Predictors of intention to use IPS QR codes in payment transactions in the Republic of Serbia

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***Abstract*— Mobile applications for personal finance were created for the common man to improve mobile banking services through significant facilitation in the field of monetary transactions. The National Bank of Serbia has enabled consumers to complete a transaction at the point of sale using the IPS QR code application. The goal of the work was to determine the predictors of intention to use mobile applications in the Republic of Serbia according to the extended UTAUT2 model. The Habit construct has the most significant influence on the intention to use the IPS QR code mobile application. The Price Value and Facilitating Conditions constructs have a strong influence. The construct Hedonic motivation shows a significant and positive influence. Social impact, Expected effort and Expected performance have a slightly weaker impact, but are still significant. The obtained results indicate that Habit is the most important factor in the acceptance of IPS QR technology. The tested model is applicable for domestic users, especially in the context of the introduction of national digital services, IPS QR code.**

***Keywords*— mobile applications, mobile banking, money transactions, IPS NBS system, IPS QR code**

I. INTRODUCTION

Mobile phones today have powerful tools and applications with significant functions and very powerful functional mobile interfaces. Today, mobile phones, as mobile communication technologies, are irreplaceable in the business world. It can rightly be said that they are of vital importance for every business person. As a very important means of communication between people, mobile phones have a wide range of functions and very important role in the field of monetary transactions, not only in various companies but also in monetary transactions with ordinary people, where internet banking stands out today. Bank applications on mobile phones provide the possibility of money transactions with guaranteed security and data protection. In the payment system of Serbia, various online transactions are carried out very successfully and at very affordable prices. These transactions have very reliable protection systems that guarantee security to users. Today, various types of applications can can be installed on mobile devices. After installing the application, mToken is also installed on the user's device, which represents security protection during logging in and making a financial transaction. Working in applications also has protection in the form of an mPIN that the user creates himself during application activation. mPIN is known only to the user and it has the role of enabling secure data exchange between the user and the Bank. Online financial transactions can be carried out at any time and without going to the Bank, and the realization is carried out in accordance with the working hours of the payment transaction.

In the era of digitization, banks in the world, including the National Bank of Serbia, are constantly working to promote various innovative solutions in order to improve cashless payments. This includes the provision of the necessary infrastructure that would ensure reliability and efficiency in payment transactions. Today there is an IPS NBS system (instant payment system of the National Bank of Serbia), which is actually a complex set of rules and standards that regulate the transfer of money at any time throughout the year and includes both payment service providers and users of those services who perform the transaction at the point of sale. This type of transaction is performed via the NBS IPS QR code.

In the series of advantages provided by the IPS NBS payment system, additional services within the framework of IPS payment [1], which refer to the simple execution of an instant transfer of funds, using a specific designation of the recipient of the funds, should be highlighted in particular. mobile phone number.

Mobile phones, in the era of digitization, occupy a significant place in the field of electronic business such as various types of banking transactions. They provide users with the possibility of insight into the state of their account as well as the possibility of making purchases [2]. The IPS QR code is a two-dimensional barcode. This code contains certain information that can be easily read by the corresponding application software, retrieving the data needed to make the payment. The specification of this code was prescribed by the National Bank of Serbia, with the aim of easier execution of payment transactions. With the mobile payment application, the IPS QR code is read, which automatically reads the payment data, and then the bill is paid with one click [3]. For the IPS QR code to work, the user must have the Bank's mobile application installed on their mobile phone. Users who own a mobile phone with at least Android version 5.0 or iOS operating system, version 8.0 and newer, can use this form of payment [4].

At the points of sale in stores, the IPS QR code is used for instant payments by generating the code in the bank's mobile banking application, using the IPS SHOW or IPS SCAN options. Payment with the IPS SHOW option can be made at the marked point of sale. The generated IPS QR code is shown to the merchant from the Bank's mobile

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application. The merchant has the option to scan the IPS QR code using an optical reader connected to the cash register or using a mobile device that has the PKS application installed (PKS instant PAY application of the Serbian Chamber of Commerce, for cashless payment via QR code). The payment is automatically executed the moment the merchant reads the IPS QR code [4]. Payment with the IPS SCAN option can also be made at the marked point of sale. The generated code is scanned at the merchant using a POS device or PKS application [4]. IPS payment on the Internet is made by scanning the IPS QR code or using the so-called deep link technology, where the bank is selected from the offered list of banks whose mobile banking application the payer uses [5]. This type of payment provides a high level of security because the customer does not leave any information about payment instrument used. With the IPS scan option, monthly bills can be paid if they contain a generated IPS QR code that meets the standards of the National Bank of Serbia. For now, the option enables payment for the services of Telekom, EPS, and Infostan [4].

II. RESEARCH METHODS

The online survey was conducted in the period from March 25 to April 20, 2025, in which 90 respondents in the Republic of Serbia participated. An online questionnaire was used for data collection. Based on the data obtained from the questionnaire, demographic data were analyzed, as well as the factors of the UTAUT2 model in the context of using the IPS QR code.

The analysis of the collected primary data was carried out in the program for statistical data processing SPSS v. 20 (The Statistical Package for the Social Sciences). The reliability of the questionnaire was examined through Krombach coefficient α, reliability analysis and correlation and regression analysis.

The reliability of the questionnaire was examined by the Internal Consistency Method, which refers to the extent in which the variables measure the same thing, whereby the internal consistency of the measurement is checked. In this paper, the Krombach coefficient α was applied. In order to design a reliable measuring instrument, the aim is for the results on similar items to be connected, that is, to be internally consistent, but also for each of them to give their full contribution to unique information. No questionnaire is valid or absolutely reliable, but the Cronbach coefficient α should always be as high as possible. Correlation analysis was used to measure the degree of linear relationship between two variables. The closer the correlation coefficient is to unity in absolute value, the stronger the correlation between phenomena. Considering that in the paper one feature of the element of the observed set was observed and only the structure and properties of the set were analyzed according to that feature, a simple regression analysis was performed because, in practice, there is often a need to monitor two or more features at the same time and to examine whether there is a mutual influence between them.

The surveyed sample was segmented according to gender, age, education, work status and amount of monthly income. An overview of the sample structure and socio-demographic characteristics of the respondents is given in Table I.

Table I. Display of demographic data

Description	Category	%	Number
Gender	Men	53,3%	48
	Women	46,7%	42
Age structure	18–25	23,4%	21
	26–35	27,6%	25
	36–45	24,5%	22
	46–55	10%	9
	56-65	7,8%	7
	65 and over	6,7%	6
Education	Elementary school	3,3%	3
	Secondary vocational education	33,3%	30
	Higher vocational education	63,3%	57
Employment	Student	15,6%	14
	Professor, doctor, engineer	26.7%	24
	Manager, entrepreneur	10.0%	9
	Employee, worker	17,8%	16
	Other occupations	19,9%	18
	Pensioners	10%	9
Income	Less than 50.000 RSD	7,7%	7
	50.000–70.000 RSD	11,1%	10
	70.000–100.000 RSD	6,6%	6
	More than 100.000 RSD	13,3%	12
	Doesn't want to comment.	61,3%	55

For the conducted research, primary data collected by survey, and online interview techniques were used. Certain information obtained indicates that the respondents are evenly distributed, with a slight majority of male persons, 53.3%, while female persons make up 46.7% of the sample. The age structure indicates that the largest share of respondents belongs to the group of 26 to 35 years (27.6%), followed by the groups of 36 to 45 years (24.5%) and 18 to 25 years (23.4%). Respondents between the ages of 46 and 55 make up 10%, while respondents older than 56 are represented by 6.7%.

When analyzing the educational structure, it was determined that most respondents, 63.3%, have higher education, 33.3% of respondents have secondary education, and 3.3% have elementary school.

The questionnaire was mostly filled out by employees of various professions (74.4%), while students made up 15.6% of the sample, and pensioners made up 10%. According to the amount of monthly income, almost each of the four mentioned groups is equally represented (Table 1), and the majority of respondents (61.3%) did not want to declare their income.

In the part related to personal finances, the majority of respondents, 43.3%, answered that they did not need any help in terms of using e-financial information. The remaining respondents need help the most to effectively use e-financial information.

When asked if they are familiar with mobile applications that help users manage e-financial information efficiently, 31.1% of respondents answered that they are familiar with them, but do not use them. Almost a third of respondents (28.8%) answered that they use applications, while 15.6% of respondents plan to use them in the near future. 17.8% of respondents declared that they were not familiar with mobile applications that help users manage e-financial information effectively, but they would like to know and learn more about them. Only 6.7% of respondents answered that they were not familiar with and were not interested in using the mentioned mobile applications.

These data enable a valid analysis of the influence of demographic factors on the acceptance of IPS QR services, and additionally ensure the relevance of the findings within different social and economic groups.

III. RESULTS AND DISCUSSION

Analysis of the reliability of the survey on a group of features includes the determination of Cronbach's alpha coefficient. The obtained values of this coefficient range from 0-1. This coefficient shows the extent to which the statements that make up a certain construct are interconnected and consistent. When the value is greater than 0.7, it is considered that the reliability and consistency of the claims are adequate, while values above 0.8 are interpreted as good, and those above 0.9 as extremely high [6]. The test reliability results are given in Table 2. The Cronbach's Alpha values obtained are greater than 0.8 (ranging from 0.818 to 0.951) and indicate that all 8 variables observed in this research have very good internal consistency.

The results shown in Table II indicate that all constructs, except one, have a satisfactory level of reliability. The highest reliability was recorded for the effort expectation (EE) construct with Cronbach's $\alpha = 0.957$, which indicates an exceptional internal consistency of the statements that make up this construct. Similar high reliability values were observed for the constructs Behavior Intention (BI) ($\alpha = 0.885$), Social Influence (SI) ($\alpha = 0.859$), Performance Expectancy (PE) ($\alpha = 0.854$), and Habit (HB) ($\alpha = 0.782$).

The constructs Facilitating Conditions (FC) ($\alpha = 0.750$) and Price Value (PV) ($\alpha = 0.772$) also meet minimum reliability criteria. When the obtained values are greater than 0.7, the reliability can be considered acceptable [7, 8].

The only construct that shows a lower level of reliability is Hedonic Motivation (HM), with Cronbach's $\alpha = 0.647$, which indicates different interpretations of hedonic motivation by the respondents. And if this value is slightly below the conventional threshold, i.e. generally accepted values that most researchers adhere to can be considered the lower limit of acceptability (0.60 - 0.70), according to Hair, Black, Babin & Anderson [6], and according to Ben Stat [9], acceptable alpha values range from 0.60 to 0.95. Nunnally [10], considers that values of 0.50-0.60 are acceptable in the early stages of research. We believe that this research on users' intention to use the new service, the IPS QR code, can be accepted as an early, initial phase of the research.

Table II. Scale reliability

Variable	***Cronbach's Alpha***
Performance Expectancy (PE)	0,854
Effort Expectancy (EE)	0,957
Social Influence (SI)	0,859
Facilitating Conditions (FC)	0,750
Hedonic Motivation (HM)	0,647
Price Value (PV)	0,772
Habit (HB)	0,782
Behavior Intention (BI)	0,885

Source: Author's calculation based on SPSS

To determine the strength of the relationship (degree of linear dependence) between the variables, a correlation analysis was performed, the results of which are shown in Fig.I. Based on the obtained values of the Pearson correlation coefficient, it can be concluded that there is a statistically significant positive relationship at the 0.01 level (probability 99%) between all variables. The obtained correlation coefficients have a positive sign (+). This indicates that better results in one variable are associated with better results in another variable. As the value in one variable increases, the corresponding value in the other variable increases [11].

Fig.I. Correlation analysis

	BI	PE	EE	SI	FC	HM	PV	HB
BI	1	0,503**	0,466*	0,437*	0,667**	0,542**	0,637**	0,677**
PE		1	0,527**	0,401*	0,360*	0,465*	0,530**	0,364*
EE			1	0,762**	0,411*	0,743**	0,506**	0,408*
SI				1	0,244	0,814**	0,589**	0,534**
FC					1	0,418*	0,378*	0,490*
HM						1	0,695**	0,605**
PV							1	0,739**
HB								1

Notes: Correlation is significant at the 0,05 level*
*** Correlation is significant at the 0,01 level*
Source: Author's calculation based on SPSS

PE - Performance Expectancy
EE - Effort Expectancy
SI - Social Influence)

FC - Facilitating Conditions
HM - Hedonic Motivation
PV - Price Value
HB - Habit
BI - Behavior Intention

Pearson's correlation analysis indicates that the variable Behavior Intention has a strong correlation with most variables, ie. that all constructs have a positive and statistically significant association with Behavioral Intention (BI). The strongest correlation is shown by the Habits (HB) construct ($r = 0.677$), which indicates that user habits play a key role in their intention to use IPS QR services. Similarly, significant positive correlations were also observed with the constructs Facilitating Conditions (FC) ($r = 0.667$, $p < 0.01$), Price Value (PV) ($r = 0.637$, $p < 0.01$), and Hedonic Motivation (HM) ($r = 0.542$, $p < 0.01$), indicating that technical support, perceived service value, and sense of satisfaction also contribute to the intention to use IPS QR service.

The construct Performance Expectancy ($r = 0.503$, $p < 0.01$) has a moderate correlation with Behavior Intention (BI), while the weakest but still significant correlations are recorded with Effort Expectancy ($r = 0.466$, $p < 0.05$) and Social Influence ($r = 0.437$, $p < 0.05$). All correlations have a positive sign, which means that the increase in the values of the independent variables is accompanied by an increase in the intention to use the IPS QR service. Analyzing the interrelationships between independent variables, a particularly strong correlation is observed between EE and SI ($r = 0.762$, $p < 0.01$), SI and HM ($r = 0.814$, $p < 0.01$), as well as PV and HB ($r = 0.739$, $p < 0.01$), which indicates the interdependence of certain dimensions of technology acceptance.

To test the research hypothesis, related to the influence of the independent variable (variables of the UTAUT2 model) on the dependent variable (Behavior Intention, BI), regression analysis was conducted, and the results are shown in Table III.

Table III. Simple regression analysis - (Dependent variable Behavior Intention)

Independent variable	**R^2**	**β**	**t**
Performance Expectancy	0,253	0,397**	5,458
Effort Expectancy	0,217	0,368**	4,939
Social Influence	0,191	0,355**	4,553
Facilitating Conditions	0,445	0,570**	8,404
Hedonic Motivation	0,294	0,538**	6,048
Price Value	0,405	0,710**	7,745
Habit	0,458	0,657**	8,631

*Notes: **Statistically significant at the 1% level*
Source: Author's calculation based on SPSS

The results of the regression analysis show that all independent variables of the UTAUT2 model have a statistically significant influence on users' intention to use mobile application services (IPS QR code), with the degree of influence being different. The Habit construct has the most significant influence ($\beta = 0.657$, $R^2 = 0.458$, $p < 0.01$), which indicates that 45.8% of the variability of users' intention to use the IPS QR service can be explained by habits. Price Value ($\beta = 0.710$, $R^2 = 0.405$, $p < 0.01$) and Facilitating Conditions ($\beta = 0.570$, $R^2 = 0.445$, $p < 0.01$) have a strong influence, which shows that users highly value the practical benefits and technical conditions of using the service.

The Hedonic Motivation construct also shows a significant and positive influence ($\beta = 0.538$, $R^2 = 0.294$, $p < 0.01$), while somewhat weaker, but still significant influences come from Social Influence ($\beta = 0.355$, $R^2 = 0.191$, $p < 0.01$), Effort Expectancy ($\beta = 0.368$, $R^2 = 0.217$, $p < 0.01$) and Performance Expectancy ($\beta = 0.397$, $R^2 = 0.253$, $p < 0.01$). Although their coefficients are lower, these results indicate that perceived effort, expected results, and environmental influence still have a relevant effect on user intentions.

Jerinić [12] believes that the sudden and fast, rapid development of information technologies today leaves a deep mark on people and dramatically affects their lives. He cites the example of bank employees in the field of eBusiness, such as electronic banking, electronic commerce, or some other new information (mobile) technologies, who are expected to use these technologies in different situations, which requires employees to possess certain specific skills, higher levels of knowledge and understanding. It can often happen that people in doubt choose a technology, which causes them to feel insecure, and as a consequence of that insecurity, fear of technology (eg, mobile information technology). The results obtained in this work can be explained by the fact that new mBanking technologies today provide opportunities for even more efficient work, safer and faster progress in managing personal finances. Today, people are exposed to fear in front of numerous innovations in all spheres of life, which causes fear, primarily in older people and those with a lower level of education. This can be seen from the results of this work related to demographic data where, in most cases, highly educated people accept various technological solutions much more easily because they have greater technological and IT literacy, which contributes to their easier adaptation to the challenges they encounter. They are not afraid to accept the news and if it, perhaps, affects the change of their daily activities. They are not afraid to accept the news and if it, perhaps, affects the change of their daily activities. Older people, with insufficient technological and informational literacy, are afraid that

such newspapers will influence the change of the reality they know and the change of their previously generally accepted habits. This fear could be overcome through the education of this part of the population in the sense that not all changes in comfort are necessarily bad, and that through education, people's awareness is raised that they should use new technologies for their well-being.

The work contributes to the connection of different areas of modern business by indicating how modern technologies affect them. Contributions to the digital literacy of people who are not familiar with the topic of mobile technology are addressed in this paper, as well as raising consumer awareness of the benefits of mobile banking. The obtained results indicate the existence of a real opportunity to expand the use of mobile phones in the field of finance and represent a significant implication for banks and other financial institutions to work on improving and expanding the marketing of already existing mobile services. Research in this area and an adequate analysis of the current situation in the financial business can contribute to the development of new ideas and technologies and play a key role in the progress and modernization of financial business.

IV. Conclusion

The work contributes to familiarizing users with the mBanking application, IPS QR, and the motives for using this application. The small sample on which the research was carried out, the fear of the unknown, primarily when it comes to monetary transactions, and the lack of knowledge of the legal regulations that serve to protect users of mobile application services for financial management, are the limitations of this research. In further research, attention can be paid to increasing the sample, sampling in neighboring countries, temporal and/or geographical comparative analysis, differences between generations and digital literacy.

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