS".

The following subsections explore existing literature focused on users' perspectives and privacy concerns relevant to MaaS services and technical features.

2.1. Information privacy concerns related to MaaS services

MaaS enables users to provide all the necessary services for their trips, such as trip planning, booking, ticketing, payment, and real-time information through a single digital platform instead of multiple ticketing and payment operations (Meurs et al., 2020). Meeting the needs of the full potential of the MaaS service will require the user to share a significant amount of personal information. To provide efficient MaaS service requires combined time- and location-specific travel behavior data of an individual. In some cases (e.g., car-sharing), the service providers may require more targeted information (such as preferred travel modes and habits, access to a vehicle, and the presence or absence of a driving license). It would likely consist of information that could be further used to personalize and customize the service. At the same time, a user's ability to schedule payment through the service will also necessitate that the user links his or her financial information, adding another layer of data to the profile. These examples entail a detailed individual profile made through these mobility services.

Further, MaaS entails that actors in the mobility realm increasingly use combinations of these data sets for service provision, project, and network planning, modeling, and programming (Zhao et al., 2015; Cottrill and Derrible, 2015; Çolak et al., 2015). Given that MaaS platforms include various mobility services, as they provide a platform for users and may allow access to multiple service providers to specific user profile information, they may also bring to the forefront questions of user data and privacy concerns.

2.2. Perceived risk of secondary use of user's personal information and mobility information

Regarding users' personal information collected by MaaS service providers, the privacy concerns can be further described as a perceived risk. Perceived risk is the degree to which individuals believe that if they disclose their personal information, they will suffer losses caused by losing control over their personal information, for example, the secondary use of information or uncertainty related to their mobility information. The former refers to a situation where "the information collected from individuals for one purpose is used for another (Smith et al., 1996, p.171)". As noted by Solove (2006, p.520), "[t]he potential for secondary use generates fear and uncertainty over how one's information will be used in the future, creating a sense of powerlessness and vulnerability."

The latter refers to information that can reveal one's location or mobility history. In terms of data contents, mobility data includes a wide range of information such as Time, GPS coordinates, Velocity, Accelerated Velocity, Address, Texts, Video and many others. Such a variety of data sources and uses increase the possibility to identify an individual through this data, providing a sense of privacy concerns emerging in the current MaaS context. These aspects also reflect the social norms as part of the Theory of Planned Behavior (TPB) (Ajzen, 1991). Social norms refer to the shared understandings of obligatory, permitted, or forbidden actions in a group of people or a larger cultural context (Cummins, 1996). In this sense, any unexpected action to use one's information is regarded as a form of privacy invention. Several studies (Abrahamse and Steg, 2009; Guagnano et al., 1995) have discussed the positive correlation between norms and behavioral intentions in other contexts. For example, Culnan (1993) found that people less sensitive about unauthorized secondary use of information have a more positive attitude towards behavior intention.

2.3. Privacy concerns related to spatial context of the MaaS services and ownership of the service to access MaaS mobility services

The spatial difference has been identified as relevant to privacy

concerns (Donath, 2020; Clarke and Greenleaf, 2017). Donath (2020) mentioned that privacy is contextual and different from place to place. For example, one may feel more secure making a phone call in a private space than in a shared space because the protection inside the car is a natural feeling. In that sense, when one travels in a car, he moves in a "private space" that distinguishes himself from the public space and vice versa. According to Finn & Wright (2010), privacy can also be regarded as a right to be alone in a personal space (i.e., car) move freely in public space without being tracked. From this perspective, individuals' privacy concerns refer to whether they can cut themselves from the public while moving from A to B and have no fear of identification, monitoring, or tracking while traveling. Now that private space is connected to public space by technology, e.g., IoT. Car users can cut themselves from the public while on the road. The private space they enjoy in the vehicle distinguishes them from bus users who move among public members. Therefore I tend to understand whether privacy concerns of space may lead users to choose different mobility services.

On the other hand, ownership of a device to access mobility services also has something to say about privacy concerns. For example, the study of Derek (2017) identifies the different attitudes towards tracking related to whether one has ownership of the car. He found empirical evidence showing that car owners are less willing to be tracked than shared-car users. Further, Acheampong and Siiba (2020) found that car ownership has something to do with privacy concerns, which has implications on one's intention to choose among different mobility services.

3. Technology acceptance models and privacy concerns

The literature review shows the need for a study on how privacy concerns affect users' acceptance of MaaS. Up until now, no such study has been carried out. It is therefore largely unclear whether and to what degree the issue of privacy influences the acceptance or rejection of MaaS. Different ways to understand why people accept or reject new technology regarding privacy concerns have been proposed (e.g. by Alberto Castañeda et al., 2007; Dinev and Hart, 2004; Malhotra et al., 2004; Stewart and Segars, 2002; Smith et al., 1996; Culnan, 1993, Ajzen, 1991). Among all the theories, the technology acceptance model (TAM) has proven to be one of the most potent theories (Venkatesh, 2000).

To evaluate the relationship between privacy concerns and the acceptance of MaaS by transport users, this study uses an adjusted version of the TAM model. The following subsections explain the variables that were operationalized by the use of the TAM model. This concerns the relationship between privacy concerns, trust, and the intention to use MaaS. Moreover, the user groups that were included in the study are being detailed.

3.1. Perceived ease of use

TAM is an adaptation of the theory of reasoned action (TRA) by Fishbein and Ajzen (1975) and mainly used for testing user acceptance of information technology (Davis et al., 1989). Davis (1989) hypothesizes that system use is directly determined by behavioral intention to use (BI), which is in turn influenced by perceived usefulness (PU) and perceived ease of use (PEU). PEU, explaining a person's beliefs in using the technology, will be free of any effort (Taylor and Todd, 1995). The perceived ease of use refers to the individual's perception of effortless use of the service (Davis, 1989). Previous studies have found that ease of use is vital for acceptance, as familiarity with technology and skill to use technology are likely to be significant with various services (Park et al., 2017; Kim et al., 2017). In addition, many earlier works have established empirical and theoretical evidence that perceived ease of use directly and positively influences behavior intention to use (Dabholkar & Bagozzi, 2002; Dabholkar, 2002; Venkatesh, 1999; Szajna, 1996; Davis, 1989).

The appeal of TAM lies in both specific and parsimonious as well as easy to modify. Researchers often augmented TAM by employing new constructs to fit specific conditions in various services, thus improving the explanatory ability of the model. These constructs are also easy to understand for system developers and can be specifically considered during system development stages. Therefore this model is applied widely to solve the acceptance problem (Taylor and Todd, 1995).

3.2. Trust

Trust is an essential element of the economic framework of social exchange (Kelley, 1982; Kelley and Thibaut, 1978). Business transactions are usually carried out within the social exchange without explicit contract or control mechanism against opportunistic behavior. In that sense, the parties involved in these activities expose themselves to a complicated social environment with mass uncertainty. To ensure better rewards from economic activities, people make efforts to reduce this uncertainty and avoid the risk of being exploited (Wrightsman, 1972). Therefore, trust is seen as a key for reducing the perceived risk of the transaction, which increases the perceived certainty regarding the expectation of the trustee (Grabner-Kraeuter, 2002; Gefen, 2004). In particular, for an online environment, without reducing perceived risk from the undesirable opportunistic behavior of e-vendor, only short-term transactions would be possible (Kim et al., 2004; Pavlou and Gefen, 2004). Accordingly, trust is an essential determinant in e-commerce, including public services (Wu and Chen, 2005).

The connections between trust and Technology acceptance model (TAM) have been widely discussed in the literature, such as online-based business settings (Gefen, 2004; Gefen et al., 2003a; 2003b; Gefen and Straub, 2003; Pavlou, 2003; Saeed et al., 2003; McKnight and Chervany, 2002; Ba and Pavlou, 2002), e-health (Dhagarra et al., 2020; Pai and Huang, 2011; Holden and Karsh, 2010), online gaming (Wu & Liu, 2007) and e-banking (Suh and Han, 2002). However, different results were found among these studies. For example, Hsu and Lin (2008) have found that trust positively influences attitudes towards the blog. In contrast, the relationship between trust and attitudes towards online purchase is not significant in the study conducted by Heijden et al. (2003). In addition, the impact of trust on intention to use is found insignificant in a mobile application (Watzdorf et al., 2010), while negative correlations are found between trust, perceived usefulness, and actual usage (Chen, 2000). While MaaS is considered a particular type of e-service, the Trust and TAM model is partly fitted to this MaaS setting. At the same time, there are additional variables, as discussed below, to be included in this particular context.

3.3. Intention to use

Theory of planned behavior (TPB) underlying the effort of TRA has been proven successful in predicting and explaining human behavior across various information technologies (Ajzen, 2002). According to TPB, a person's actual behavior is directly influenced by his or her behavioral intention and in turn, jointly determined by attitude, subjective norm and perceived behavioral control toward performing the behavior (Ajzen, 1991). In that sense, under the TPB and the TAM, it is known that the attitude towards behavior is a fundamental determinant of behavior intention (Ajzen, 1991; Davis et al., 1989). Within MaaS mobility services, it is also possible to assert that a better user's general attitude towards a service will increase the likelihood of providing personal information in exchange with a specific mobility service. That says Intention to Use is a construct that mediates the impact on the willingness to provide personal information. Accordingly, an individual would not provide his personal information to a particular service provider without intention to use that service (Ajzen, 1991).

4. Research design and methodology

4.1. Guiding questions

According to the literature review and the introduction of the TAM model, users' privacy concerns related to MaaS services have multiple dimensions. All these dimensions may have implications on the user's intention to use MaaS. In the context of this study, two research questions serve to illuminate the complex issue:

RQ1. What are the dimensions of MaaS users' privacy concerns?
RQ2. What explains users' intention to use MaaS services?

To find answers to these questions, a case study was conducted. The selected case helped to illuminate privacy concerns involved in the MaaS services. The case selected for this study was a MaaS pilot launched in Stavanger, a city in Southeast Norway, in November 2019.

Most inhabitants in Stavanger use cars as the means of transportation with 57 % (Uteng and Voll, 2016). In recent years, a substantial package of incentives developed to promote zero-emission vehicles in the Norwegian market (Norsk elbilforening, 2021a), which makes Norway the leading country in electric transport adoption. Among these electric cars, Tesla is one of the most registered models while this study is conducted (Norsk elbilforening, 2021b).

Public transport is the other alternative to cars. Kolumbus administrates public transport in this area, which works towards connecting a wide range of mobility services such as car sharing with boat and bus (Kolumbus, 2019). Moreover, this area has widespread infrastructures, wireless networks, and highly educated inhabitants with IT competencies. All mentioned conditions provide advantages for developing new modes of services around the concept of MaaS. In this selected MaaS pilot project, Kolumbus (regional public transport operator) collaborated with Hyre (car-sharing service provider) to develop shared car service in line with MaaS. This project was implemented in "innovation park", which is an area far from the city center. People who work in this area must drive or take the bus to get to work. With this pilot project, users can use the same price to access bus or shared-car service via a mobile app. The service is designed in the way that the payment is determined by the distance of travel but not the transportation. Hence, this pilot offered a unique opportunity to study the users' perspective on the adoption of MaaS regardless of the economic issues and was therefore chosen as a case for this current study.

Per se, this particular case serves as an instrument to illuminate a complex issue or concern with fruitful insights. Further, Norway is a unique society where electronic payment has been largely diffused for many years, and the trust in data provision is commonly accepted. In this sense, the generalization to other contexts is disputable.

4.2. Research design

In this case study, privacy concerns related to MaaS service were studied. Particular attention was given to the explaining factors on users' MaaS adoption. The emphasis is on quantitative data collection and analysis. The research design includes a two-stage process that begins with qualitative data collection and analysis and moves to quantitative instrument design and testing (see Fig. 1).

The research design follows a sequential mixed-method approach (Creswell and Plano Clark, 2018). First, qualitative data was used to answer the first research question. In this stage of the research process, differences between user groups regarding their privacy concerns were being studied. In the literature review, It was found that the spatial context and ownership of the device to access mobility services were relevant to privacy concerns. Hence, these two dimensions help to identify-four groups of MaaS users from the selected MaaS pilot as participants for this study (see Section 4.2.1). Then, in a second stage, quantitative data was used to answer the second research question. Since the existing literature does not explain which factors have implications for MaaS user's adoption (see section 2), the second stage aims at empirically finding factors that can explain the intention of users to use MaaS.

The integration between these two stages occurs where qualitative data was analyzed and used to develop an instrument for quantitative data collection. The intention was to develop an instrument grounded in participants' views (e.g., MaaS users) rather than the use of an off-the-shelf instrument that might not opt to reflect their views. The evaluation of these data using qualitative and quantitative methods (thematic content analysis, survey, and factor analysis, regression analysis) allowed conclusions to be drawn regarding the validity of the hypotheses.

4.2.1. Stage 1: Qualitative study

In Stage 1, forty-seven semi-structured interviews were conducted between July and August 2020. The qualitative data was used for initial exploration and to see whether MaaS users' privacy concerns differ in relation to the spatial context of the MaaS service and ownership of the device to access mobility services. Participants were MaaS users

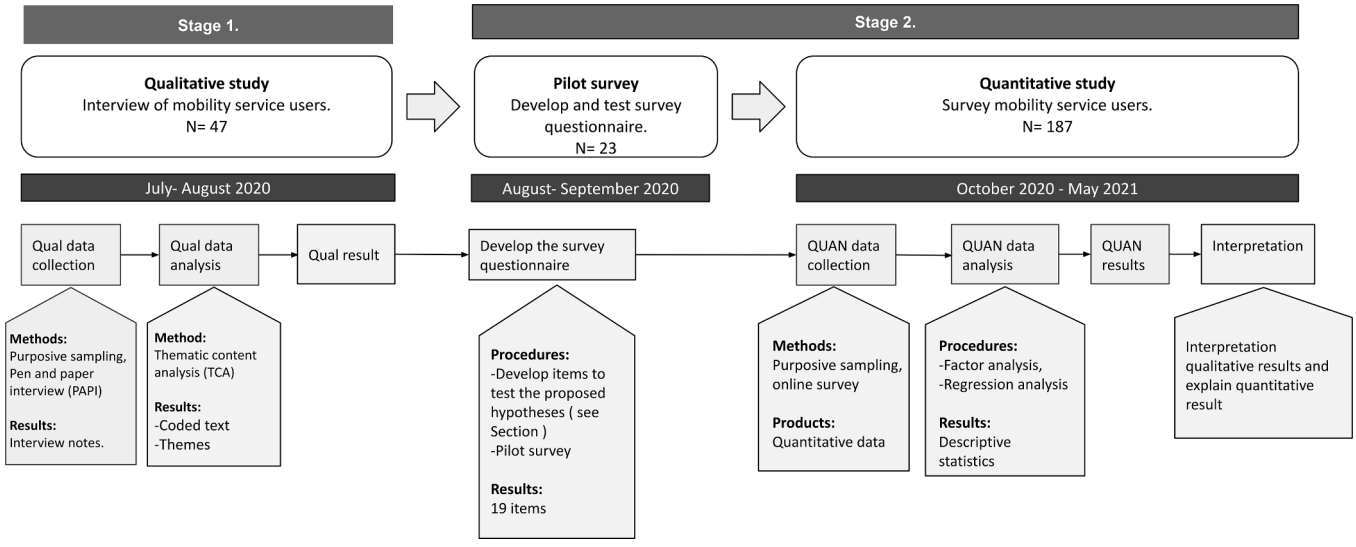

Fig. 1. Research process.

recruited from the mentioned MaaS pilot regarding the research design. Therefore, four groups of users were selected:

1. Public transport users who use mobile apps (spatial context of the service: not private; ownership of the device to access mobility: yes); and
2. Public transport users who use bus cards (spatial context of the service: not private; ownership of the device to access the mobility service: no).
3. Shared car users (spatial context of the service: private; ownership of the device to access the service: no); and
4. Tesla owners (spatial context of the service: private; ownership of the device to access the service: yes).

Accordingly, purposive sampling technique was used. As a result, there are twenty-four participants in group 1; three in group 2; ten in group 3 and 4, respectively. Since qualitative data is used for a preliminary exploration about MaaS user's privacy concerns, this process stops when no new information is discovered in data analysis. The interviews consisted of questions in the following three parts: One part is related to their experience of using MaaS mobility services in general; In the other part, respondents were asked about their perception of information privacy. In addition, interview participants' demographic information was gathered, including age, education, civil status. Thematic content analysis was used for qualitative data analysis. Several categories of the respondent's answers were generated along with the variables in the proposed hypotheses (See next Section 4.2.2). The qualitative data resulted in interview summaries, consisting of the research material organized according to the research themes.

4.2.2. Stage 2: Stage of mixing survey development

4.2.2.1. Hypothesis and measurement. According to the literature review (See Section 2.1-3) and the TAM (See Section 3), several factors influence MaaS service adoption. On the one hand, Perceived ease of use (PEU) (Park et al., 2017) and Trust (TU) (Pavlou, 2003) may positively influence users' intention to use these services, which support MaaS adoption. However, on the other hand, factors such as Perceived privacy concerns (PU) (Hsu and Lin 2016), Perceived risk of Use and Sharing of user's personal information (SI) (Stewart and Segars, 2002), and Mobility information (MI) (Pavlou and Gefen, 2004) may negatively influence users' intention to use (IU) these services which decrease MaaS adoption.

The following hypotheses were proposed and visualized as a research model for this study, as shown in Fig. 2, based on these assumptions.

Hypothesis 1. Perceived ease of use (PEU) is positively associated with Intention to Use (IU) to use MaaS mobility service.

Hypothesis 2. Perceived privacy concerns (PC) is negatively associated with Intention to Use (IU) MaaS.

Hypothesis 3. Perceived risk of secondary use of personal information (SU) is negatively associated with Intention to Use (IU) in MaaS.

Hypothesis 4. Perceived risk related to mobility information (MI) is negatively associated with Intention to Use (IU) in MaaS.

Hypothesis 5. Trust (TU) is positively associated with Intention to Use (IU) to use technology in MaaS service.

An online survey was conducted to collect quantitative data to test hypotheses 1–5. The survey was designed based on the existing literature (presented in Section 2 of this paper) and this study's stage one results. The survey contained questions on users' privacy concerns in the service adoption stage and the six constructs where items were measured on a 7-point Likert scale (from 1, strongly disagree, to 7, strongly agree). Nineteen items from previous studies were selected and modified to the context of this current study to measure the six constructs (see Table C).

4.2.2.2. Survey. The survey was conducted as part of a service adoption questionnaire for MaaS users to mitigate the possible nonresponse bias due to the disinterest in information privacy. In addition, participants' demographic information, including age, sex, and education were selected. Factor analysis was used to confirm the relationship between survey items and identify the total number of dimensions represented on the survey. Further, regression analysis was used to test the proposed hypotheses, which estimates the relationships between dependent and independent variables. This process was conducted among the MaaS users between October 2020 and March 2021, using the software surveyXact. Using selective sampling techniques, a total of 187 usable responses were obtained. This sample includes only participants with high academic qualifications and English proficiency. The sample was constructed based on the assumption that the selected participants – 240 postgraduates with a background in sustainable development[1] from the University of Stavanger – might have high intentions to support and be capable of completing the survey. This technique is a selective sampling. Therefore, higher income and higher education groups were overrepresented in the sample. However, since the purpose of this study is not to generalize the results to any specific group, this bias does not cause any conflict.

Before starting the survey, a pilot survey was conducted between August and September in 2020. Twenty-three MaaS users who were recruited randomly from the "Innovation Dock" at Stavanger, To distinguish the participants in the pilot survey from the primary one, the selected site is far away from the campus. Further participants were asked whether they are employees or students at the University of Stavanger. Only those who did not belong to these two groups could participate in the pilot survey. The sample size was not set in advance, as the purpose of the pilot survey was to improve the quality of the survey questionnaire. Hence, all items were reviewed by professors, researcher peers, and doctoral students for appropriateness and comprehensiveness. The testing and modifying of the questionnaire were based on the feedback of pre-testing participants. This process was repeated until no further changes were considered necessary. Overall, the findings from stage one and two will be present in the next section.

5. Findings

This study aimed to address the research questions through a mixed method study that explored the users' privacy concerns in a MaaS pilot. Correspondingly, the results consisted of the findings from qualitative study contributing to the quantitative study.

5.1. Stage 1: User interviews

The participants were divided into four groups regarding the spatial context and ownership of the device to access the selected mobility services (See Section 4.2.1). As a result, forty-seven interviews were conducted. Twenty-two participants are in group 1, four in group 2, and ten in groups 3 and 4, respectively. In the following, the result is presented by identified theme where the similarities and differences according to these four groups of users will be described. The interview participant's demographic background is presented in Table A.

Privacy concerns. As mentioned in Section 4.1, privacy concerns could be much different in other countries. The result of interviews shows that most respondents had at the very least a few privacy

[1] Master's students enrolled in "the energy, society, and environment," "the regional and urban planning," "the energy engineering," "the environmental engineering," "the resource, and energy management," course of study at the University of Stavanger.

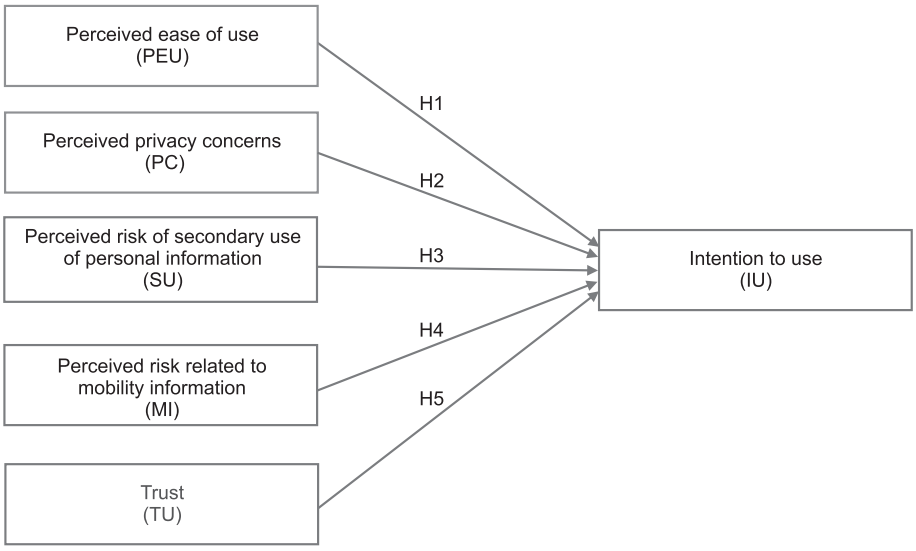

Fig. 2. Research model.

Table A
Demographics information of interviewees (N = 47).

		EV owner	Shared car	Bus
Age (no.)	60 – 69	1	0	0
	50 – 59	4	0	0
	40 – 49	4	4	1
	30 – 39	1	4	8
	20 – 29	0	2	18
Gender	Male	8	8	9
	Female	2	2	18
Civil Status	Single	2	2	17
	Partner	8	8	6
	Other	0	0	4
Education	Ph.D	2	2	1
	Master	6	4	8
	Bachelor	0	3	11
	High School	1	1	7
IT competence	Yes	3	5	2
	No	7	5	25

concerns. It was also shown that bus users were slightly less concerned with sharing personal data with mobility service providers than car users. However, this result did not show the spatial context of the MaaS services has something to do with user's privacy concerns. For example, it was apparent that young people were less concerned with sharing their data, particularly among the age group 20–29. One respondent from this group explained that she could not be bothered with evaluating data gatherings because the service providers already have a lot of her information, so it is too late to worry about it. Another respondent who belonged to this age group said she had privacy concerns about the personal information collected by the bus operator, but it was not too much.

Further, more than half of the female respondents entail concerns of their privacy higher than personal interest to use smart mobility. In contrast, the other half of female respondents argued that sharing their personal information makes it easy to use. Additionally, a few female respondents described the perceived risk of personal information as "I do not know" or "not so much as a concern" due to their lack of knowledge and experience about information privacy. In contrast, many male users could name some data security problems such as "data breaching" and "aggregate information." Meanwhile, whether the user's privacy concerns are related to the spatial context of the MaaS service, remains unclear, we will bring it further into discussion.

Moreover, the bus user group is divided into two segments according to the tool one uses to buy the tickets: bus cards or apps. Bus users who use bus cards have less privacy concerns than those who use mobile apps. However, only a few respondents use bus cards, while most use mobile apps. The other two segments – shared car users and Tesla owners – have relatively more significant privacy concerns compared to bus users. However, the interview data does not show the difference in privacy concerns between Tesla owners and shared car users. These two groups of users differ in ownership that shared car users do not own the car. Thereby, they have less option to determine data processing through consent in comparison to a car owner. All these give us an insight indicating the privacy concern is more related to information privacy rather than ownership of the device to access the mobility service.

Use and sharing of personal information. Further, most respondents reflect a high level of privacy concerns related to the theme of Secondary Use of Personal Information. We do not see the explicit difference regarding this theme caused by the spatial context of the mobility services or ownership of the device. Meanwhile, one respondent elaborated that privacy concerns were related to using the user's data. The commercial uses are mentioned among several respondents as "not acceptable," while using these data to improve the services is otherwise acceptable. While almost all respondents from the shared car segment revealed deep concerns about the secondary use of personal data, one of them mentions that this data should be used based on the contract. However, several respondents who belonged to the bus users group mentioned they did not mind. Interestingly, they belonged to 20–29 and 30–39; most were female with a lower grade of higher education. However, more than half of the female respondents also expressed negative issues concerning the secondary use of their personal information. Besides, all respondents with a higher-grade high education show a unanimous negative attitude toward secondary information. These observations made us decide to test whether perceived risk of secondary use of user's personal information has an impact on their intention to use MaaS.

Ease of use. Moreover, most respondents express their impression that MaaS services are excellent and convenient. We connected these statements to the theme of Perceived Ease of Use. More specifically, all Tesla owners express the highest positive attitude about sharing their information which can be exchanged with very good services.

Meanwhile, several opposite opinions appear from the segment of shared car users. The issues that have been specified are complicated registration and lease processes. While almost all respondents of all segments recognize that sharing information can contribute to ease of use, few female respondents of the segment of bus users do not think so. They belong to the age group of 20–29 and 30–39. However, they cannot describe the perceived risk of personal information, which indicates that they may lack relevant knowledge and experience of information privacy.

Trust. Moreover, most participants present a high level of Trust of service providers to handle their personal information in a secured manner. However, Tesla owners and shared car users have relatively low levels of trust in comparison to bus users. Many bus users express their belief that the bus operator can manage users' personal information well. The reason for the trust is diverse. For example, one mentioned company in Norway is trustworthy since they have to follow the laws (GDPR). In contrast, the other mentioned big companies like Tesla supposedly have better resources to manage that well. Meanwhile, there is no clear evidence to show the difference caused by spatial context or ownership regarding this theme.

However, a gradual reduction of trust and the increase of respondents' age is observed. More specifically, the level of trust is highest among the age groups 20–29, then moderately reduced among 30–39. In the age group 40–49 and above, the level of trust appears almost none. Besides, the male respondents of the age groups 50–59 emphasize that they do not trust that they can handle users' information well. These respondents discussed examples of risks such as data breaching, unclear purpose of data usage, aggregate information.

Mobility Information. Most respondents expressed that they have a high level of privacy concerns regarding mobility information (i.e. the concern of sharing personal mobility data, like location, time, etc.)There is no difference caused by spatial context or ownership regarding this theme. However, there are many interesting statements along this theme. For example, one respondent who belonged to the age group 30–39 mentioned it could be dangerous to reveal an individual's location information. However, he points out that a public authority can mitigate privacy concerns by securing this information. The other respondent who belonged to the 20–29 age group explained that she could not be bothered with evaluating data gatherings because of the time and effort involved. However, some consumers expressed that they relied on the law to protect their data. Another respondent who belonged to this age group did not mind sharing personal data through a company website, but only if it did not leave the website. Additionally, a respondent who belonged to the 20–29 age group was also unclear about his privacy concerns, and as such, he remained neutral on privacy concerns. The participants who belonged to the age groups 20–29 and 30–39 reflect higher personal interests than privacy concerns.

According to the user interviews, most of the interviewees (thirty-three of forty-seven) had privacy concerns in one or another. Except for the Tesla owners, The interview result did not show any clear difference between the other user segments. Of the ten Tesla owners, all had information privacy concerns, whereas six out of ten shared car users and eight out of twenty-seven bus users did not have privacy concerns. Privacy concerns did not appear apparently among the shared users during the service adoption stage, perhaps because the interviewees in this group accessed the service via their companies. However, four of them had been pondering privacy issues during their service use. Two of these users were concerned about the convenience of the service, and the other two were apprehensive about using their data for creating profiles and marketing purposes.

Although privacy concerns appeared among user segments, users were concerned about different issues. For example, some users were concerned about data disclosure, while others were concerned about their data utilization by third parties. For example, a user pondered whether somebody had access to his or her location information. The other user mentioned her concerns about privacy issues related to data disclosure to third parties and secondary use of their personal information, either in an authorized or unauthorized way. Meanwhile, many users had no clue where the data were disclosed, who had access to their data, and what purposes the data were used for.

Unexpectedly, none of the users considered information privacy concerns critical to their intention to use mobility service. However, several users mentioned that they had pondered on information privacy issues when making their decision, after reading critical comments in the media about privacy problems related to services of this kind and discussing the topic with their friends. Nevertheless, none of the interviewees considered privacy issues problematic in this service. Descriptive statistics of the interviewees' demographics and a summary of their information is outlined in Table A.

5.2. Stage 2: User survey

5.2.1. The dimensions that influence user's intention to adopt MaaS service

The demographic information of survey participants is included in Table B. The first question aims at answering whether the underlying factors that have an implication for a user's intention to adopt MaaS service tap into one or five more general dimensions. To measure the sampling adequacy for appropriateness of the factor analysis, the data were subjected to the KMO measure and Bartlett's test of sphericity. The KMO recorded a value of 0.8, and Bartlett's test of sphericity = 1875.080. $P < 0.001$, indicating the sampling adequacy for factor analysis. Because the KMO value surpassed the threshold of 0.5 (Kaiser, 1974), Bartlett's test shows that there are correlations between the variables, indicating a data reduction technique (i.e., exploratory factor analysis) is suitable to use.

To explore the factorial dimensions in the selected sample, all 19 items of the instrument were subjected to an exploratory factor analysis with varimax rotation. The maximum likelihood factor analysis is used with a cut-off point of 0.40and Kaiser's criterion, i.e. extracting components/factors with eigenvectors greater than 1.0 yielded a five-factor solution as the best fit for the data. Table 1 presents the results.

This set of items share 83.96 % variance in common (2), which indicates they are highly correlated (Comrey and Lee, 1992). Interestingly, two of the five factors obtained had almost exactly the same structure as those found in the previous study (Park et al., 2017; Hsu and Lin, 2016). These two factors are: (a) Ease of use with three subscales: PEU 1–3. This factor had an eigenvalue of 2.447 and accounted for 15.72 % of the variance; (b) Privacy concerns with three subscales: PC1-3. This factor had an eigenvalue of 2.45 and accounted for 15.85 % of the variance. The third factor Trust with three subscales: TU1-TU3 The eigenvalue of this factor was 2.9 and accounted for 18.17 % of the variance. The scales related to use and sharing of personal information with MaaS providers (SU1-4) converges into one dimension. These four scales are loaded on one factor, which can be called 'Perceived risk of secondary information', with an eigenvalue of 2. 954, accounting for 18.45 % of the variance. The scales related one's perceived risk of location or mobility information loaded on another factor with an eigenvalue of 2.52,

Table B
Demographic characteristics of participants at on-line survey (N = 187).

Age	n (%)	Education	n (%)
20–29	116 (62 %)	High school	9 (4.8 %)
30–39	47 (25.1 %)	Post graduated (MSc /MPhil)	82 (43.9 %)
40–49	18 (9.6 %)	PhD	91(48.7 %)
50–59	5 (2.7 %)	Vocational training	5 (2.7 %)
60–69	1 (0.5 %)		
Gender	n (%)	Use of Public transport	n (%)
Male	105 (56.1 %)	Yes	154 (82.4 %)
Female	82 (43.9 %)	No	33 (17.6 %)

Note. N = 187 (n (%) = the number and percentage of participants that choose each alternative to this question).

Table 1
Exploratory Factor Analysis of the Items of dimensions that influence MaaS support.

Items	Factors					Dimension
	1	2	3	4	5	
MI1	0.147	−0.105	0.205	**0.864**	−0.034	Perceived risk of Mobility information
MI2	0.371	−0.135	0.309	**0.739**	−0.009	
MI3	0.279	−0.102	0.347	**0.782**	−0.042	
UI1	**0.841**	0.081	0.260	−0.003	0.128	Perceived risk of Secondary used of information
UI2	**0.751**	−0.004	0.095	0.364	0.069	
SI1	**0.852**	0.153	0.152	0.136	0.04	
SI2	**0.765**	−0.084	0.070	0.441	0.049	
PEU1	0.058	0.177	0.072	−0.097	**0.896**	Perceived Ease of use
PEU2	0.005	0.132	0.001	−0.103	**0.93**	
PEU3	0.183	0.208	−0.102	0.165	**0.842**	
TU1	0.031	**0.959**	−0.101	−0.089	0.172	Trust
TU2	0.057	**0.968**	−0.080	−0.106	0.171	
TU3	0.058	**0.936**	−0.088	−0.098	0.187	
PC1	0.211	−0.003	**0.864**	0.184	0.062	Privacy concerns
PC2	0.166	−0.124	**0.896**	0.207	0.004	
PC3	0.130	−0.172	**0.764**	0.344	−0.107	

Notes: Extraction method; maximum likelihood; Rotation method; Varimax with Kaiser normalization. Loadings larger than 0.40 are in bold.

accounting for 15.75 % of the variance. This factor can be labeled 'Perceived risk of mobility information'. These findings suggest that the study participants perceived the structure of support of MaaS adoption by five factors. Further, scale analysis was used to estimate the reliability of scale (see Tables D1–5). The Cronbach's alpha for the entire 19-item scale was 0.84. No item appeared to be problematic in any of these tests (e.g., no double loading, Cronbach's-$\alpha > 0.7$ (Taber, 2018), thus providing no evidence for a failed translation.

5.2.2. *Explanation of user's intention to use MaaS services*

Table 2 shows the summarized results for an ordinary regression model explaining factors and its impact on the user's intention to use MaaS service.

In column A, as we assumed, an increase in ease of use is associated with a higher intention to use the MaaS service, controlling for all other factors. The value of the y-intercept (7.18) indicates the intention for using MaaS without perceiving ease of use. The results in column B indicate that lower trust in MaaS service providers leads to less intention to adapt to the service. The value of the y-intercept (2.17) indicates the intention for using MaaS without trust. Column C shows that privacy concerns negatively influence users' intention to use the MaaS service. The y-intercept (7.18) indicates the intention for using MaaS without privacy concerns. However, the statistically significant did not appear with secondary user information use. The results in column D show that the perceived risk of secondary use of personal information does not imply reduced user's intention to use MaaS services. In contrast, the perceived risk of mobility information has. The y-intercept (13.83) indicates the intention for using MaaS without privacy risk related to mobility information.

So far, except for the perceived risk of secondary use of personal information, each of the variables received at least some support. As you can tell from looking at Table 2, the results in columns A through E do not control for the other explanations. The full multiple regression model results, in which the factors can compete for explanatory power, is rectified in column F. It shows the situation where all five variables are entered in the same regression model. There, we see that the effect of ease of use on users' intention to use MaaS services is reduced in the multiple regression context- compare the coefficient of 0.18 with the multiple regression 0.01. Similarly, the effect of trust remains almost unchanged in the full multivariate framework. However, the effect of privacy concerns changes. Before controlling for the rest of the other factors, the effect of privacy concerns was (as expected) negative and statistically significant. However, in column F, where we control for trust, ease of use, secondary use of information, and mobility information, the effect flips the sign. It is now not statistically significant, which means that when we control for these factors, users' privacy concerns are less likely to affect their intention to use the MaaS service. Lastly, while the statistical significance of the perceived risk of mobility information remains unchanged in the multiple regression model, its effect on users' intention to use MaaS slightly decreases while controlling all other factors.

Table C
Questionnaire items used to measure constructs.

Constructs	Descriptions
Perceived ease of use (Park et al., 2017)	PEU1: When using MaaS mobility does not require significant mental effort. PEU2: MaaS mobility service is easy to use PEU3: Using MaaS mobility is understandable and clear.
Perceived privacy concerns (Hsu and Lin, 2016)	PC1. There is a considerable privacy risk involved in using MaaS mobility service PC2: My decision to access "MaaS mobility service" exposes me to privacy risk. PC3: Using MaaS mobility services would lead to a loss of privacy.
Secondary use of personal information (Stewart and Segars, 2002)	SU1: Service providers cannot use personal information for other purposes unless it has been authorized by the users providing personal information. SU2: When a user provides personal information to a service provider for some reason, the service provider cannot use the information for any other purposes. SU3: Service providers should not sell personal information in the database to other companies. SU4: Service providers should not share personal information with other companies unless it has been authorized by the users providing personal information.
Trust (Pavlou, 2003)	TU1: This service provider is trustworthy in handling the information. TU2: This service provider keeps its promises related to protecting the information provided by me. TU3: This service provider keeps users' interest in mind when dealing with information.
Perceived risk of mobility information (adapted from Pavlou and Gefen, 2004)	MI1: In general, it is risky to provide location information to MaaS mobility providers. MI2: There will be much uncertainty associated with giving mobility information to service providers. MI3: There is a potential loss associated with providing personal information to service providers.
Intention to use (adapted from Lee, 2005)	IU1: I am willing to use this smart mobility service IU2: I am willing to provide my personal information to the service provider IU3: I will recommend this service provider to others

Table D1
Scale analysis *Trust.*

	1st factor
Kolumbus (public transport operator) is trustworthy in handling the information.	0.657
Kolumbus (public transport operator) keeps its promises related to protecting the information provided by me.	0.685
Kolumbus (public transport operator) keeps users' interest in mind when dealing with information.	0.752
Hyre (car-sharing company) is trustworthy in handling the information.	0.818
Hyre (car-sharing company) keeps its promises related to protecting the information provided by me.	0.884
Hyre (car-sharing company) keeps users' interest in mind when dealing with information.	0.867
Tesla (electric car company) is trustworthy in handling the information	0.802
Tesla (electric car company) keeps its promises related to protecting the information provided by me.	0.833
Tesla (electric car company) keeps users' interest in mind when dealing with information.	0.761
Eigenvalue	5.585
R^2	0.62
Cronbach's alpha	0.919
N	187

Table D2
Scale analysis *Ease of use.*

	1st factor
When using MaaS mobility does not require significant mental effort.	0.899
MaaS mobility service is easy to use.	0.93
Using MaaS mobility is understandable and clear.	0.879
Eigenvalue	2.447
R^2	0.81
Cronbach's alpha	0.886
N	187

Table D3
Scale analysis *Privacy concerns.*

	1st factor
There is a considerable privacy risk involved in using MaaS mobility service	0.897
My decision to access "MaaS mobility service" exposes me to privacy risk.	0.94
Using MaaS mobility services would lead to a loss of privacy.	0.878
Eigenvalue	2.45
R^2	0.81
Cronbach's alpha	0.886
N	187

Table D4
Scale analysis *Perceived risk of secondary use of information.*

	1st factor
MaaS service provider cannot use personal information for other purpose unless it has been authorized by the users providing personal information	0.834
When a user provides personal information to a MaaS service provider for some reasons, the service provider cannot use the information for any other purposes.	0.848
MaaS service providers should not sell personal information in the database to other companies.	0.865
MaaS service providers should not share personal information with other companies unless it has been authorized by the users providing personal information.	0.868
Eigenvalue	2.91
R^2	0.72
Cronbach's alpha	0.875
N	187

Table D5
Scale analysis *Perceived risk of mobility information.*

	1st factor
In general, it is risky to provide mobility information to MaaS mobility providers.	0.897
There will be much uncertainty associated with giving mobility information to service providers.	0.94
There is a potential loss associated with providing mobility information to service providers	0.878
Eigenvalue	2.45
R^2	0.81
Cronbach's alpha	0.888
N	187

6. Discussion

In the literature review a significant gap regarding privacy concerns related to MaaS service has been identified. Two aspects are crucial. The first is related to the mobility service. The literature suggests that the spatial context of a service (i.e., one can travel alone in a car or travel without distinct oneself from the other by public transport), and the ownership of the device to access the mobility service are relevant to one's privacy concerns. The second aspect is related to information. MaaS required information disclosure from the users to enable the services. It is widely believed that decline in data disclosure due to privacy concerns will result in a decrease in data quality and incompleteness of data. It is, in turn, believed that privacy concerns are not favorable for the development of MaaS. Meanwhile, different studies point out that trust is more influential in some cases than privacy concerns. There is, hence, indication that the role of privacy concerns may be overstated. The result of this research indicates that there is indeed no clear evidence to support that privacy concerns among MaaS users are related to the use of the mobility service. Instead, the results suggest that users' privacy concerns in MaaS relate to the information and personal data disclosure. Surprisingly, trust - not privacy concerns - seems to be the key to users' intention to use MaaS.

These findings roughly cover the identified gap in the privacy literature. Yet, so far, there were only few studies that had a similar attempt to cover this gap, for example, Rohunen and Markkulas (2019) who aimed at exploring the differences in privacy concerns between private and company users in a MaaS pilot. Earlier, Pell et al. (2012) studies road users' acceptance of sharing their location information collection via company-owned and private cars. None of these works find any apparent difference in privacy concerns between user groups. Interestingly, both of them conclude that a large number of MaaS users with no particular personal privacy concerns might be explained by trust. This current study adds empirical evidence to support the same conclusion.

Another explanation of the results is the "privacy paradox phenomenon", which refers to the phenomenon that users do not necessarily limit their data disclosure despite expressing concerns (for more detail, see Acquisti et al., 2015). The findings show that many MaaS users are aware of privacy issues, but it does not necessarily affect their intention to use MaaS. Hence, the difference between the use of services and personal privacy concerns possibly reflects the "privacy paradox phenomenon". This phenomenon may be explained by the users' expectation to receive better mobility services. Many interview participants mentioned their willingness to disclose their mobility data to make the services become more convenient. It indicated that increasing the quality of services such as increasing users' perceived ease of use, might contribute to users' willingness to open data collection and enabling the development of open data-based services. This corresponds with Bandura (1986) who suggests perceived ease of use (PEU) is hypothesized to

Table 2
Factors that have implication on user's intention to adopt MaaS services.

Independent variable	Parameter estimate (standard error)					
	A	B	C	D	E	F
Ease of use	0.18* (0.6)	–	–	–	–	0.01 (0.036)
trust	–	0.21** (0.01)	–	–	–	0.198** (0.014)
Privacy concerns	–	–	−0.21** (0.05)	–	–	0.006 (0.042)
Secondary use	–	–	–	−0.04 (0.46)	–	−0.019 (0.03)
Mobility information	–	–	–	–	−0.217** (0.048)	−0.1* (0.039)
intercept	7.18** (1.05)	2.17** (0.5)	14.23** (0.93)	11.58** (1.14)	13.83** (0.78)	4.474** (0.95)
R^2	0.55	0.67	0.093	0.006	0.13	0.707
N	187	187	187	187	187	187

Notes: The dependent variable is the user's intention to use MaaS service.
Standard errors in parentheses.
* $p < 0.05$; **$p < 0.005$. (Two-tailed *t*-test, despite directional hypothesis).

positively influence a person's favorable outcome expectation toward accepting innovative technology. Although the current study field to find evidence to support this hypothesis, it may be just limited by the selected samples. Hence, it does not mean PEU should be ignored in future research.

Finally, while Trust appears to be the key to user's adoption of MaaS, this current study did not look into the interrelation between Trust, Ease of use and Privacy concerns and how they affect user's intention to use MaaS. This represents an important limitation that needs to be addressed.

7. Conclusion and policy recommendations

Personal data such as travel behavior is the key to the development of Mobility-as-a-service because it allows the customization and personalization of mobility services. Hence, service providers need to collect users' personal information, and users need to accept data collection to enable these services. However, the ICT and data disclosure of MaaS make users vulnerable to cyber threats. Therefore, it is vital to understand whether privacy concerns impact individuals to compromise their willingness to use MaaS.

By exploring the underlying factors of MaaS users' intention to use the services, this study found that the relationship between data disclosure and users' intention to use MaaS is not as straightforward as described in existing privacy theories. Put differently, privacy concerns do not affect the intention to use MaaS directly. Instead, trust is the key determinant of users' intention to use MaaS. These findings suggest that, while privacy concerns do have implications on users' acceptance of service in many other studies, the broader social and cultural context in which this occurs needs to be taken into account. In societies where trust level is high (i.e., this current study is a case in Norway, a high trust society), privacy concerns do not necessarily become a hurdle of MaaS development. In contrast, where trust is generally low, the development of MaaS may be at greater risk due to individuals' privacy concerns.

Thus, increasing the use of MaaS requires lowering the barrier to accessing it. Privacy concerns do not play much of a role in that regard. Rather, based on the findings of this study, it can be said that enhancing the sense of trust between MaaS service providers and users is the key to large-scale MaaS adoption. This has practical implications. MaaS functions best where the internet and data is freely accessible. As the emerging smart mobility ecosystem will rely on smartphones and more extensive data transmissions, these issues are fundamental. Based on the findings of this study, it can be said that accessibility to MaaS for all groups needs to be established and improved. For example, accessibility can be an issue for those who may likely need to reduce data use because of cost or data restrictions. Besides, accessibility to the internet may also be influenced by age and technological skills, which may not be an issue in highly educated Norway but many other countries. Therefore, measures to lower the barriers to accessing MaaS are suggested. For example, offering services in different languages may help lower the barrier to linguistic minorities. Further, real-time communication through mobile applications may lower the barrier of technological skills and make it easy for the elders to access MaaS. In addition, more public support for data access, such as through public Wi-Fi, can solve the issue of data restriction. In sum, there are limitations of this current study that need future efforts to address. For the first, this particular case cannot offer a clear picture of the study topic. Future research into privacy issues and MaaS should therefore focus on establishing a clearer and more universal picture of how privacy concerns and related constructs influence an individual's intention to use MaaS. Further, while this case study reveals that trust is the key to a user's intention to use MaaS, more advanced studies are required to gain more insight into the interaction between constructs-to investigate, for instance, how trust, perceived ease of use and privacy concerns interacted, or do observable studies to gain understanding of whether there are other factors associated with frequent use of MaaS. Finally, this study demonstrates how quantitative and qualitative methods complemented each other on the methodological side. This demonstrated the potential of using mixed methods approach to identify aspects more accurately and offset the weakness of each approach alone. Since MaaS is a relatively new concept, and there remain many unexplored possibilities, it is suggested that future researchers can consider mixed methods to add strength to the study of relevant issues. Simultaneously, as MaaS is emerging over time, there will be a need for further studies evaluating business models and market constellations as services and actors evolve. Therefore, this study offers valuable information for researchers, practitioners, and policymakers to continue seeking for future MaaS development.

Availability of data

The datasets used and/or analyzed during the current study are available from the author upon request.

CRediT authorship contribution statement

Stella Huang: Conceptualization, Data curation, Methodology, Investigation, Formal analysis, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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