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AN ANALYSIS OF BUSINESS ADMINISTRATION USE OF THE PIŁA CITY CARD AS A MEANS OF URBAN COMMUNICATION

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Abstract: The article will present the application and use of the Piła City Card (PCC) which is utilized as a ticket in public transport in Piła (MZK). In the next stage of research, other possibilities of its use will be presented. The aim of the study was to analyse the existing system of how the PCC works and to get to know the public opinion on the subject of its functioning and how to further expand its use. The research was carried out in the city of Piła, using a questionnaire consisting of 12 single-choice closed and 2 open questions. The residents of the City of Piła were satisfied with the services provided by MZK and the introduction of an electronic ticket encoded on the PCC. The functioning of this card makes travelling much easier. The respondents also gave many interesting suggestions regarding other applications of the PCC than just in communication. Some of the proposals, after consultations with the city authorities and MZK, are currently being implemented.

Keywords: city card, public transport, Piła.

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1. Introduction

Due to the rapid development of civilization, and consequently also technology, more and more facilities are being created to improve the existing systems, such as communication. Nowadays, efficient and fast communication is a very important if not the most important thing. Thanks to an efficient communication system one can easily change location and quickly move from one place to another. An efficient communication is influenced by many elements, such as: roads, vehicles, facilities systems, efficient planning, safety and people. Communication is one of the elements of the broad concept of collective transport.

The article focused on the use of the PCC, which is associated with collective transport, finding its application in public transport buses. In the next stage of research, other possibilities of using PCC will be presented.

2. Urban logistics and city card

The task of urban public transport is to provide transport services in order to meet the needs of moving city residents within it. The organization of efficient and fast public transport can significantly improve the quality of life of city dwellers, increase travel comfort and offset high traffic volumes. Such activities are needed in connection with the economic development of urban areas. Cities are constantly growing, new housing estates are being created, the number of cities is increasing, hence the need to apply the solution of introducing new routes of public transport in order to facilitate access to many services, administration, work and shopping centers. The increasing inconvenience of travelling in cities especially during rush hour, and its negative effects such as congested streets, accidents and collisions cause the necessity of introducing changes in developing mobility in order to optimize the use of collective and individual transport means, resulting in the creation of co-modality between them (Coyle, Bardi, & Langrey, 1992).

A city card is a form of transport fare, an electronic season ticket for a journey made using public transport. This is part of the proximity card, also called contactless. At first glance, it resembles a contactless payment card. The proximity card is a small electronic card made of plastic with a built-in microprocessor, which contains the data of the card used. Such a card is more durable than the traditional paper ticket, easily damaged. City cards can be used not only on public transport but also as, for example, student ID card, parking card, ID (Bugajski, 2018).

It should be emphasized that the city card is not the same as an electronic public transport ticket, i.e. it is only a form of a ticket. An actual city card should be characterized by the possibility of paying for various services within one medium. However, the dominant application of a city card is an electronic public transport ticket, which means that public transport is the priority for the functioning of every large city (Bugajski, 2018).

The technological standard of the city card on the Polish market are proximity cards in MIFARE technology, presented below.

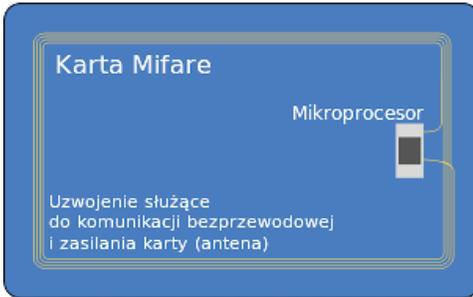


Fig. 1. Mifare Card

Source: (Lorent, 2014).

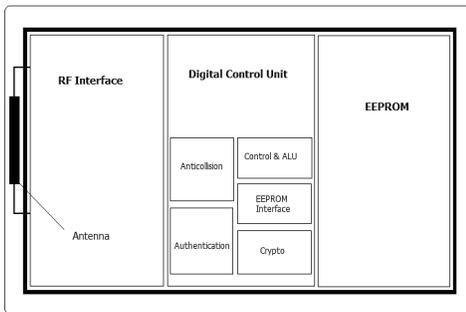


Fig. 2. Diagram of building Mifare cards

Source: (Lorent, 2014).

The city card is very easy to use. The information is read electronically by means of electromagnetic induction, when the card is put close to the reader. Thanks to wireless communication, the chip located on the card applied to the reader automatically saves information about the card holder and informs that he/she is authorized in this case for the given journey. The problem of using the city card has been raised in the following publications: (Agard, Morency, & Trépanier, 2006; Aurigi, 2005; Bagchi & White, 2004; Bagchi & White, 2005; Bąk & Borkowski, 2010; Blythe, 2004; Caragliu, Del Bo, & Nijkamp, 2011; Government of UK, 2013; Hendry, 2007, p. 248; Himanshu, 2014; Hollands, 2008; Mezghani, 2008; Pelletier, Trépanier, & Morency, 2011; Tomanek, 2007; Trépanier, Chapleau, & Tranchant, 2007; Urbanek, 2015).

3. The city of Piła public transport and the city card

Piła is a county ('powiat') town in the Greater Poland Voivodeship. Until 1998, it was the capital of the Piła Voivodeship. In terms of size, it occupies fourth place in the voivodship and is the largest city in northern Wielkopolska. Piła is located in the Gwda Valley, on the border of Wysoczyzna Krajeńska, Pojezierze Wałeckie and

Dolina Noteci. The Gwda River flows through the city, situated 11 km above its confluence with the River Noteć.

The city of Piła is a significant industrial and service centre as well as an important transport hub. Following the administrative reform of the country, since 1 January 1999, Piła is the capital of the county with nearly 74 thousand residents, of which the majority are women. However, over the years it can be observed that the number of inhabitants has been slightly falling. The vast majority of the residents are people of working age, however there are increasingly more people in post-working age (Urząd Miasta Piły, 2017).

The public transport in Piła uses only buses (Table 1) and a seasonally operating ‘water tram’ on the river Gwda, providing the highest level of comfort. The communication system in the city operates smoothly, and even the smallest problem, is resolved by the local public transport company (Miejski Zakład Komunikacji, MZK), aimed at making travelling by public transport a safe and preferential choice. In order to improve the communication system, in 2009 an electronic Piła City Card (PCC) was introduced, replacing the paper ticket. The introduction of this card has greatly improved the ease of travel, the card is individually assigned to each user as shown in Figures 3 to 5. Another advantage is that it is more durable than paper tickets (MZK Piła, 2017b).

Initially, the card was to replace paper tickets used in public transport, and was also introduced in this way, but it was not supposed to end there. The card was later going to be implemented as an admission ticket, for example to a museum, a swimming pool, a cultural centre, and to pay a parking fee. However, until

Fig. 3. Image No. 1 PCC

Source: (MZK Piła, 2017b).



Fig. 4. Image No. 2 PCC

Source: (MZK Piła, 2017b).





Fig. 5. Image No. 3 PCC

Source: (MZK Piła, 2017b).

1 September 2018, the card functioned just as a season ticket, and it was only in September 2018 that the Piła Senior Card (PSC) was introduced. Residents registered in Piła and are 60 years old can apply for it at the bus station. The main goal of PSC's introduction is to improve the quality of life of people over 60, as well as to increase their quality of life through wider access to cultural goods and sports (Urząd Miasta Piły, 2018).

Table 1. MZK Piła bus fleet

Bus type	Adapted to people with disabilities	Date of production	Date of purchase	The numbers of the bus routes	The number of items
Jelcz 120M	no	2000	2000	363,364, 365	3
Mercedes Citaro	yes	1998, 2000, 2003, 2004	2012, 2013, 2014	406-411	6
Neoplan N4016	yes	1998	1998	354, 355, 359	3
Neoplan N4411	yes	2002,2003	2010	396-401	6
Solaris Urbino 10	yes	2003, 2011	2004, 2011	372-374,404	4
Solaris Urbino 12	yes	2005-2007, 2009, 2010, 2011, 2016, 2017	2005-2007, 2009, 2010, 2011, 2016, 2017	377-380, 382-395, 402-403, 412-416	25
Solaris Urbino 12 Hybrid	yes	2017	2017	420-425	6
The number of all buses					53
The share of buses adapted for the disabled in the fleet					93%
The average age of the operated bus fleet					5 years

Source: (MZK Piła, 2018c).

Currently, the company (MZK Piła Sp. z o.o.), is implementing projects which involve a purchase of low-emission buses, modernization of the bus depot, as well as the construction of an integrated interchange centre and the Dynamic Passenger Information System (MZK Piła, 2018a). Photos of the he PCC are shown below.

The implementation of the PCC System was to provide many benefits for both the MZK and its passengers; electronically coded tickets have significantly improved travelling, because it is no longer necessary to buy a traditional paper ticket, which

had an impact on the convenience of travel. Through the Municipal Card System, it is easy to conduct a survey of passenger flows, each passenger putting the card closer to the reader saves information on the device, which allows to see the number of passengers traveling on a given bus route. The collected information is used by the carrier to adjust the services or the frequency of connections on a given line depending on the intensity. An important advantage of the PCC is that if the card is lost or stolen, the money deposited by the card holder is not lost. After informing the MZK about the theft or loss of the card, the passenger is assigned a specific ticket, and the amount is transferred to the duplicate card and the old card is blocked (Karta miejska..., 2014).

The MZK, wanting to improve and develop, introduced another facility which is topping-up the PCC using the Internet PCC Service System. From 1 March 2018, one can easily buy a season ticket encoded on the card without leaving home, which up to then was possible only at the indicated stationary points in the city of Piła. These activities, enabling the online sales of electronic tickets, have significantly improved the quality of customer service. One can buy a ticket using the Internet Service System 24 hours a day, 7 days a week, as shown in the figure below.

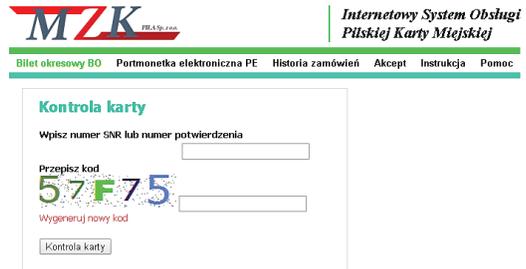


Fig. 6. Internet Service System PCC

Source: (MZK Piła, 2018a).

Non-cash means of payment such as the City Card, can be extended to include many other various services such as cultural and social as well as leisure. The PCC gives many opportunities for its use for purposes other than just communication. Despite future plans and projects that were to be implemented regarding the PCC System for its operation not only in the MZK but also in other areas, they only remained as plans. It was not until nine years after the introduction of the PCC to the MZK, i.e. in 2018, that an additional application was introduced, which is the PSC mentioned earlier (Grad, Ferensztajn-Galardos, & Krajewska, 2015).

4. Functional study: The PCC

The aim of the study was to analyse the existing PCC system and to examine public opinion on the subject. The research was carried out in the city of Piła where the PCC operates. The studies covered the period from December 10, 2018 to February 10, 2019.

The survey method was used to carry out the research. The questionnaire contained 12 single-choice questions closed and two open-ended questions. A small-scale pilot study was prepared, using the questionnaire to verify the outcome. After minor modifications, the questionnaire was forwarded directly to individual respondents, asking for a written answer. The two-month period of conducting the survey resulted in 150 returned surveys.

5. Results and analysis of test results

The respondents' answers to the questions are presented in the following bar charts. Of the 150 respondents, the majority were women (60%) and 40% men, and the resulting difference is small.

Question 1. Age range

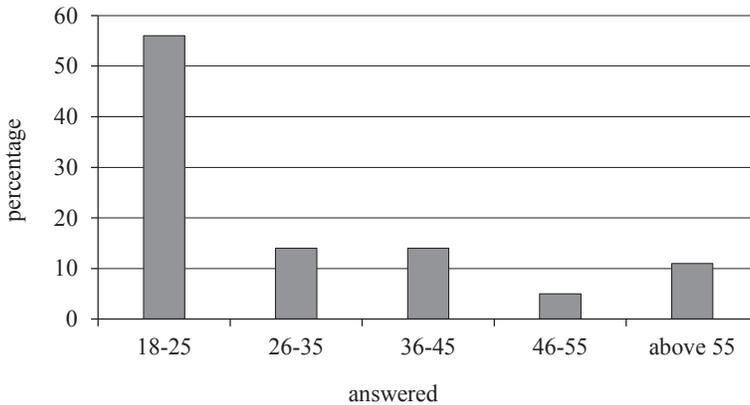


Fig. 7. Answers given to question 1

Source: own work.

The age range of respondents is varied, which has a positive effect on the quality of the results. People of different ages perceive differently the functionality of different systems. However, the vast majority of respondents were young people in the 18-25 age group, which is 56% of the sample. The high number of the respondents from this range confirmed the fact that they are people who often use the services provided by the MZK in Piła and have the PCC. It is mostly young people in education, which constitute the vast majority of travelers using public transport.

In the next step, the age of the respondents and their gender were analysed, most of whom were 18-25 years old. The highest percentage of respondents were women aged 26-35 and over 55-12%, and men aged 26-35. The results are in line with the previous results. The data is presented in the table below.

Table 2. Analysis of the age of the respondents and their gender

Age/ gender	Women	Men
18-25	53.85%	56.67%
26-35	12.09%	18.33%
36-45	15.38%	11.67%
46-55	6.59%	3.33%
Over 55 years old	12.09%	10.00%

Source: own work.

Question 2. How often do you use public transport in Pila?

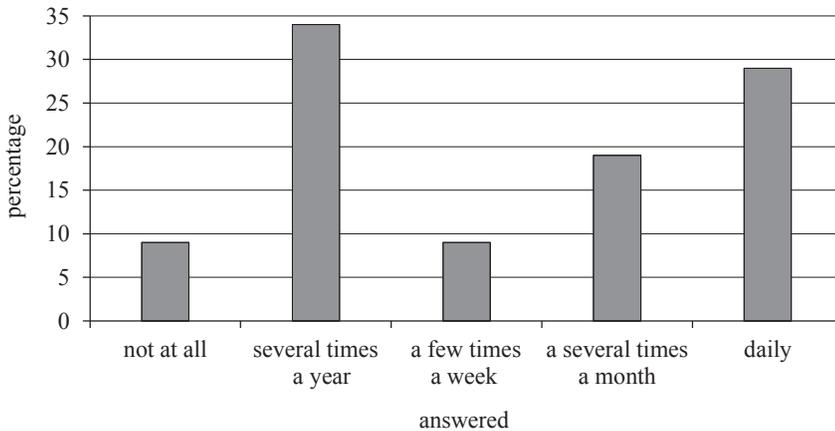


Fig. 8. Answers to question 2

Source: own work.

When asked about the frequency of using public transport services, most answered “several times a year” and “every day”, and the other options obtained a smaller number of answers. A small number of respondents do not travel by public transport at all. The answers are varied, as evidenced by the fact that the residents are motorized and either travel by their own means of transport or do not have to use public transport. The frequency of using public transport services depends on their destination, which was analysed in question 4.

In the next step, the frequency of using public transport, in which the city card is currently used was correlated, as well as the gender and age of the respondents. Based on the conducted analysis, it can be concluded that a large group of men (26%) aged 18-25 do not use public transport. Every day, men aged 36-45 and women aged 46-55 use public transport. However, most women and men aged 36-45 use public transport several times a month. Moreover, in the category ‘several times a year and several times a week’, men aged 46-55% and women aged 36-45 use public transport several times a year. The large percentage of people who do not use

Table 3. The frequency of using public transport depending on the gender and age of the respondents

Frequency of using public transport / age of respondents	Men					Women				
	18-25	26-35	36-45	46-55	over 55 years old	18-25	26-35	36-45	46-55	over 55 years old
Not at all	26.47%	0.00%	0.00%	0.00%	16.67%	6.12%	9.09%	0.00%	0.00%	0.00%
Several times a year	26.47%	54.55%	28.57%	50.00%	50.00%	34.69%	18.18%	50.00%	0.00%	27.27%
A few times a week	17.65%	18.18%	14.29%	50.00%	0.00%	16.33%	36.36%	7.14%	33.33%	36.36%
Several times a month	8.82%	0.00%	14.29%	0.00%	0.00%	10.20%	0.00%	21.43%	16.67%	9.09%
Daily	20.59%	27.27%	42.86%	0.00%	33.33%	32.65%	36.36%	21.43%	50.00%	27.27%

Source: own work.

public transport is caused by the frequent use of their own car, which is confirmed by the increase in the number of registered cars in the last twenty years (Gorzelańczyk, 2020a, 2020b; Gorzelańczyk, Jurkovic, Kalina, Sosedova, & Luptak, 2020). The data were presented in the table below.

Question 3. To what extent are you satisfied with the services provided by public transport in Pila?

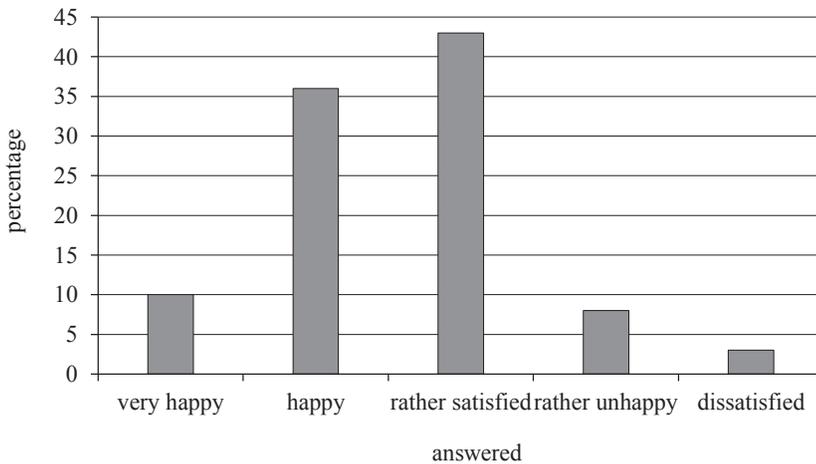


Fig. 9. Answers to question 3

Source: own work.

Almost all respondents are satisfied with the public transport services. Most of the answers are not entirely clear, the respondents are “rather satisfied”, which may be caused by a lack of opinion on this topic. A negative opinion may be due to the occurrence of an unpleasant situation experienced by the respondent.

Question 4. What is the purpose of your trip?

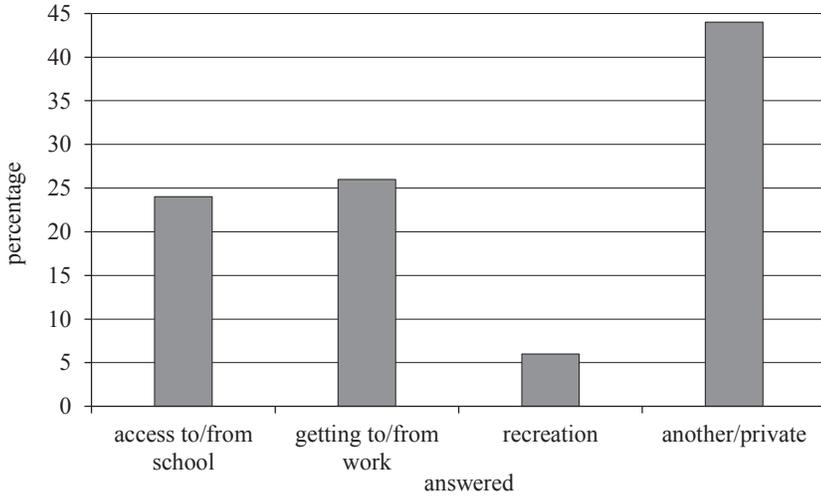


Fig. 10. Answers to question 4

Source: own work.

Most people answering this question do not travel for everyday purposes such as work or school, but for other private purposes, which may coincide with the answer given in question 2, i.e. “several times a year”. A smaller group, not much different from each other, are people travelling to work and school, which may coincide with the answers given to question 1 regarding the age range, where the prevailing group comprises people learning or working. A small number of people travel “for leisure”, which may mean that they chose Urban Communication, for example as an access to the allotment.

Question 5. What kind of tickets do you use?

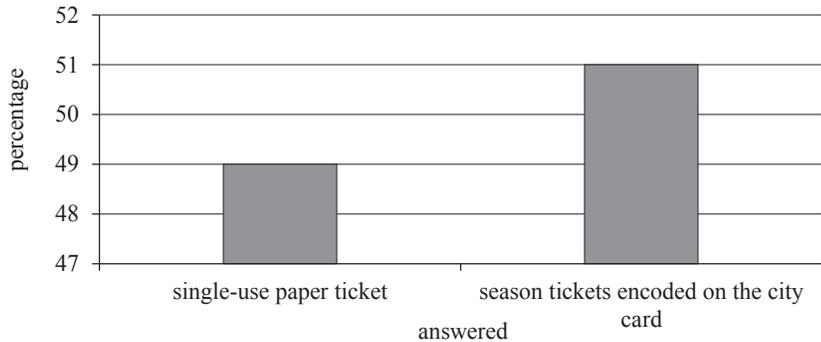


Fig. 11. Answers to question 5

Source: own work.

In this question regarding the type of tickets used by the respondents, the answers are aligned. The answers about the use of the PCC-coded tickets show that they are used more. It is known that people using public transport will sporadically travel using a one-off ticket, while those who use it on a daily or several-times-a-week basis probably have tickets coded for the PCC.

Question 6. Are you satisfied with the introduction of the PCC?



Fig. 12. Answers to question 6

Source: own work.

For the next question regarding satisfaction with the introduction of the PCC, the majority of respondents are satisfied with the introduction of the electronic ticket system coded on the card. The replies containing the word “rather” suggest that they are not completely convinced of their answer. It may result from the fact that they are people who travel using paper tickets, hence have no opinion about the city card.

Table 4. Satisfaction of respondents with the PCC and their age and gender

Question/gender	Men					Women				
	18-25	26-35	36-45	46-55	over 55 years old	18-25	26-35	36-45	46-55	over 55 years old
Rather dissatisfied	8.82%	18.18%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dissatisfied	8.82%	9.09%	0.00%	50.00%	0.00%	2.04%	0.00%	0.00%	16.67%	0.00%
Rather pleased	41.18%	18.18%	28.57%	50.00%	0.00%	46.94%	36.36%	42.86%	0.00%	27.27%
Happy	26.47%	36.36%	28.57%	0.00%	66.67%	28.57%	45.45%	57.14%	50.00%	18.18%
Very pleased	14.71%	18.18%	42.86%	0.00%	33.33%	22.45%	18.18%	0.00%	33.33%	54.55%

Source: own work.

The impact of respondents' satisfaction with the PCC was correlated depending on their gender and age. On this basis, it can be concluded that men and women aged 36-45 and over 55 are most satisfied with the introduction of the city card. However, men and women aged 46-55 are not satisfied. The results are quite surprising, as it could have been assumed that young people would be the first to use the new technology. The data are presented in the table below.

Question 7. Does the PCC always work correctly in the reader installed on buses?

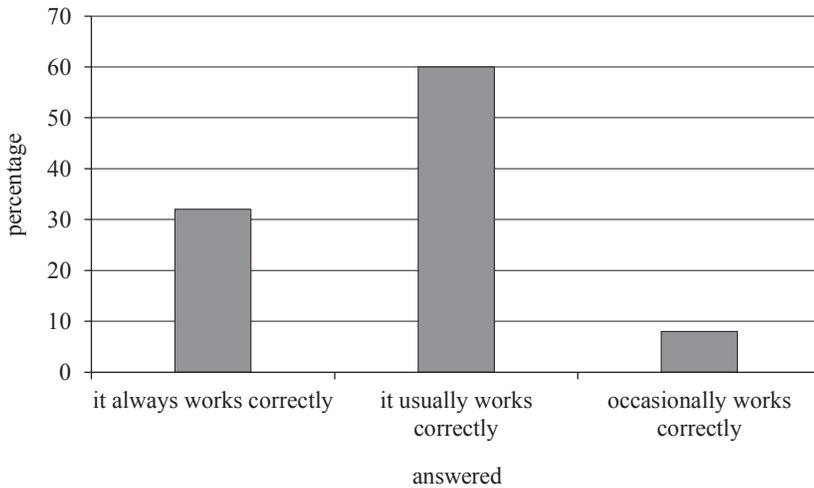


Fig. 13. Answers given to the question 7

Source: own work.

Most people who use the PCC think that the card works properly in the readers on the bus. The answer “usually works correctly” may indicate that it has been given to people who have encountered minor problems while using the card or are not the holders of such a card and have given an answer on the assumption. The fact that “sporadically operates correctly” can also be answered by people who are not either holders of such a card, or persons whose card is not working properly due to some error on the card, which can appear as in any other device.

Question 8. Do you use the city card as a PSC?

In answer to the next question, the majority of respondents stated that they do not use the PCC as the PSC. This may be due to the fact that the PSC is granted to people over 60, and among the respondents only a few people answered that they are over the age of 55, so that other respondents do not even have such a card.

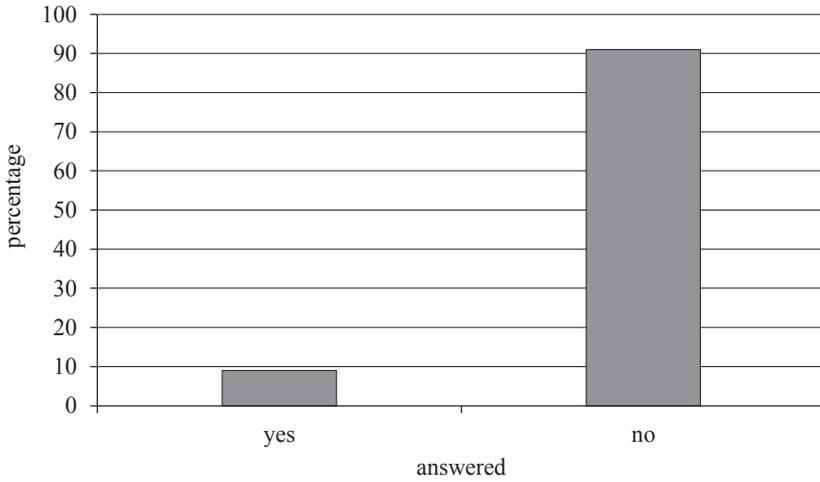


Fig. 14. Answers given to the question 8

Source: own work.

Question 9. Are you satisfied with the benefits of the PSC?

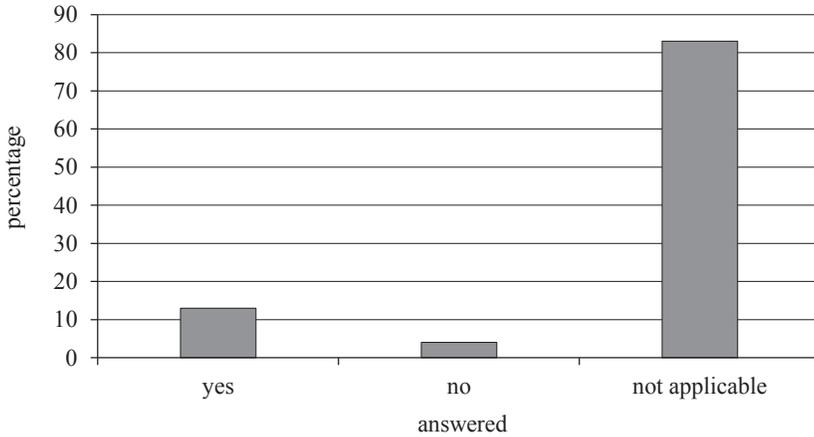


Fig. 15. Answers given to the question 9

Source: own work.

The answer to this question is quite clear and results from the previous question. If the respondents do not use PSC, they have no opinion about it and cannot answer whether they are satisfied or not. However, people who have such a card and use it, are satisfied with the benefits that this card brings to the user.

Question 10. Does the city card facilitate travelling by public transport in Pila?

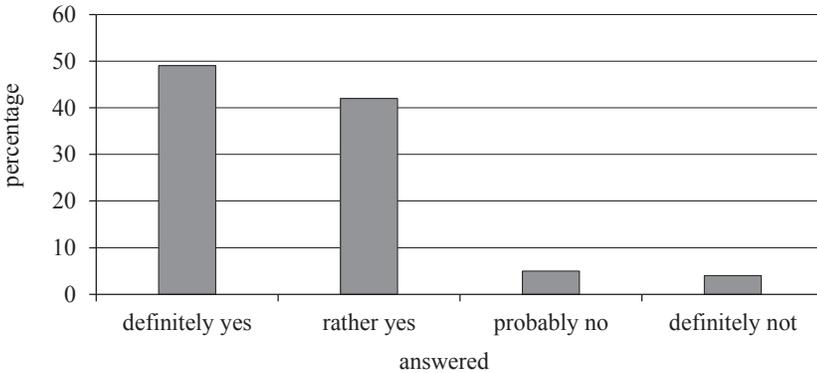


Fig. 16. Answers to question 10

Source: own work.

Analysing the respondents' answers to this question, it can be stated that public transport users are satisfied with the introduction of electronic season tickets coded on the PCC, which facilitates travel by public transport, according to a significant number of the respondents. Boarding the bus and registering the ticket does not require much time, it takes a few seconds. There is no need to buy a ticket every time. The introduction of electronic tickets has significantly improved the comfort of use and ease of travelling by public transport in Pila.

Question 11. Are you in favour of introducing a different use of the PCC than just public transport?

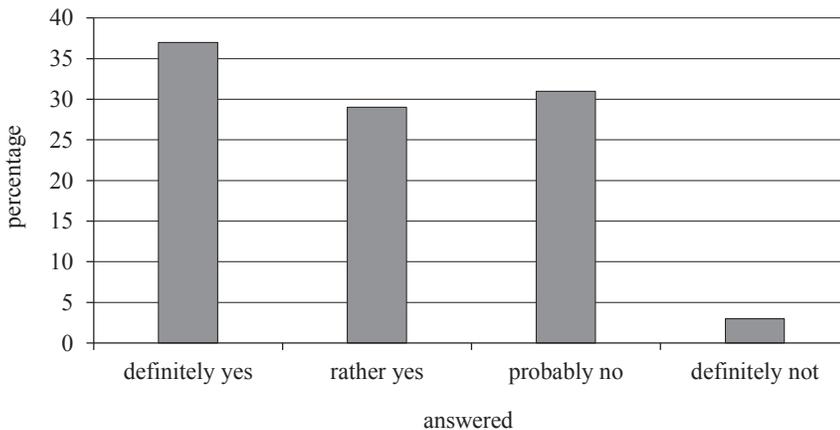


Fig. 17. Answers given to question 11

Source: own work.

Most of the answers to this question favour the introduction of other PCC applications than just in public transport. The figure above shows that about 30% of the respondents do not see the need to introduce new solutions for using the PCC. This may result from the public's lack of knowledge that the existing city card can be used for other services than just travelling on public transport.

Answers to the wto additional open questions were not obligatory, nevertheless many respondents expressed their opinion regarding these questions; the answers are presented below.

Question 12. Please give a proposal for the use of the PCC

Table 5. List of answers given to question 12

Proposals of respondents using PCC	The number of proposals
Parking fees	6
Payment for entries to the aquapark	4
As an ATM card	1
On trains	1
A large family card	2
Rental of city bicycles with PCC	1
Entrances to the theatre, museum, gym	2
Slag tickets coded on PCC	1
Charges for using the Taxi	1
Benefits at events organized by the city	1
Other discount cards, for example at discounts in partner stores	3
In connection with student IDs	2

Source: own work.

Based on the above table, it can be concluded that the proposals for using the PCC are different. Some of them could be introduced, while others have never been thought of before in connection to the PCC, example e.g. partner stores and encoding some discounts used during shopping on the card. Judging by the responses of the respondents, who even wanted to give their own proposals, it should be recognized that the PCC should have more applications than just public transport.

In the next question, the respondents had the opportunity to express their opinion on the functioning of the city card. The answers relate mainly to the poor quality of the readers on buses. and this is quite a recurring problem. In addition, according to the passengers, it is unnecessary to use the card after entering the bus. This is justified because the people who are validating the card are not afraid to do so because they know that they have a ticket purchased on this card. Abolishing the obligation to read

the card after entry could result in a larger number of people travelling without a ticket. It would be necessary to increase the ticket control, which is associated with an increased number of inspectors, and thus higher employment costs.

6. Possibilities of using the PCC

The City Card has already been introduced in many cities in Poland and functions mainly as an electronic season ticket encoded on the City Card, but it also has additional functions. Each city that has introduced the card for communication also extended its additional usefulness in various cultural areas and public utilities, thus introducing more than one application is very practical. With one card one can pay for or enjoy benefits in several areas. Many users of such cards appreciate this functionality very much, and would even like to expand its scope of activity to other areas of use.

The PCC, when it was first introduced, was to be used not only in public transport. Its functionalities were also foreseen in cultural, public or social services, however it was only reserved for periodic tickets used when travelling by public transport. It is only recently that additional functionality has been introduced as buying the card at the bus station, which is just beginning to develop and is being used by more and more people entitled to such a card. When conducting a survey on the functioning of the City Card, the majority of respondents were in favour of introducing new ways of using the existing card, such parking fees, admission fees to the Aquapark, cinema, theatre and ATM card, and a student ID.

7. Conclusion

The article presents an analysis of the use of the PCC in public transport in Piła, verified by a survey conducted among residents of Piła. Based on the survey, it can be concluded that the PCC is used mainly by young people up to 25 years of age, practically every day via single and monthly tickets. They are satisfied with the services provided by public transport and the introduction of the PCC by the MZK, which facilitates their travel. Due to the age of the respondents, they do not use the PCS.

The next part lists new proposals for its use. These suggestions include parking fees, entrance fees to the Aquapark, cinema, theatre and ATM card, and student ID. It is reasonable to apply the city card also in other areas of life than currently.

The suggestions presented in the article may be introduced in other cities, however when introducing a city card, the local governments should also consider the possibility of using it not only in urban transport.

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ANALIZA BUSINESS ADMINISTRATION WYKORZYSTANIA PILSKIEJ KARTY MIEJSKIEJ W ŚRODKACH KOMUNIKACJI MIEJSKIEJ W PILE

Streszczenie: W artykule przedstawiono wykorzystanie Pilskiej Karty Miejskiej (PKM), która służy jako bilet w komunikacji miejskiej w Pile (MZK). W kolejnym etapie badań zostaną zaprezentowane inne możliwości jego wykorzystania. Celem pracy była analiza istniejącego systemu PKM oraz poznanie opinii publicznej na temat jego funkcjonowania i możliwości szerszego wykorzystania. Badania przeprowadzono na terenie miasta Piła za pomocą kwestionariusza składającego się z 12 pytań zamkniętych jednokrotnego wyboru i 2 pytań otwartych. Mieszkańcy Piły byli zadowoleni z usług świadczonych przez MZK oraz wprowadzenia biletu elektronicznego zakodowanego w PKM. Funkcjonowanie tej karty znacznie ułatwia podróżowanie. Respondenci przekazali również wiele ciekawych sugestii dotyczących innych zastosowań PKM niż tylko w komunikacji. Część propozycji, po konsultacjach z władzami miasta i MZK, jest obecnie wdrażana.

Słowa kluczowe: karta miejska, transport publiczny, Piła.