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# A model for the adoption of transport management systems in the South African taxi industry

**Authors:**
Lovemore Motsi[1]
Baldreck Chipangura[1]
Nyaradzo Musanhi[1]

**Affiliations:**
[1]School of Computing, College of Science, Engineering and Technology, University of South Africa, Johannesburg, South Africa

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**Corresponding author:**
Lovemore Motsi,
motsil@unisa.ac.za

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**Background:** From the Information Systems (IS) research perspective, the war between the e-hailing entrepreneurs and metered taxi operators in South Africa is a fight between technology innovators and laggards of the technology. The metered taxi operators are resisting to adopt e-hailing platforms and are fighting e-hailing entrepreneurs from using the technology. To find an amicable solution to the war, factors that affect the adoption of e-hailing platforms by metered taxi operators should be understood.

**Objectives:** The objective of the study is to identify factors that influence the adoption of e-hailing platforms by metered taxi operators.

**Method:** The technology acceptance model (TAM) was adopted and adapted as a lens to understand technology adoption by metered taxi operators. Quantitative data were collected through an online survey and 253 metered taxi entrepreneurs responded with usable data. The respondents were all from Sandton city, Gauteng Province of South Africa.

**Results:** The study found significant and insignificant factors that influence metered taxi operators to adopt e-hailing platforms. It was found that perceived safety (PS) and perceived cost (PC) of adopting e-hailing platform were significant on attitude towards use of e-hailing platform (ATUeHP), and ATUeHP was significant on behavioural intention to use e-hailing platforms (BIUeHP). The BIUeHP was significant on the actual usage of e-hailing platform (AUeHP). However, Pearson's *r* value was 0.113 for the perceived ease of use (PEOU) and ATUeHP, which is not statistically significant. With a Pearson's *r* value of 0.053, perceived accessibility, perceived convenience (PCA) and ATUeHP are not statistically significant.

**Conclusion:** Taxi entrepreneurs' attitudes towards the adoption of e-hailing platforms are influenced by a number of factors, and these include cost, usability and safety as well as their perceptions of accessibility and convenience.

**Contribution:** The findings of this study will thus be crucial to the South African taxi sector because they will serve as the foundation for the development of a new research framework. This theoretical framework acts as a guideline for the adoption of transport management systems in the South African taxi industry.

**Keywords:** TAM; taxi industry transport management systems; Uber; South Africa; taxi entrepreneurs.

## Introduction

Fourth industrial revolution (4IR) technologies transformed transport management in South Africa and the world over. This resulted in the adoption of e-hailing platforms such as Uber, Taxify, Boilt and many others, which have improved the efficiency of public transport operations in South Africa. Prior to the introduction of e-hailing platforms, public road transport was dominated by metered taxi operators, buses and pick-and-drop minibus taxis (Mmakwena 2022). The introduction of the e-hailing platforms resulted in the formation of new entrepreneurs within the public transport industry in South Africa. Henama and Sifolo (2017) observed that the introduction of e-hailing entrepreneurs tapped into the market share of the traditional metered taxi operators. Because of the business competition brought by the e-hailing entrepreneurs, the metered taxi associations sought dominance by pushing them out (Wakelin-Theron, Ukpere & Adekanmbi 2022). As a strategy, metered taxi associations proposed that e-hailing entrepreneurs be regulated through the taxi industry regulations. Furthermore, Henama and Sifolo (2017) revealed that metered taxi associations organised street demonstrations in Cape Town, Johannesburg and Pretoria demanding that e-hailing entrepreneurs comply with taxi industry regulations. The demonstrations turned violent

in some cities, resulting in the loss of lives and cars of e-hailing entrepreneurs (Mnkwema 2022). The fight over the dominance of public transport routes has been going on for a long time, and amicable solutions have not been reached (Mmakwena 2022; Ngubane, Mkhize & Olofinbiyi 2020). Mnakwema (2022) revealed that taxi wars are not peculiar to e-hailing entrepreneurs but have been fought between different taxi associations over the control of routes. Even though wars have been fought, it is unique that metered taxi associations have grouped to fight e-hailing entrepreneurs across cities in the country (Ebeid 2022).

To address the friction between the e-hailing entrepreneurs and metered tax operators, solutions have been proposed from a point of view of a licencing regulatory framework (Pillay, Chetty & Kuppusamy 2022), market regulation and law enforcement (Ebeid 2022). However, from Information Systems (IS) research perspective, the war between the e-hailing entrepreneurs and metered taxi operators can be seen as a fight between technology innovators and laggards in the adoption of a technology. In this study, the e-hailing entrepreneurs are perceived as the innovators, and the metered taxi operators are the laggards. Therefore, we postulate that the resistance by metered taxi operators to adopt e-hailing platforms causes them to fight with e-hailing entrepreneurs. In essence, the metered taxi operators are fighting e-hailing entrepreneurs to stop them benefitting from business advantages that are brought by e-hailing platforms. If metered taxi operators adopt e-hailing platforms, we predict that there will be minimum friction between the two business groups. The aim of this study is to identify factors that influence metered taxi entrepreneurs to adopt e-hailing platforms. As a contribution, this study proposes a model for the adoption of an e-hailing platform in the South African taxi industry.

## E-hailing and metered taxi operators in South Africa

The entrance and adoption of e-hailing platforms in South Africa can be viewed as embracing information and communication technologies for development (ICT4D). Information and communication technologies for development is one of the United Nations' Sustainable Development Goals (UNSDG), which is presumed to be a key driver for leapfrogging development in developing countries (Persaud & Dagher 2021). On that basis, adoption of e-hailing platforms is seen as an opportunity for introducing innovative, smart and efficient transport in the cities of South Africa (Ribbans et al. 2022). The business model employed by the e-hailing platforms is to recruit unemployed drivers who have their own or have access to a car and link them with potential customers. An e-hailing platform is an Internet-based transport management software that helps drivers receive trip bookings from customers, navigation, geopositioning customers and the management of trip fares. Popular e-hailing platforms in South Africa include Uber, Bolt, InDriver and Africa Ride.

Boateng, Appau and Baako (2022) outlined the advantages of e-hailing platforms as an opportunity for formalising informal transport operators, providing a market, efficient and convenient transport services to customers, and increased government revenue through tax collection. Furthermore, e-hailing platforms are commended for being secure because they provide real-time geolocation of the car, car details and the driver's personal details (Henama & Sifolo 2017). In contrast, the disadvantages are that e-hailing drivers operate outside the *National Land Transport Act (Act 9 of 2009)* (Pillay et al. 2022), the government struggles with tax collection because e-hailing platform companies sometimes hide important information from the government (Boateng et al. 2022), the companies were criticised for unfair labour practices that contravene the country's employment regulatory frameworks (Ribbans et al. 2022), and e-hailing entrepreneurs are taking business from the metered taxi market (Henama & Sifolo 2017).

Metered taxis, also known as minicabs, have been on the South African public transport market before the e-hailing platform entrepreneurs. The market share of metered taxis is relatively small as compared to commuter minibus taxis and buses in South Africa (Ebeid 2022). Therefore, metered taxi entrepreneurs are small businesses that operate in towns, cities, and are mostly visible in areas where there is low demand for buses or commuter minibus taxis (Pillay et al. 2022). Metered taxis charge their customers on a fixed rate per kilometre that is gazetted by a taxi association to which the taxi operator belongs (Henama & Sifolo 2017). Pillay et al. (2022) identified the following as challenges encountered by metered taxi operators. A client should use a phone to call and book a ride; if a client does not have the number of any taxi operator, they cannot access the taxi. The metered taxis operate from a fixed terminus where they park their cars, which means a client must walk to access a taxi. Moreover, in South Africa, metered taxis are not allowed to roam the streets to look for clients, which is a disadvantage. All these disadvantages make the metered taxi business less lucrative as compared to e-hailing entrepreneurs who have access to the market through the Internet-connected e-hailing app.

## Research model and hypotheses

This study adopts technology acceptance model (TAM) (Davis 1985) as a theoretical lens to understand the adoption of e-hailing platforms by metered taxi operators in South Africa. The technology acceptance model is an information systems theory that explains how an organisation accepts and uses a new information technology system. According to Davies (1985), TAM facilitates the testing of user acceptance processes before an information technology system is implemented at an organisation. Additionally, Pal and Vanijja (2020) viewed TAM as a model for elaborating user behaviour when testing an information technology system. The model is based on the relationship between external IS factors and actual use (AU) (Marikyan & Papagiannidis 2023).

The main constructs of TAM are perceived usefulness (PU), perceived ease of use (PEOU), attitude towards use (ATU), behavioural intention (BI) and AU, PU and PEOU. Contextualised TAM versions have been developed by adding and integrating new components and distinct variables based on the environment and area of study. This enables the TAM's dimensions to be modified in particular circumstances, improving predictions in those contexts (Rahimi et al. 2018). Many studies have extended TAM by introducing new constructs. For this study, three constructs are introduced to extend TAM model and as the constructs are perceived cost (PC), perceived safety (PS) and perceived convenience (PCA). The research model and hypotheses, as shown in Figure 1, were proposed to test how the constructs influence the adoption of e-hailing platforms by metered taxi entrepreneurs in the South African taxi industry.

# Discussion on technology acceptance model constructs

## Perceived usefulness

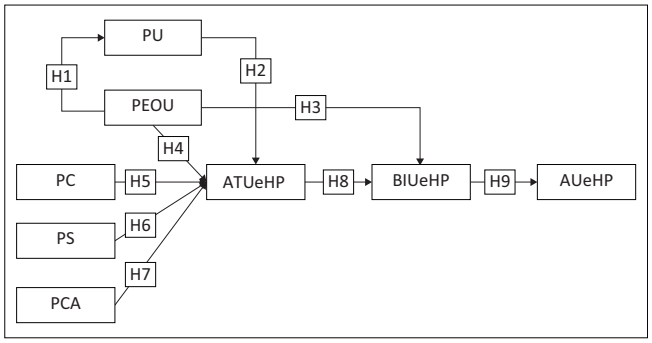
Davis (1989) described the use of a technology in terms of action, which is the direct actual usage of a technology to perform a job. Hence, people use a technology if it is useful. Usefulness is how a user perceives a system as having a potential to add value in the work that they do (Davis 1989). Perceived usefulness is a determinant of ATU and BI. The usefulness of a technology relates to its added advantages; for example, Ribbans et al. (2022) indicated that the usefulness of e-hailing platforms is seen in connecting clients with the e-hailing drivers, which improves the efficiency, security and pleasure of travelling. Hence, this study proposes the following hypotheses:

**H1:** Perceived ease of use positively influences the PU of e-hailing platforms.

**H2:** Perceived usefulness positively influences the attitude towards use of e-hailing platforms (ATUeHP).

## Perceived ease of use

Perceived ease of use pertains to issues of usability of a technology. The easiness of using a technology without investing a lot of energy mentally or physically (Davis 1989).




PU, perceived usefulness; PEOU, perceived ease of use; AUeHP, actual usage of e-hailing platform; BIUeHP, behavioural intention to use e-hailing platforms; ATUeHP, attitude towards use of e-hailing platform; PS, perceived safety; PCA, perceived convenience; PC, perceived cost.

**FIGURE 1:** Research framework.

According to TAM, PEOU determines PU and ATU because users find technologies that are easy to use to be useful and will have positive attitude towards using the technology. However, as shown in Figure 1, this study also ascertains how PEOU affects BI and how it impacts the ATU of e-hailing platforms. When it comes to embracing information technology to improve business performance, entrepreneurs' BI impacts whether they would accept or reject a technology (Moghavvemi, Salleh & Standing 2016). Hence, this study proposes the following hypotheses:

**H3:** Perceived ease of use has a positive influence on behavioural intention to use e-hailing platforms (BIUeHP).

**H4:** Perceived ease of use has a positive influence on ATUeHP.

## Perceived cost

The fundamental of business is to maximise profits and reduce costs. Utami et al. (2021) observed that any form of electronic commerce introduces some additional cost with respect to computing hardware, broadband and software application costs. This can be true for e-hailing platforms. In a study carried out in Ghana, Pasquali, Commenges and Louail (2022) found that investing in e-hailing platforms such as Uber required some capital for purchasing a car and a smartphone.

Moreover, e-hailing entrepreneurs incur operations costs such as insurance, car maintenance, broadband, fuel cost and commissions paid to the e-hailing company (Boateng et al. 2022). Even though investments in e-hailing business have long-term benefits, Pasquali et al. (2022) found that investment costs determine whether entrepreneurs will adopt e-hailing platforms or not. Therefore, this study hypothesises that PC of running e-hailing platforms has influence on ATUeHP:

**H5:** Perceived cost of running e-hailing platforms has a positive influence on the ATUeHP.

## Perceived safety

Safety first is a primary rule of life, which means entrepreneurs must minimise risk of injury or incur losses when operating e-hailing transport. Safety in business is viewed from the physical safety of property, human resources and customers (Giddy 2019). The business architecture of e-hailing platforms was designed to guarantee the safety of customers because the movement of the car is traceable (Boateng et al. 2022). In addition, drivers of e-hailing cars undergo a compulsory criminality check, which increases the PS of customers (Arumugam, Ismail & Joeharee 2020). On the other side, e-hailing drivers are protected from their customers who may have criminal intent by recording their details.

The drivers have the option of receiving payment online and do not need to carry cash which can be robbed by criminal customers (Sciarelli et al. 2022). Because of the volatility of the South African transport industry due to gatekeeping by metered taxi associations, the safety of e-hailing property, human resources and customers is not

guaranteed (Henama & Sifiso 2017). Apart from the violence by metered taxi operators, the architecture of e-hailing platforms provides a safe working environment for entrepreneurs and clients of e-hailing platform. In some past studies on e-hailing, safety was found to have a significant effect on attitude towards use (Sciarelli et al. 2022; Utami et al. 2021). Hence, the following hypothesis is proposed in this study:

**H6:** Perceived safety has a positive influence on ATUeHP.

### Perceived convenience

E-hailing platforms are convenient to both the entrepreneurs and the customers. The e-hailing platform helps entrepreneurs with business management. The application allows drivers to connect with customers, navigation, online payment and reconciliation of accounts (Utami et al. 2021). Through smartphones, drivers can calculate the distance and cost for picking a client, which help them to calculate profit they can make per trip (Arumugam et al. 2020). The e-hailing platform calculates the exact time it will take a driver to pick up a customer, which is also convenient for the customer. Even though the e-hailing platforms have the convenience of cashless payment through e-wallet, in Ghana, drivers see this as an inconvenience to them (Boateng et al. 2022). Boateng et al. (2022) found that cash in hand was preferred because remittances from e-hailing companies took longer to reflect in the drivers' account. Despite the inconvenience that came with the late remittance of payments by entrepreneurs, this study hypothesises that PCA has a positive influence on ATUeHP.

**H7:** Perceived convenience has a positive influence on ATUeHP.

### Attitude towards use

Attitude towards use is the degree of an individual's affect towards using a technology (Davies 1989). Research found that ATU determines the user's BI to use a new technology and ultimately AU (Scherer, Siddiq & Tondeur 2019). Attitude determines personal choices at individual level or at group level (Hogg & Grieve 1999). That means, individuals can have a positive or a negative attitude towards a technology from a personal point of view, or attitude can be predetermined by a group (Bayerl, Lauche & Axtell 2016). This can be true in South Africa where individual entrepreneurs adopted e-hailing platforms, in contrast to metered taxi entrepreneurs who rejected e-hailing platforms following a decision taken by taxi associations they belong to (Henama & Sifiso 2017).

Attitude towards use is a function of PU and PEOU (Ahmed et al. 2020; Akbari et al. 2020; Averweg 2008; Demoulin & Coussement 2020). Previous studies found that PU and PEOU were significant in predicting ATU (Liu 2015; Venter, van Rensburg & Davis 2012; Wu, Huang & Lin 2016). However, in some studies, one of the constructs or both were insignificant (Averweg 2008; Demoulin & Coussement 2020). The disparities in predicting ATU in the above studies can be attributed to moderating factors such as educational level or experience of the user. Wu et al. (2016) explained that a mediating factor such as longevity of technology use on the market could have effect on usefulness of a technology. Therefore, this study postulates that if metered taxi entrepreneurs perceive e-hailing platforms as useful (PU) and easy to use (PEOU), they will have a positive attitude towards using (ATU) the e-hailing platforms. Moreover, metered taxi's ATU will have a positive influence on BI to use e-hailing applications. Based on this discussion, the following hypothesis is proposed:

**H8:** Attitude towards using an e-hailing platform has a positive influence on BIUeHP.

### Behavioural intention

Behavioural intention is the determination that a person has when performing a specific activity (Davis, Bagozzi & Warshaw 1989). Davis et al. (1989) presented BI as function of ATU and PU, where technologies are used to increase job performance irrespective of whether users have positive or negative attitude towards the technology. Contrasting results have been found on the significance of PU on BI. There are studies that found an insignificant relationship between PU and BI (Sonneberg et al. 2019) and there are studies that found significant relationships (Wang et al. 2020). In a study to determine the attitude of ride pooling users, Sonneberg et al. (2019) found an insignificant relationship between PU and BI. The results were described as unexpected because the ride pooling service was perceived to be essential to the users. The insignificance was explained as being due to the fact that the ride pooling service is more expensive than the public transport, so the participants in the study did not see its worthiness.

On the other hand, BI determines the actual usage of a technology (Davis et al. 1989). Behavioural intention is the desire of a person to use a technology to enjoy the benefits associated with the technology. There are studies that have proved the significance of BI in determining AU of a technology (Sarmah, Dhiman & Kanojia 2021). Sarmah et al. (2021) found BI significant in the AU of mobile wallets in India. Hence, this study proposes the following hypothesis:

**H9:** Behavioural intention to use e-hailing platforms has a direct positive influence on actual use of e-hailing platforms (AUeHP).

## Research methodology

This study was positivist and collected quantitative data from metered taxi operators using a survey. The metered taxi operators who completed the survey were all from the Sandton city in Gauteng province of South Africa.

The survey used a questionnaire to collect data. The questionnaire collected biographic data of participants and answered the questions formulated from the main nine constructs of the adapted TAM model adopted in this study. For each construct of the model, a set of questions was created to collect data. The data collection survey had 24 questions

distributed across the constructs. The questionnaire used Likert scale rating with five scales from (1) strongly disagree to (5) strongly agree. The questionnaire was peer-evaluated by three researchers in this study. A pilot test was conducted with a sample of 15 participants, and the feedback from the pilot test was used to improve the questions.

The participants were sampled from taxi entrepreneurs who operate in Sandton city. The entrepreneurs were randomly and individually approached when they were parking their cars along the streets and asked to complete a paper questionnaire. Only metered taxi entrepreneurs were included in the study; if the driver oversaw the car, they were requested to give the questionnaire to the entrepreneur to complete. A total of 300 questionnaires were distributed, and 253 were returned with usable data.

The collected data were cleaned and coded using the IBM SPSS version 25 program. Descriptive analyses were carried out to establish the variability and central tendency of the data. In addition, the data were tested for reliability using Cronbach's alpha (Pallant 2016), and exploratory factor analysis was used for measuring construct validity (Yong & Pearce 2013). However, the results of factor analysis are not presented in this article due to space limitations. The Pearson correlations were used as well as hypothesis testing in this study.

The research was ethically undertaken, and all procedures as set by the university were followed. The project was approved by the ethics committee and a certificate was provided. Participation in the survey was voluntary, and participants were free to withdraw from the study at any time. The participants were not compensated for participating in the study. However, participants can benefit from the published results of this study.

## Demographics

From the 253 respondents who completed the questionnaire, males were 224 (88.5%) and females were 29 (11.5%). The age frequency distribution showed that the age group with the most metered taxi entrepreneurs (42%) was between 31 and 40 years. In terms of academic qualifications, the frequency distribution showed that the entrepreneurs' qualifications were fairly distributed across qualifications, for example, a degree (29.6%), matric (29.2%) and certificates (28.1%).

With respect to technological ownership, all the entrepreneurs (100%) owned a smartphone. The entrepreneurs had varied experience with using mobile technologies for operating metered taxi business. The frequencies of those who considered themselves experts in using each of the following technologies were as follows: telephone calling (100%), WhatsApp (51%), Google Maps (23.3%) and Global Positioning System (GPS) (44.3%).

## Reliability measurement – Cronbach's alpha

Cronbach's alpha was used to determine the internal consistency (reliability) of the multi-item measurement scales. Table 1 presents descriptive statistics such as the mean, skewness and kurtosis values. As a generic rule for explaining the statistics, skewness should lie between ±1 and kurtosis between ±3. The variables presented in Table 1 lie between the acceptable values and show distributions that are not too highly skewed.

## Correlation analysis

Correlation is used to find if there is any statistical relationship between two variables. The correlation coefficient measures the strength of the linear relationship between two variables (Ganti 2020). A bivariate calculation was performed to determine the Spearman's Rho correlation and strength of the correlation coefficient. The strength of the correlation lies between a value of zero (0) indicating no relationship, value of one (1) indicating a positive relationship or a value of negative one (–1) indicating a negative relationship. According to Pallant (2016), the thresholds for Spearman correlation ($r$) values are regarded as weak ($r < 0.3$), moderate ($0.3 < r < 0.5$) and strong ($r > 0.5$) (Pallant 2016). The correlation results of this study are presented in Table 2.

## Hypotheses testing

A statistical hypothesis test is a method of statistical inference that helps analysts to appraise support or evidence for some claim regarding the population from which the sample has been drawn (Majaski 2020). The summary of the hypotheses which were supported or rejected is shown in Table 3.

## Ethical considerations

An application for full ethical approval was made to the UNISA-CAES Health Research Ethics Committee received on 10/11/2018. The ethics approval number is 062/NM/2018/CAES_SoC.

**TABLE 1:** Reliability by means of Cronbach's alpha.

| Variables | Variance extracted (%) | Cronbach's alpha | No. of items | Mean | SD | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|
| PU | 64.04 | 0.810 | 4 | 4.633 | 1.225 | -0.668 | 1.258 |
| PEOU | 79.22 | 0.861 | 3 | 4.194 | 0.755 | -0.685 | -0.071 |
| AUeHP | 83.37 | 0.800 | 2 | 4.600 | 1.249 | -0.370 | 0.283 |
| BIUeHP | 80.49 | 0.876 | 3 | 3.733 | 1.491 | 0.331 | -0.469 |
| ATUeHP | 81.67 | 0.924 | 4 | 4.469 | 0.995 | -2.074 | 2.078 |
| PS | 91.18 | 0.951 | 3 | 4.883 | 1.133 | -0.149 | -0.521 |
| PCA | 73.07 | 0.631 | 2 | 3.801 | 1.068 | 0.320 | 1.184 |
| PC | 90.14 | 0.949 | 3 | 4.862 | 1.130 | -0.146 | -0.519 |

PU, perceived usefulness; PEOU, perceived ease of use; AUeHP, actual usage of e-hailing platform; BIUeHP, behavioural intention to use e-hailing platforms; ATUeHP, attitude towards use of e-hailing platform; PS, perceived safety; PCA, perceived convenience; PC, perceived cost; SD, standard deviation.

**TABLE 2:** Pearson correlations.

| Correlations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **PU** | **PEOU** | **AUeHP** | **BIUeHP** | **ATUeHP** | **PS** | **PCA** | **PC** |
| **PU** | | | | | | | | |
| Pearson correlation | 1 | 0.612** | 0.476** | 0.099 | 0.206 | -0.030 | 0.721** | 0.542** |
| Sig. (2-tailed) | - | 0.000 | 0.000 | 0.456 | 0.001 | 0.726 | 0.000 | 0.000 |
| *N* | 253 | 253 | 253 | 253 | 253 | 253 | 253 | |
| **PEOU** | | | | | | | | |
| Pearson correlation | - | 1 | 0.475** | 0.481** | 0.173 | -0.138 | 0.567** | 0.541** |
| Sig. (2-tailed) | - | | 0.000 | 0.00 | 0.052 | 0.020 | 0.000 | 0.000 |
| *N* | - | 253 | 253 | 253 | 253 | 2536 | 253 | 253 |
| **AUeHP** | | | | | | | | |
| Pearson correlation | - | - | 1 | 0.373** | 0.443** | 0.010 | 0.421** | 0.444** |
| Sig. (2-tailed) | - | - | | 0.000 | 0.000 | 0.912 | 0.000 | 0.000 |
| *N* | - | - | 253 | 253 | 253 | 253 | 253 | 253 |
| **BIUeHP** | | | | | | | | |
| Pearson correlation | - | - | - | 1 | 0.465** | 0.456** | 0.348** | 0.311** |
| Sig. (2-tailed) | - | - | - | - | 0.000 | 0.000 | 0.000 | 0.000 |
| *N* | - | - | - | 253 | 253 | 253 | 253 | 253 |
| **ATUeHP** | | | | | | | | |
| Pearson correlation | - | - | - | - | 1 | 0.462** | 0.053** | 0.409** |
| Sig. (2-tailed) | - | - | - | - | - | 0.000 | 0.300 | 0.000 |
| *N* | - | - | - | - | 253 | 253 | 253 | 253 |
| **PS** | | | | | | | | |
| Pearson correlation | - | - | - | - | - | 1 | 0.421** | 0.407** |
| Sig. (2-tailed) | - | - | - | - | - | - | 0.000 | 0.000 |
| *N* | - | - | - | - | - | 253 | 253 | 253 |
| **PCA** | | | | | | | | |
| Pearson correlation | - | - | - | - | - | - | 1 | 0.423** |
| Sig. (2-tailed) | - | - | - | - | - | - | - | 0.000 |
| *N* | - | - | - | - | - | - | 253 | 253 |
| **PC** | | | | | | | | |
| Pearson correlation | - | - | - | - | - | - | - | 1 |
| Sig. (2-tailed) | - | - | - | - | - | - | - | - |
| *N* | - | - | - | - | - | - | - | 253 |

PU, perceived usefulness; PEOU, perceived ease of use; AUeHP, actual usage of e-hailing platform; BIUeHP, behavioural intention to use e-hailing platforms; ATUeHP, attitude towards use of e-hailing platform; PS, perceived safety; PCA, perceived convenience; PC, perceived cost.

*, Correlation is significant at the 0.005 level (2-tailed); **, Correlation is significant at the 0.001 level (2-tailed).

**TABLE 3:** Findings of the research hypotheses.

| Proposed hypotheses | Description | Findings |
|---|---|---|
| H1: | Perceived usefulness (PU) positively influences the perceived ease of use (PEOU) of e-hailing platforms: β = 0.140; $p < 0.05$. | Supported |
| H2: | Perceived usefulness (PU) positively influences the attitude towards use of e-hailing platforms (ATUeHP): β = 0.169; $p < 0.05$. | Supported |
| H3: | Perceived ease of use (PEOU) positively influences behavioural intention to use e-hailing platforms (BIUeHP): β = 0.172; $p < 0.05$. | Supported |
| H4: | Perceived ease of use (PEOU) positively influences attitude towards the use of e-hailing platforms (ATUeHP): β = 0.029; $p > 0.05$. | Not Supported |
| H5: | Perceived cost (PC) positively influences attitude towards the use of the e-hailing platforms (ATUeHP): β = 0.198; $p < 0.05$. | Supported |
| H6: | Perceived safety (PS) positively influences attitude towards use of the e-hailing platform (ATUeHP): β = 0.114; $p < 0.05$. | Supported |
| H7: | Perceived convenience (PCA) positively influences attitude towards use of the e-hailing platform (ATUeHP): β = 0.080; $p > 0.05$. | Not Supported |
| H8: | Attitude towards use of e-hailing platforms (ATUeHP) positively influences behavioural intention to use e-hailing platforms (BIUeHP): β = 0.190; $p < 0.05$. | Supported |
| H9: | Behavioural intention to use e-hailing platforms (BIUeHP) positively influences actual use of e-hailing platforms (AUeHP): β = 0.174; $p < 0.05$. | Supported |

## Discussion of the results

Cronbach's alpha was utilised to measure the reliability of constructs and a value greater than 0.7 indicates strong reliability (Hair et al. 2022). All the constructs of the model had Cronbach's alpha greater than 0.7, which indicates a strong internal consistency. This study adapted the TAM model and tested nine hypotheses to investigate the factors that influence adoption of e-hailing platforms by metered taxi operators. Pearson correlations were used for hypothesis testing and Table 2 presents the correlations and Table 3 presents the summarised results.

The relationship between PU: (mean = 4.191) has a positive influence on PEOU: (mean = 4.194). There was also a positive correlation between the two variables ($r = 0.162$, $p < 0.05$) and (β = 0.140, $p < 0.05$), hence (H1) was supported. The results also confirm the research model's hypothesised prediction, which was made in this study. In this study, the mean scores for PU and PEOU suggest that the participants agreed on the constructs. The results indicate that users' PU and PEOU of ride-sourcing apps, as well as their satisfaction level, strongly influence users' continuing usage intention. Previous studies

(Cheng 2021; Jing et al. 2021; Weng et al. 2017), which demonstrated the strong impact of PU, PEOU, and satisfaction on users' continuing intention, provide support for our findings.

The relationship between PU: (mean = 4.191) has a positive influence on ATUeHP: (mean = 4.469). There was also a positive correlation between the two variables ($r$ = 0.206, $p < 0.05$) and (β = 0.169; $p < 0.05$), hence (H2) was supported. The results also confirm the research model's hypothesised prediction, which was made in this study. That means participants agreed on the constructs of PU and ATUeHP. This result is in line with earlier research by Cheah et al. (2020), which shows that technology is viewed as being useful and has been demonstrated to have a positive impact on attitudes towards a variety of goods and services. As evidenced by its potential influence on both intentions and actual behaviour (Ajzen 1987, 1991, 2011; Solomon et al. 2013), a positive (or favourable) attitude results in a positive intention to engage in the behaviour (Liu et al. 2012).

The findings in Table 3 showed that PEOU (mean = 4.194) impacts significantly on attitude towards use of e-hailing platforms (ATUeHP) (mean = 4.469). Based on the mean scores, it is suggested that the respondents strongly agree with the constructs of ATUeHP and PEOU. Correlation between the variables was found to be statistically significant ($r$ = 0.481, $p < 0.05$) and (β = 0.172; $p < 0.05$), hence (H3) was supported. The results are in line with those of Liu and Yang (2018), who discovered that metered taxi entrepreneurs' opinions towards the adoption of e-hailing platforms are influenced by perceptions of the systems' ease of use. Further, the study's findings suggest that South African metered taxi business owners will adapt and use e-hailing platforms if they believe it is easy for them to adopt e-hailing platforms and use these platforms. That means participants agreed on the constructs of ATUeHP and PEOU.

Interestingly, the relationship between PEOU (mean = 4.194) and ATUeHP (mean = 4.469) was found not significant in this study. A positive correlation was found between the two variables ($r$ = 0.13, $p > 0.05$) and (β = 0.029; $p > 0.05$), hence (H4) was not supported. Mean scores for ATUeHP and PEOU suggest that the participants agreed on the constructs. According to this study, users' early impressions of a system's usability can prompt them to learn more about it, and if the system can also give them crucial information, it might be easier for them to accept it in the long term even though it was not significant. In addition, these findings confirm previous research by Keong (2016) who found favourable connection between users' attitude towards mobile taxi ordering (MTO) apps technology adoption and their beliefs about its PEOU and PU rather than perceived pricing.

As shown in Table 2 and Table 3, the findings of the extended variable in TAM showed that the PCA (mean = 3.801) has a positive significant effect on ATUeHP (mean = 4.469). These mean scores suggest that participants agreed on the constructs of PCA and PEOU. This study found no significant correlation between the two variables; however, it does show (β = 0.080; $p > 0.05$), hence H7 was not supported. The findings are in contradiction with those of Liu and Tai (2016) who investigated the correlation between users' perceptions regarding convenience and their intention to adopt new technology. This evidence is supported by research done by Xu, Huang and Li (2019), which found that PCA was a major motivator for customers to select mobile payment over credit card method. Accordingly, it might be suggested that metered taxi entrepreneurs who are aware of the PCA are more likely to consider risk to be low, which will boost trust and have a positive effect on ATUeHP. Perceived cost (mean = 4.862) has a positive significant influence on ATUeHP (M = 4.469). The mean scores suggest that the participants agreed on the constructs of ATUeHP and PCA. Pearson's correlation analyses revealed significant correlation between the two variables (β = 0.198; $p < 0.05$), hence (H5) was supported. The findings from this study supported the common postulation by Davis (1985), which holds that attitudes towards usage have a beneficial impact on behavioural intention. This corroborates the findings of a study by Liu (2015) that examined how users of taxi hailing apps behaved in a large city. The study demonstrates that users who intend to use taxi hailing services eventually do so, demonstrating that taxi entrepreneurs' BI to use a system does in fact influence real system usage.

The results of the present study showed that metered taxi entrepreneurs' PS was significant towards ATUeHP. Furthermore, the two variables also have a positive statistically significant relationship (β = 0.114; $p$ <0.05), hence H6 was supported. That means participants agreed on the constructs of ATUeHP and PS. These findings confirm earlier studies' findings that e-hailing services are seen as secure since they permit cashless transactions (Juma 2016). The results of this study lend credence to Palmér's (2017) assertion that metered taxi entrepreneurs who utilise e-hailing platforms do not usually carry big sums of cash since they are less likely to be targeted for large-scale robberies than traditional metered taxis.

Surprisingly, the relationship between PCA (mean = 3.801) and ATUeHP (M = 4.469) was found to be non-significant in this study. That means participants agreed on the constructs of ATUeHP and PCA. However, Pearson's correlation analyses revealed a positive statistically non-significant ($r$ = 0.053; $p < 0.05$) and (β = 0.080; $p$ >0.05), hence H7 was not supported. Further, these findings contradict previous research by Keong (2016) who found a significantly favourable connection between users' attitude towards MTO apps technology adoption and their beliefs about its PEOU and PU rather than perceived pricing. Findings also revealed that ATUeHP (M = 4.469) impacts significantly on BIUeHP (mean = 3.733). In this study, these mean scores suggest that the participants agreed on the constructs of ATUeHP and BIUeHP. There was a positive correlation between the two variables ($r$ = 0.465, $p < 0.05$) and (β = 0.190; $p < 0.05$), hence

(H8) was supported. The findings are in line with those of Liu and Tai (2016), who investigated the correlation between consumers' perceptions regarding convenience and their intention to adopt new technology. Supporting this evidence, in the work undertaken by Xu et al. (2019), PCA was proven to be one key factor that made consumers choose mobile payment over the credit card method.

The findings of the extended variable in TAM demonstrated that behavioural intention to use e-hailing platforms (BIUeHP) (M = 3.733) impacts significantly on actual use of e-hailing platforms (AUeHP) (M = 4.600). These mean scores further suggest that the respondents agreed on the construct of BIUeHP and strongly agreed on AUeHP. A positive correlation was found between the two variables ($r = 0.375$, $p < 0.01$) and ($\beta = 0.174$; $p < 0.05$), hence (H9) was also supported. According to TAM (Weerasinghe, Chandanie & Hindagolla 2018), real technology use is determined by the BI of its user. These findings are consistent with that theory. Davis (1989) claims that once a person has established the intention to utilise a particular technology, it will result in the actual employment of the technology. The findings of this study are consistent with those of a previous studies (Chin & Lai 2018; Haba & Dastane 2018; Teo, Mustaffa & Rozi 2018), which found that multiple investigations into ride-hailing confirmed the significant associations between the two constructs.

The study's first limitation was its geographic restriction to Sandton in South Africa's Gauteng province, which prevented its conclusions from being definitive. It would be necessary to do additional research in other South African provinces. There might be variations in the taxi industry used in a study population in other South African provinces. Furthermore, the dataset used in this investigation was only ever gathered once (cross-sectional survey only). The study's second limitation was that, because it was conducted in one developing country setting, it did not accurately represent all developing countries. In addition, the results of this study might not be applicable to other developing countries. Although there is no proof that these minibus (kombi) taxis in South Africa use e-hailing platforms, future research can be done to see how they can use technology to improve their businesses.

# Conclusion

This study used the TAM to analyse how South African taxi owners were utilising transportation management systems. The research subject was analysed and addressed using a TAM-based methodology. A survey was distributed to the South African taxi industry to examine the relationships between the TAM extended constructs (PEOU, ATUeHP, PC, PS, PCA, AUeHP and BIUeHP). This study used IBM SPSS to analyse the data and test the nine hypotheses that were put forth. Out of these nine hypotheses that were tested, seven (H1, H2, H3, H5, H6, H8 and H9) were accepted, while two (H4 and H7) were rejected. The most significant factor influencing taxi entrepreneurs' behaviour to use e-hailing platforms, according to a Pearson correlation study to ascertain the relationship between BI of metered taxi entrepreneurs and their attitudes towards using the technology, was their attitude towards using the technology. For the PEOU and ATUeHP, the Pearson's $r$ value was 0.113, which is not statistically significant. Perceived susceptibility PCA and ATUeHP are not statistically significant with a Pearson's $r$ value of 0.053. In addition, for AUeHP and PC, the Pearson's $r$ value was 0.409, which is statistically significant.

In addition, the study discovered a number of factors that seemed to influence the adoption of e-hailing platforms. These factors include the opinions on cost, usability and safety held by metered taxi owners as well as their perceptions of accessibility and convenience, all of which influence their attitudes about employing e-hailing systems. The behavioural goals of metered taxi entrepreneurs were also discovered to have a favourable impact on the adoption of transportation management systems. Most metered taxi entrepreneurs were discovered to be between the ages of 31 and 40, were informed about technology, and conscious of its advantages. The age of metered taxi entrepreneurs may have a big impact on the adoption of e-hailing platforms.

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## Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

## Authors' contributions

The authors confirm contribution to the article as follows. Study conception and design: L.M., C.B.; data collection: N.M.; analysis and interpretation of results: L.M., C.B.; draft manuscript preparation: L.M., C.B. All authors reviewed the results and approved the final version of the manuscript.

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## Data availability

The data that support the findings of this study are not openly available but are available from the corresponding author, L.M., upon reasonable request.

## Disclaimer

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