The Use of Mobile Applications for Purchasing Tickets for Public Transportation in Poland

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Abstract:

Purpose: This paper examines the actual use of mobile applications by consumers in Poland, seeking differences among various consumer groups.

Design/Methodology/Approach: The survey was conducted in 2022 using the CAWI technique on a representative sample of 1,067 people. To investigate the use of mobile applications for ticket sales, a questionnaire was designed with a range of answers covering the frequency of such applications' usage.

Findings: Poles are aware of mobile tickets; however, more than half of the respondents (54.1%) have never used a mobile application to purchase a public transportation ticket. Only 3.7% use a mobile app every day. There is no statistically significant correlation between the use of mobile applications for purchasing transportation tickets with respect to education level. However, there is a strong correlation with age and some correlation with the respondents' place of residence.

Practical Implications: The use of mobile applications for purchasing public transportation tickets in Poland is on the rise. Therefore, every public transportation provider should consider implementing this technology.

Originality/value: The paper is based on own, primary research.

Keywords: Mobile apps, tickets, Poland.

JEL classification: R12, M15, M31, D10.

Paper Type: Research study.

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1. Introduction

Public transportation is an important aspect of everyday life of many people, as it plays a critical role in enhancing mobility, promoting economic development, and improving environmental sustainability (Bian *et al.,* 2023). Nowadays improving a city transport system does not solely mean building new infrastructures or repairing aging ones (Cellina *et al.,* 2023), transportation is also more and more dependent on information and communications technologies (ICT) (Gossling, 2018), frequently provided by smartphone apps (Shaheen *et al.,* 2017).

The penetration of internet access is quite high in Poland, reaching 93,3% of households in 2022, with the almost even spread among cities and rural areas: big cities 94,4%, small cities 92,3% and rural areas 93,2% (GUS Raport „Społeczeństwo informacyjne w Polsce w 2022 (Central Statistical Office in Poland Report "Information society in Poland in 2022)). The actual usage varies among various social groups.

The lowest percentage of internet users is recorded in the group of retirees and other economically inactive individuals – in 2022 only 60.4% of them regularly used the internet, but compared to 2018, this percentage has increased by 17.3 percentage points. Regular internet usage in 2022 is reported by 83% of farmers - this group shows the highest dynamism, with an increase of 7.9 percentage points compared to the 2021, and 25.2 percentage points compared to 2018. Other groups declare regular internet usage at higher levels - from 86.3% among the unemployed to nearly 100% among students and students (Strategic Report iab, 2023).

With advances in mobile communications technologies and smartphones the transportation companies in developed in developing countries introduced a new sales and communication channel – mobile apps for purchasing tickets for public transportation. With the development of mobile ticketing, ticket sales channels have expanded and evolved rapidly (Chen *et al.,* 2022).

The paper examines the actual use of mobile application by consumers in Poland, seeking differences between various groups of consumers.

2. Literature Review of the Use of Mobile Applications for Purchasing Tickets

The development of the smartphones caused the development of mobile marketing. Shankar and Balasubramanian define mobile marketing (m-marketing) as "the two- or multi-way communication and promotion of an offer between a firm and its customers using a mobile medium, device, or technology" (Shankar and Balasubramanian, 2009). Mobile phones are handheld devices used in accessing, sending, and sharing data via call, text and other mechanisms depending on phone features.

Mobile phones with Internet capability support similar features and functions as internet-connected personal computers, laptops, and similar computing devices. As such, m-marketing takes advantage of both the mobility and wide reach afforded by mobile technology (Ngai and Gunasekaran, 2007). A key driver of the success of m-marketing is the acceptance and use by consumers since the power of mobile marketing depends on the extent of consumer responsiveness (Heinonen and Strandvik, 2007).

A unique characteristic of smartphones is their ability to download and run tens of thousands of applications (apps), which vary from informative to entertaining. Mobile phone applications (apps) are specific m-marketing tools designed for the interchange of information, networking, and leisure (Kuan-Yu and Yu-Lun, 2012). Taylor *et al.* (2012) define mobile apps as small programs that run on a mobile device and perform tasks ranging from banking to gaming and web browsing (Taylor *et al.,* 2011).

The growing popularity of mobile apps is explained by the rise in smartphone ownership. Because mobile apps are an integral part of the smartphone experience, the growing base of smartphone users leads to more apps being developed to serve a wider and wider range of consumer needs. From a marketing perspective, this growth of smartphone ownership and mobile app consumption may create new mobile marketing opportunities beyond the traditional mobile marketing strategies (e.g., SMS advertising) (Kim and Yoon, 2014).

Mobile apps present value to users in following key areas (Bredican and Vigar-Ellis, 2014):

- mobility – the user can conduct business anytime and anywhere,
- flexibility – users can engage in other activities such as travelling while conducting business or transactions,
- ease of use,
- speed with which information can be accessed as a well-made app can provide a far better user experience than even the best websites,
- convenience, as the device tends to be within arms-length of the user for long periods of time,
- security - as they provide safe storage of personal data so that users can save time,
- apps provide entertainment or stress release via games apps,
- apps assist users' time management (e.g., reminder calendar scheduling),
- apps can assist with navigation and trip planning via maps and local information,
- apps can also provide offline access to content or perform functions without a network/wireless connection.

The abovementioned benefits, especially the increase in customer satisfaction and user interface simplicity of the transportation system, where users can order, purchase, manage and validate ticket prices on their mobile devices caused the rising popularity of mobile ticketing (Aristio *et al.,* 2021). Smartphone transit apps present a cost-effective strategy that could facilitate and promote transit use and user experience (Bian *et al.,* 2022). The ease of ticket purchase was indicated as the most frequently chosen feature of transportation services in 2022 in Poland (Rosa, 2022).

There are various types of electronic tickets. M. Puhe, M. Edelmann and M. Reichenbach distinguish three main forms of electronic tickets (Puhe *et al.,* 2014):

- Premium SMS based transactional payments: Users send their request using short messages (SMS) and pay their fare with the next phone bill.
- Optical character recognition (OCR): Users receive an image that functions as a code (e.g., 2D barcode) that contains all required information.
- Contactless Near Field Communication: The process is similar to OCR, but the information is instead stored in the NFC memory of the phone. That way, many different tickets can be stored on a single phone; also related to different services.

For each of these forms a mobile application can work as a platform.

The paper aims to analyze the actual use of mobile applications for tickets purchasing in Poland.

3. The Research Design

The survey was conducted using the CAWI technique (Computer-Assisted Web Interview). The questionnaire survey conducted with the CAWI technique was based on an electronic questionnaire that respondents filled out independently through a website. The CAWI measurement was carried out between September 21 and October 12, 2022, by utilizing the proprietary consumer panel.

The sample selection was conducted in such a way as to obtain a random sample with an assumed 95% confidence level and a maximum 3% margin of error. According to the Central Statistical Office in Poland (GUS) in 2021, there were 31,142,016 people in Poland over the age of 18. Based on the assumptions regarding the confidence level and maximum error, the sample size for the study was calculated to be 1,067 people.

For the purpose of the research of the use of mobile applications for tickets selling, the question was designed with a cafeteria of answers covering the frequency of use of such applications.

The following hypotheses were stated:

−   Hypothesis 1 (H1) there are no general differences between the use of mobile applications to purchase tickets between respondents with various level of education.
−   Hypothesis 2 (H2) there are no general differences between the use of mobile applications to purchase tickets between respondents of various age.
−   Hypothesis 3 (H3) there are no general differences between the use of mobile applications to purchase tickets between respondents with different place of living.

The verification of the hypotheses is going to be based on the research question "How often do you use a mobile app to purchase public transport tickets?" compared to various characteristics of the researched sample.

4.   Findings

The general use of mobile applications to purchase tickets in Poland is presented in Table 1.

Table 1. *The use of mobile application for purchasing a transportation ticket*

Research question: "How often do you use a mobile app to purchase public transport tickets?"		
Answer	N	%
Everyday	39	3.7%
A few times a week	105	9.8%
At least once a month	170	15.9%
Less frequently than once a month.	176	16.5%
Never	577	54.1%

Note: N=1067.
Source: Own elaboration based on the research results.

According to the research, Poles are aware of mobile tickets, however more than half of the respondents (54.1%) have never used a mobile application to buy a public transportation ticket. Only 3.7% use a mobile app every day. The use of mobile applications to purchase tickets by respondents with various education level in Poland is presented in table 2.

Table 2. *The use of mobile application for purchasing a transportation ticket among the respondents with various education level*

Research question: "How often do you use a mobile app to purchase public transport tickets?"	Education level			
Answer	elementary	Vocational	secondary and post-secondary	Higher

Everyday	3,3%	2,9%	3,3%	4,3%
A few times a week	10,0%	10,3%	11,1%	8,2%
At least once a month	3,3%	17,6%	15,5%	16,8%
Less frequently than once a month	20,0%	13,2%	17,1%	16,6%
Never	63,3%	55,9%	53,0%	54,1%

Note: N=1067.
Source: Own elaboration based on the research results.

The data was examined using Pearson's Chi-squared test with simulated p-value based on 5000 replicates. $\chi^2 = 8.302330911$, p = 0.76244751. There is no basis for rejecting the null hypothesis of no differences between the education level and the use mobile application for purchasing a transportation ticket. Therefore, the Hypothesis 1 (H1) "there are no general differences between the use of mobile applications to purchase tickets between respondents with various level of education" should be verified positively.

The use of mobile applications to purchase tickets by respondents with various age in Poland is presented in Table 3.

Table 3. *The use of mobile application for purchasing a transportation ticket among the respondents with various age*

Research question: "How often do you use a mobile app to purchase public transport tickets?"	Age (years)					
Answer	18 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 or more
Everyday	6.1%	4.9%	0.5%	3.8%	0.0%	0.0%
A few times a week	14.1%	13.3%	7.1%	4.9%	3.1%	5.3%
At least once a month	18.6%	18.5%	17.2%	12.1%	7.2%	5.3%
Less frequently than once a month	19.8%	14.3%	17.2%	14.8%	19.6%	0.0%
Never	41.4%	49.0%	58.1%	64.3%	70.1%	89.5%

Note: N=1067.
Source: Own elaboration based on the research results.

The data was examined using Pearson's Chi-squared test with simulated p-value based on 5000 replicates. $\chi^2 = 73.87947222$, p = 0.00019996. The null hypothesis should be rejected. Therefore, the Hypothesis 2 (H2) "there are no general differences between the use of mobile applications to purchase tickets between respondents with various age" should be rejected. A clear trend can be seen – younger generations are more likely to use a mobile application to buy a public transportation ticket.

The use of mobile applications to purchase tickets by respondents with various place of living in Poland is presented in Table 4.

Table 4. *The use of mobile application for purchasing a transportation ticket among the respondents with various place of living*

Research question: "How often do you use a mobile app to purchase public transport tickets?"	Place of living	
Answer	urban	rural
Everyday	3.4%	4.1%
A few times a week	11.2%	7.0%
At least once a month	15.7%	16.4%
Less frequently than once a month	18.0%	13.2%
Never	51.7%	59.2%

Note: N=1067.
Source: *Own elaboration based on the research results.*

The data was examined using Pearson's Chi-squared test with simulated p-value based on 5000 replicates $\chi^2 = 10.12740816$, p = 0.038335335. Assuming significance level of 0.05, the calculated p-value is lower, therefore the null hypothesis should be rejected. Therefore, the Hypothesis 3 (H3) "there are no general differences between the use of mobile applications to purchase tickets between respondents from various place of living" should be rejected.

The place of living has an impact on the purchasing of transportation tickets using a mobile application. However, the correlation is not very strong, as using a stronger p-value of 0.01, the calculated p-value of 0.038335335 would be higher and there would be no basis for rejecting the null hypothesis.

5. Discussion

Concerning the education level (Table 2) no statistically significant differences between researched groups have been observed. A relevant study was conducted in China, in 2015 (Guan *et al.,* 2020). The results concerned, among others, the socioeconomic status correlation with the use of mobile tickets. It was not directly correlated, as well. A possible explanation of the phenomenon may be that mobile applications are easy to use and almost everybody has a mobile device (i.e., usually smartphone) these days.

Therefore, the socioeconomic status, including the education level, has less impact on the use of mobile applications. However, further research is required in this area (Cronley *et al.,* 2023).

Concerning the age of the consumer, a similar study was conducted in Poland in 2016 (Kos-Łabędowicz, Urbanek, 2017) on a sample of 452 persons, of which 93.1% were students aged 18-24 years. The results concerning the purchasing of tickets using a mobile application were presented on a scale from "often" (8.4% respondents), "sometimes" (11.4% respondents) and "never" (77.2% respondents).

The research results for young people presented in Table 3 of this paper show an improvement in mobile apps diffusion. Mobile application usage for purchasing transportation tickets becomes increasingly more popular (with the current results "everyday" + "a few times a week" adding to 20.2% of young people. Even X generation (50-69 years) uses mobile apps for purchasing transportation tickets to the extend young people were using them 7 years ago.

However, the older generation (70 or more years old) hardly uses mobile apps, as only 10.6% of them people use mobile apps for purchasing tickets (a few times a week or at least once a month). It may be explained by the lack of abilities or higher risk perception (Ariffin, 2018).

Considering the correlation between the place of living and the use of mobile application for purchasing transportation tickets, the results in the study show some correlation (Table 4). Especially, people from rural areas use mobile applications for purchasing transportation tickets slightly more often every day (urban 3.4% vs rural 4.1%), which can be explained by the forced mobility (commute to school, work, or leisure).

The public transport in rural areas should be carefully designed, as Bian et al (Bian *et al.,* 2022) stated "current studies have not paid enough attention to the important subgroup of captive riders, such as the riders in rural areas who rely on infrequent and unreliable transit services."

6. Conclusion

The smartphone market in Poland has reached a saturation point. A majority of Polish individuals utilize mobile applications on a daily basis. While mobile ticketing is well-known to the population, over half of the respondents (54.1%) have never utilized a mobile application for the purchase of public transportation tickets.

Notably, the level of education does not appear to be a hindrance to such usage, as there is no statistically significant difference observed among groups with varying education levels. On the other hand, age plays a significant role in this context, with younger generations displaying a higher propensity to employ mobile applications for purchasing public transportation tickets.

Furthermore, there are discernible variances in the use of mobile applications for ticket purchases among respondents hailing from different residential areas, underscoring the need for additional research in this area.

Taking all these factors into consideration, the use of mobile applications for purchasing public transportation tickets in Poland is steadily increasing, leaving ample room for further adoption of this method for ticket procurement.

Consequently, it is advisable for public transportation providers to explore the implementation and refinement of this technology, with particular attention to addressing the needs of older generations and residents of rural areas.

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