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SOFTWARE ENGINEERING - KNOWLEDGE AREA - SOFTWARE MAINTENANCE: ANALYSIS OF THE LOGISTICS OF BUSINESS SERVICES OF THE E-CITIZEN SYSTEM

Abstract: The knowledge area of software maintenance is related to all other aspects of software engineering and because knowledge area description applies to all other knowledge area of software engineering, in this research paper we made analyses the logistics of business services of the Croatian e-citizen system, focusing on the knowledge area and user satisfaction with recommendations for improvement. Our analyses the logistics of business services of the Croatian e-citizen system, focusing on the post-delivery phase. Post-delivery activities of the Croatian e-citizen system include software monitoring, modification, training, and working with or liaising with the help desk. Software operation and maintenance support activities of the Croatian e-citizen system are performed during the pre-delivery phase and during the post-delivery phase. Pre-delivery activities of the Croatian e-citizen system include planning post-delivery operations, maintainability, and determining the logistical support required to transition from development to maintenance. The research aims to determine the extent to which Croatian e-citizen system, as a digital public administration service, meets logistics and user needs and identifies the business managerial challenges they face. In the first part of the research, we provide an overview of the theoretical framework of e-government and the digitalization of public services, with a short analysis of examples from other EU countries and region near Croatia (with examination the logistic and development of the Croatian e-citizen system in detail, including its functionality and usage statistics). In the second part of the research, which is empirical part of the research, we made analyses the logistics of business services of the Croatian e-citizen system, focusing on the knowledge area and user satisfaction with recommendations for improvement. Analytical results, about the logistics of business services of the Croatian e-citizen system, show that most of users recognize the importance of the Croatian e-citizen system for modernizing public administration but point out shortcomings in the intuitiveness of the user interface and limited-service integration. Based on these findings, several measures are proposed to improve the logistics of business services of the Croatian e-citizen system and enhance user satisfaction.

Keywords: Croatian e-citizen system, knowledge area of software maintenance, logistics of business services, user experience

1. INTRODUCTION

In this research about the software engineering, in knowledge area we focus our research interest in specific research area related to software maintenance, concretely in specific analysis of the logistics of business services of the e-citizen system in Croatia. According to the “SWEBOK Guide ver. 4.0” edited by Washizaki (2024) referring to projects and approaches

of software engineering, or knowledge area and software maintenance and according to research named “Managing IT projects: building a body of knowledge in IT project management” edited by Perera and Eadie (2021), software maintenance is defined as the totality of activities required to provide cost-effective support for software in operation. Software operation and maintenance support activities are performed during the pre-delivery phase and during the post-delivery phase. Pre-delivery activities include planning post-delivery operations, maintainability, and determining the logistical support required to transition from development to maintenance. Post-delivery activities include software monitoring, modification, training, and working with or liaising with the help desk. The knowledge area (KA) of software maintenance (SM) is related to all other aspects of software engineering. This description of KA applies to all other KAs for software engineering in relatively new guide edited by Washizaki (2024). The knowledge area of software maintenance is related to all other aspects of software engineering and because knowledge area description applies to all other knowledge area of software engineering, in this research paper we made analyses the logistics of business services of the Croatian e-citizen system, focusing on the knowledge area and user satisfaction with recommendations for improvement. Our analyses the logistics of business services of the Croatian e-citizen system, focusing on the post-delivery phase. Post-delivery activities of the Croatian e-citizen system include software monitoring, modification, training, and working with or liaising with the help desk. Software operation and maintenance support activities of the Croatian e-citizen system are performed during the pre-delivery phase and during the post-delivery phase. Pre-delivery activities of the Croatian e-citizen system include planning post-delivery operations, maintainability, and determining the logistical support required to transition from development to maintenance. The research aims to determine the extent to which Croatian e-citizen system, as a digital public administration service, meets logistics and user needs and identifies the business managerial challenges they face. In the first part of the research, we provide an overview of the theoretical framework of e-government and the digitalization of public services, with a short analysis of examples from other EU countries and region near Croatia (with examination the logistic and development of the Croatian e-citizen system in detail, including its functionality and usage statistics). In the second part of the research, which is empirical part of the research, we made analyses the logistics of business services of the Croatian e-citizen system, focusing on the knowledge area and user satisfaction with recommendations for improvement. Analytical results, about the logistics of business services of the Croatian e-citizen system, show that most of users recognize the importance of the Croatian e-citizen system for modernizing public administration but point out shortcomings in the intuitiveness of the user interface and limited-service integration. Based on these findings, several measures are proposed to improve the logistics of business services of the Croatian e-citizen system and enhance user satisfaction. The paper analyses the logistics model of e-Citizen’s system services with a focus on user satisfaction and recommendations for improvement. The research sought to determine to what extent e-Citizens, as a digital public administration service, logistically meets the needs of users and what challenges they face. Part of the research paper provides a brief overview of the theoretical framework for e-government and the digitalization of public services, along with an analysis of examples from other EU countries. The development of the e-Citizens system, its functionality, and statistical data on usage are very briefly analysed. The empirical part of the research paper includes a survey of user satisfaction with the e-Citizens system and its logistics services. The results mainly show that users recognize the importance of the system for the modernization of public administration but point to shortcomings in the intuitiveness of the user interface and limited integration of services. Based on these and other findings, specific measures were proposed to improve the logistics of services and the entire system to increase user satisfaction and direct the maintenance and development of the e-Citizens software. This work and research would analyse the logistics of business services of the e-citizen system (as a part of software engineering, knowledge area, software maintenance) in terms of whether the logistics of the service provides all the expected and sufficiently diverse services that can be useful to the majority of interested citizens, i.e. the respondents in this research, in general and in everyday life, and to verify the common opinion that citizens often do not use the aforementioned services due to their insufficient information or even their poor education as potential users of the e-Citizen system. This research paper analyses all the main features of the system perceived by the respondents, and additionally explores their experiences in using e-services and what are the suggestions of the respondents (citizens) as their users for improving the system in general and specifically for some of the segments of the e-Citizen system, that is very important for software maintenance, as part of software engineering, knowledge area (Dennis, & Wixom, 2000; World Bank, 2009; Malecki, 2002Musa, & Đurman, 2016; Kovač, 2018; Frankiewicz, & Chamorro-Premuzic, 2020; Official Gazette, 2023).

2. RESEARCH PROBLEM, SUBJECT, GOALS, HYPOTHESES, METHODS

Despite the many advantages that the e-Citizens system offers, users continue to face various challenges and dissatisfactions. The research problem lies in identifying and understanding these challenges and in finding ways to eliminate them to improve the efficiency and acceptance of the system among citizens. One of the key problems is the logistical complexity of using the system. Although the system is designed to be intuitive, many users, especially the elderly population or those with a lower level of digital literacy, often have difficulty navigating and using different functionalities. This can result in frustration, giving up using the system and returning to traditional methods of interaction with public administration. Another problem lies in technical and logistical difficulties and possible unreliability of the system. Users often report problems with the logistical complexity of the system, especially accessing services, loading pages, or even technical failures that prevent the completion of necessary procedures. Such problems not only affect user

satisfaction but can also reduce citizens' trust in the system and public administration. Furthermore, users often face a lack of logistical support and a lack of information. In cases where they encounter a problem or have a question, they often do not have an easy way to get help or additional information. This can further increase frustration and reduce overall satisfaction with the system. The research problem also involves identifying differences in satisfaction among different groups of users. For example, satisfaction can vary depending on demographic characteristics such as age, education, digital literacy, and frequency of system use. Understanding these differences can help in adapting the system during software maintenance and system improvements, and for the system to better meet the needs of all users. It is also important to investigate how the current services of the e-Citizen system can be improved during software maintenance. This includes analysing user feedback and suggestions for improvement, as well as exploring best practices from other countries that have successfully implemented similar digital systems. The research problem focuses on identifying and addressing barriers that hinder users from fully and effectively using the e-Citizen system. By understanding and eliminating these problems during software maintenance, we are getting closer to the desired goal, which is: "to increase user satisfaction, improve system efficiency and encourage wider use of digital services in public administration, especially through the e-Citizens system". Through the analysis and recommendations that will emerge from this research, we hope to contribute to the creation of a more efficient, accessible and user-oriented e-Citizen's system. The subject of the research is the analysis of the logistical functionality and efficiency of the e-Citizens system, with an emphasis on user experience and satisfaction with the services offered by the system, with the aim of better software maintenance of the system. The e-Citizens system provides its users with access to numerous government and public services via the Internet. The work aims to examine how users experience these services, what are the recommendations for their use and where there are opportunities for improvement. The experimental part of the research is based on a survey conducted among users whose responses were analysed to collect data on their satisfaction, frequency and method of use, problems they encounter and suggestions for improving the system, through better logistical and software maintenance of the system. The objectives of the research work include the analytical identification of relevant literature and relevant e-content, etc. on the available e-services of the e-Citizens system, the analytical and comparative assessment of technical and other relevant characteristics and basic user interfaces, additional analytical research of the user experience, studying the diversity of user e-profiles, and assessing the overall logistical availability, with an analysis of the logistical and general efficiency of e-services, etc., and identifying the most common expectations and needs of users of the researched e-Citizens system. The research will propose specific recommendations for improving the system with the aim of increasing user satisfaction. The aim of the paper is to prove or disprove the given two hypotheses: Hypothesis 1: The e-Citizens system represents a positive step towards the digitalization of public administration, but the user interface is not intuitively designed, which makes it difficult to navigate and reduces user satisfaction; Hypothesis 2: The functionality of the e-Citizens system is limited due to insufficient integration of related systems, which does not give users access to comprehensive information and services. Main research questions (RQ) arise from the previously defined research objectives: (RQ 0) Demographic characteristics of the respondents? (RQ 1) How often do you use the services of the e-Citizens system? (RQ 2) How satisfied are you with your experience using the e-Citizens system? (RQ 3) How clear and intuitive is the user interface of the e-Citizens system? (RQ 4) Is the content and information on the system clearly written? (RQ 5) Are you concerned about data security when using the e-Citizens system? (RQ 6) Do you notice improvements in the system from the first use to today? (RQ 7) What level of credentials do they use to log in? (RQ 8) How would you rate the overall experience of using the e-Citizens system? (RQ 9) Please list at least one thing that you consider the most valuable or positive about using the e-Citizens system. (RQ 10) Please list at least one aspect of the e-Citizens system that you would like to improve. (RQ 11) Please list the 3 services that they use most often. (RQ 12) Do you use the m-Tax application? (RQ 13) How likely are you to refer a friend to use the e-Citizens system? This research paper used methods of data qualification collected from secondary sources such as books, scientific and professional articles, statistical reports, legal regulations and internet sources. The method of research and content analysis of relevant literature was applied, which provided a thorough insight into existing works, studies and documents related to e-Government, digitalization of public administration and the e-Citizens system. Furthermore, the pilot research method was used, which consisted of conducting an anonymous survey on the use of the e-Citizens system. In this way, data on user experiences and satisfaction and their suggestions for improving the system were collected first-hand. The modelling method was used to create conceptual models based on the collected data, while the methods of analysis and synthesis, including classical analysis, SWOT analysis were applied to identify the strengths and weaknesses of the e-Citizens system as well as opportunities for their improvement. Also, the methods of inference and hypothesis testing were used to confirm or reject assumptions. Finally, they apply statistical methods and analysis with the use of appropriate tools to quantitatively analyse the collected data from the survey and reach a conclusion based on objective indicators.

3. SWOT ANALYSIS, RESEARCH RESULTS WITH INTERPRETATION

It should be noted that for the purpose of writing this paper, a study was conducted in which an anonymous survey questionnaire created using the Google Forms application was used. The survey can be viewed as a quantitative research method.. The target group of this study were adult citizens of Croatia. The main goal of conducting the survey was to investigate the level of use of e-Citizen system services and the attitudes of the respondents. The survey questionnaire consisted of four parts. The first part contained questions related to general (demographic) data of each respondent, such

as: age, level of education, place of residence. The second part of the survey was intended for people who do not use e-Citizen system services. The third part of the survey was intended for respondents who use services via the e-Citizens system and their attitudes about it. The total number of questions in the survey was eighteen. The research was conducted in the period from June 1, 2024, to June 20, 2024, and a total of 173 respondents responded to the questionnaire. Table 1 shows the identified factors for each individual SWOT category. It should be noted that the area of public administration digitalization in Croatia is characterized by pronounced weaknesses, while the external environment offers favourable opportunities, so it is necessary to mitigate or neutralize weaknesses to better exploit the available opportunities (Wilson, 2002; Malecki, 2002).

Table 1: SWOT analysis of digitalization of public administration

Strengths	Weaknesses
Secured record financial resources through NPOO A complete legal framework is provided Continuous increase in users of e-services Established operational model of accelerated digitization of public services Successful development of the e-Citizens system and the START platform High pace of creation and launch of new e-services Existing experience of digitization in certain sectors The shared services centre (CDU) migrated the systems of 300 institutions In the openness of data of public authorities above the EU average	Lack of administrative simplification and redesign of public services according to the concept of "citizen at the center" before the digitization of the service itself The practice of coordinated prioritization of public services that need to be digitized has not taken hold Croatia is far below the EU average in terms of the amount of pre-filled data in digital forms of public services - insufficiently applied "only once" principle (repeated request for data) Lack of public service analysis from the perspective of user experience The existence of numerous active functionalities of digital public administration whose potentials are not fully utilized Insufficient use of analytical tools over large data sets in the decision-making process and policies in public administration Insufficient use of analytical tools over large data sets in the decision-making process and policies in public administration Availability of digital public services for citizens and businesses below the EU average Lack of a single contact center for all public e-services Insufficient level of digitalization of supporting business processes in public administration Insufficient measurement of satisfaction of users of public (e-services) The most important administrative procedures for cross-border users are not fully available online in the Republic of Croatia
Opportunities	**Threats**
Existence of EU funds for technical assistance and financing of the implementation of measures for the digitalization of public administration A high level of awareness achieved at all levels of government about the necessary cooperation in the development and introduction of advanced e-services Existence of global, proven business cases for the application of advanced e-services in providing higher quality and more efficient digital public services Availability of private sector capacities for additional support in the accelerated digitalization of the public sector and services Availability of examples of good practice in strategic thinking and the implementation measures and projects of digitization of public administration of other highly digitized member states.	The continued outflow of professional staff will cause a lack of resources for the implementation of measures of accelerated digitization of public administration. Increasing risks of computer security incidents and hacker attacks on national public services Global security threats that can divert resources and digitization efforts from public administration to other spheres of public action Lack of interest of key stakeholders in participating in consultation processes and advocating key changes related to digital transformation

Source: Authors.

Below is a presentation and interpretation of the research conducted. (I.) The first question related to the age structure of the respondents (173 respondents fully answered this questionnaire question). The smallest share, 4%, is made up of respondents older than 65 years. 8.1% of respondents are in the age group from 51 to 65 years, while 37.6% belong to the age group from 41 to 50 years. The largest share of respondents, 42.8%, belongs to the group from 25 to 40 years. Overall, 80.4% of respondents are in the age range from 25 to 50 years, which indicates a relatively younger population among the surveyed users of the e-Citizens system. (II.) The second question is about the level of education of the respondents (173 respondents fully answered this questionnaire question). The largest number of respondents has a university degree,

50.9%. This is followed by respondents with a higher education degree, 24.3%, and those with secondary school, 17.3%. The smallest share, 7.5%, is made up of respondents with postgraduate or doctoral studies. This distribution of educational levels indicates a high level of education among the surveyed users of the e-Citizens system. (III.) To the third question about the place of residence according to the size of the settlement (this question of the questionnaire was fully answered by 173 respondents), most respondents, 67.1%, stated that they live in a city with more than 50,000 inhabitants. A further 19.7% live in a city with a population of up to 50,000, while 13.3% of respondents come from smaller municipalities. This distribution suggests that the largest share of surveyed users of the e-Citizens system is concentrated in urban areas. (IV.) The fourth question to choose their status (173 respondents fully answered this question of the questionnaire) yielded the following answers: Students 9.8%, Unemployed 3.5%, Public sector employee 41.6%, Private sector employee 34.7%, Business owner/craft 12.1%, Retired 4.6% and Parent/caregiver status 0.6%. Most respondents are employees in the public or private sector, with the number of employees in the public sector being slightly higher. (V.) The answers to the fifth question on the use of the e-Citizens system (173 respondents fully answered this question of the questionnaire) are as follows. A total of 7.5% of respondents do not use the e-Citizens system, so the second section asks why they do not use it. The reasons they give are as follows: Lack of need: Some respondents point out that they simply did not have the need to use the e-Citizens system, which suggests that the perception of user needs is an important factor in encouraging the use of digital services; Perception of complexity: There is a partial feeling that the system is too complicated to use, which may indicate the need for a better user interface and a more intuitive design; Amount of information requested: Some respondents believe that the amount of data requested from them is too large, which may create the impression that the system is not adapted to the average user; Doubts about data security: Insufficient information about security protocols and personal data protection further contributes to caution towards using the system; Personal preferences: There are also respondents who simply do not want to use the system, which may indicate deeper social or psychological reasons that go beyond technical aspects; Technical problems: Some respondents state that they have encountered problems related to credentials, which affected their motivation to continue using the system; Insufficient experience: A certain number of respondents state that they have not had the opportunity to use the system so far, which may indicate the need for additional education and informing citizens about available services; Aversion to technology: Some respondents point out that they are not familiar with technology and do not feel comfortable using it; General lack of interest: Finally, some respondents simply do not see the need to use the e-Citizens system, which may include lack of information or insufficient recognition of the value of digital services. All other answers refer to respondents who answered affirmatively to the question of whether they use the e-Citizens system. In the following questions, the query was set in the form of a Likert scale (the Likert scale consists of statements, usually 15 to 20, which express a positive or negative attitude towards an object of the attitude. Each statement is usually accompanied by five possible answers. They express the degree of agreement, or disagreement with the attitude expressed in the statement (complete agreement, agreement, undecided/neutrality, disagreement, complete disagreement)) with 5 levels, ranging from "completely agree" to "completely disagree". (VI.) To the sixth question in the form of the statement "I often use the services of the e-Citizens system" (this question of the questionnaire was fully answered by 160 respondents), most respondents expressed a high degree of agreement. The results show that 30.6% of respondents chose answer 5 (I completely agree), while an additional 30% chose answer 4 (I agree). A neutral position, answer 3, was taken by 22.5% of respondents. Answer 2 (I disagree) was chosen by 12.5% of respondents, while the smallest number of respondents, 4.4%, completely disagreed with the statement, choosing to answer 1. These data suggest that a total of 60.6% of respondents tend to say that they often use the services of the e-Citizens system, while a smaller share of respondents, 16.9%, disagreed. (VII.) To the seventh question in the form of the statement "I am satisfied with the experience of using the e-Citizens system" (this question of the questionnaire was fully answered by 160 respondents), with 23.8% of respondents choosing the highest satisfaction rating, answer 5 (I completely agree), while the largest part of the respondents, 46.9% of them, chose answer 4 (I agree). A neutral attitude towards this statement, answer 3, was taken by 16.4% of the respondents. A lower level of agreement is expressed by 8.1% of the respondents with answer 2, while 5% of the respondents are completely dissatisfied, choosing to answer 1 (I completely disagree). These data show that a total of 70.7% of the respondents are satisfied with their experience of using the e-Citizens system, while a relatively small part, 13.1% of them, expressed dissatisfaction. (VIII.) To the eighth question in the form of the statement "The user interface of the e-Citizens system is clear and intuitive" (this question of the questionnaire was fully answered by 160 respondents), the respondents' answers on a 5-point Likert scale show the following distribution: 13.8% of respondents completely agree with this statement (answer 5), while 27.5% choose answer 4, which also indicates a positive attitude. A neutral position towards the clarity and intuitiveness of the interface was taken by 28.7% of respondents, choosing answer 3. A lower degree of agreement is expressed by 18.1% of respondents (answer 2), while 11.9% of respondents completely disagree with the statement, choosing to answer 1. The results show that a total of 41.3% of respondents consider the user interface to be clear and intuitive, while 30% express disagreement. (IX.) To the ninth question in the form of the statement "The content is adapted and the information on the system is clear" (this question of the questionnaire was fully answered by 160 respondents), the respondents' answers were distributed as follows: 13.1% of respondents completely agree with the statement (answer 5), while 32.5% choose answer 4, which indicates a positive attitude towards the clarity of information. A neutral attitude towards the content of the system is held by 31.9% of respondents with answer 3. A lower degree of agreement is expressed by 15.8% of respondents (answer 2), while 8.9% of respondents completely disagree with the statement, choosing to answer 1. These data show that 45.6% of respondents are satisfied with the clarity and adaptation of the information on the system, while 24.7% express disagreement. (X.) To the 10th question in the form of the statement "When using the e-Citizens system,

data security is not a problem for me" (this question of the questionnaire was fully answered by 160 respondents), the respondents answered as follows: 40.6% of the respondents completely agree with the statement (answer 5), while 35.6% choose answer 4, which also indicates a high degree of trust in the security of the system. A neutral attitude towards this statement is taken by 16.9% of the respondents, choosing to answer 3. Less disagreement is expressed by 5% of the respondents with answer 2, while 1.9% completely disagree, choosing to answer 1. The results show that a total of 76.2% of the respondents do not have a problem with trust in data security when using the e-Citizens system, while only 6.9% expressed concern about this issue. (XI.) To the eleventh question in the form of the statement "Since the first use of the system until today, I have noticed improvements in the e-Citizens system" (this question of the questionnaire was fully answered by 160 respondents), the respondents' answers were distributed as follows: 15% of respondents completely agree (answer 5), while 24.4% choose answer 4, which indicates a positive perception of changes in the system. Most respondents, 43% of them, take a neutral position, choosing to answer 3. Less disagreement is expressed by 11.3% of respondents (answer 2), while 6.3% completely disagree with the statement, choosing to answer 1. These results show that a total of 39.4% of respondents notice improvements in the e-Citizens system, while 17.6% expressed disagreement regarding the progress of the system. (XII.) To the twelfth question "What level of credentials do you use?" (160 respondents fully answered this question of the questionnaire), the results show the following distribution of responses among respondents: 16.3% use a low level of security, 66.3% use a medium, or significant, level of security, while 35% of respondents use a high level of security. These results show that most users (66.3%) prefer a significant level of security, while a slightly smaller but significant portion of respondents (35%) is oriented towards the highest level of credential security. (XIII.) To the thirteenth question "Please rate your overall experience of using the e-Citizens system" (160 respondents fully answered this question of the questionnaire), the respondents' responses were distributed as follows: 19.4% of respondents chose the highest satisfaction rating, answer 5, while the largest part of respondents, 47.5%, rated their experience with a rating of 4. 26.9% of respondents chose a neutral rating of 3, while 4.4% chose answer 2, and the smallest part, 1.9%, expressed complete dissatisfaction with a rating of 1. These data show that most respondents (66.9%) have a positive experience with using the e-Citizens system, while only a small proportion, 6.3%, expressed dissatisfaction. (XIV.) To the additional fourteenth open-ended question “Please list at least one thing that you consider most valuable or positive about using the e-Citizens system.”, respondents gave the following answers: (A) Availability of documents and speed of access: Respondents highlighted advantages such as “Availability of documents”, “Quick access to necessary documents and medical findings”, “Speed of issuing a certificate without going to offices”, “Speed of obtaining the requested information, data, papers”, “Speed of getting documents” and “Speed of obtaining a document”. Many additionally emphasized the benefit of “I don’t have to go to the counters of institutions”, as well as “No waiting for certificates for 7 working days or more” and “No waiting in lines”.; (B) Health services (health portal and e-Health): There are frequent responses that emphasize the benefits of health portals, such as "Health", "Health Portal", "E-Health" and "e-Health Portal", with users highlighting the possibilities of "tracking health referrals and prescriptions" and "reviewing medical findings".; (C) Electronic performance of administrative tasks without physical attendance: Users praised the system for the possibility of "I don't have to visit counters for every nonsense", "That I can do everything without leaving home" and "I can take over everything without coming to institutions". Specific responses also included tasks such as "registering a newborn", "enrolling a child in kindergarten" and "importing a car without going to customs".; (D) Tax services: Many highlighted tax-related services, such as "e-Tax" and "Inspection of PK card". The convenience of "When I get my tax refund" and "Tax, health portal (orders and findings)" was particularly appreciated.; (E) Wider availability of services and digitization of processes: Responses included praise for "Availability of an increasing number of services", "Availability of documentation via the Internet" and possibilities such as "Downloading of documents (e-registers and others)", "Electronic obtaining of documents and certificates" and "Data available online". (E) Saving time and easing bureaucracy: Several respondents emphasized time savings, with specific statements such as "Time saved by not having to go for paperwork", "I don't have to wait at counters for various certificates", "Reduced walking around different institutions and quick access to the documents and data you need".; (F) Ease of access and transparency: Some respondents mentioned the importance of "Everything available in one place", "All necessary documents are at hand" and "Easier way to obtain documents".; (G) System Security and Different Credentials: Several respondents valued “Login Security through Different Credentials” and “Security”.; (H) Specific services for parents and students: Some users mentioned additional services, such as “E-diary”, “I have access to my child’s grades and exams” and “Excuses for absences”. (XV.) In response to the additional fifteenth open-ended question “Please list at least one aspect of the e-Citizens system that you would like to improve”, respondents stated the following: (A) User interface and user experience (UX): Respondents often cited the need for a “clearer interface”, “better information transparency”, and an interface that is “more intuitive and adapted to all citizens”. Many described the system as “confusing” and “inconsistent” and that it requires further simplification to make it easier to use. Specific suggestions include: “Page clarity”, “easier document search”, “more accessible home page”, as well as a better explanation of credentials and security levels, which users consider important for easier navigation. Several respondents suggested “better harmonization of the application” and a more consistent user experience, highlighting that the user interface is “too cumbersome” and requires “improvement of intuitiveness and consistency”.; (B) Authentication and login: Users expressed dissatisfaction with the authentication process, with suggestions such as: “Authentication via e-personal ID must be easier”, “Easier login” and “Easier access to the system”. Several respondents highlighted frustration with “constant approval and confirmation of consent to switch between systems”, suggesting that a single login should allow access to all services without additional confirmation.; (C) Additional services and expansion of existing ones: Some users want to see “a greater number of available services”,

including “additional services such as voting in elections” and “better integration with other public administration systems”. Specific suggestions include “availability of all public health findings on e-Citizens”, “expanding the number of services in the Tax System” and “enabling services related to justice”.; (D) Health Portal and Health Services: Several respondents highlighted the need for improvements in the "Health Portal", citing a problem with the availability of information as "sometimes the findings are available and sometimes they are not". Other suggestions include "better functionality of the health portal" and "full integration of health findings and data".; (E) Communication and Notifications: Users suggested "better notifications about the delivery of information and documents", stating that they want "e-mail notifications about the arrival of messages or documents".; (F) Simplification of language and instructions: Some respondents suggested "clearer instructions for navigating the system" and "simplified descriptions of functions", considering that the explanations are "sometimes written in technical and incomprehensible language". (XVI.) To the additional sixteenth open-ended question “Please list the 3 services you use most often.”, respondents answered the following: (A) Tax services (e-Tax): The most frequently used tax services include income tax filing, tax refunds, access to tax and accounting data, and issuance of receipts and tax liability status certificates.; (B) Health services (Health Portal, HZZO): Respondents often mentioned access to health data via the Health Portal, including downloading test results, supplementary health insurance through HZZO, and e-Health services for children.; (C) Issuance and retrieval of certificates and documents (civil registry books, Ministry of Internal Affairs): Issuance of birth certificates, citizenship certificates, certificates of no criminal record, and various other official certificates is a common practice. Services such as civil registry books and residence records at the Ministry of Internal Affairs are also highlighted.; (D) User mailbox and receiving notifications: Many users use the user mailbox to check mail and notifications, which includes receiving important documents and official notifications from various government systems.; (E) Educational services (e-Dnevnik): The e-Dnevnik application for parents and students is often used to check grades, attendance and absences in schools.; (E) HZMO services and the pension system: Insight into pension service and related information are also among the frequently used services, with an emphasis on employment and legal status.; (F) Cadastre and land registry services: Many users use e-Cadastre and related land registry services to view and issue title deeds and view cadastral data.; (G) Children's registration and document issuance services: Kindergarten registration services, issuing documents for children and viewing their educational and health data are also among the frequently used functions. (XVII.) To the seventeenth additional question "Do you use the mPorezna application?" (160 respondents fully answered this question of the questionnaire), the results showed that 35% of respondents answered affirmatively, while 65% of respondents chose a negative answer, not using this application. These data suggest that the majority of respondents (65%) do not use the mPorezna application, while a smaller part of users (35%) use this service. (XVIII.) To the additional eighteenth question "On a scale of 1 to 10, how likely is it that you would refer a friend to use the e-Citizens system?" (160 respondents fully answered this question of the questionnaire), the respondents' answers were distributed as follows: 37.5% of respondents rated the probability with 10 (the highest rating); 11.3% chose a rating of 9; 18.1% of respondents gave a rating of 8; 13.1% chose a rating of 7; 10% of respondents gave a rating of 6; 3.1% gave a rating of 5; 3.1% chose a rating of 4; 0.6% of respondents rated it 3; 1.9% gave it a rating of 2; 1.2% of respondents chose a rating of 1 (the lowest rating). These data indicate that a significant portion of respondents (48.8%) expressed a very high probability of recommending the e-Citizens system, while a smaller percentage of respondents (3.1%) expressed a low probability of recommending it. The following is an interpretation of the results and recommendations for improving the logistics of e-citizen services. From the data collected in the survey, about the e-Citizens system, but also about the respondents, it is possible to additionally conclude the following: (A) More than 80% of respondents are between 25 and 50 years old, which shows that the system is most often used by people of working age, who are more digitally literate and often use online services for business and personal needs. Users older than 65 years of age make up only 4% of respondents, which may indicate challenges in accessing or perceiving digital services among the older population.; (B) Over 50% of respondents have a university degree (VSS) or higher, which indicates users with a higher level of education, who are already familiar with online services. However, a significant percentage also has a secondary education (17.3%), which may indicate the need for a more adapted and simpler interface for the wider population.; (C) The majority of respondents (67.1%) live in larger urban areas, meaning that digital services are more accessible and used in cities, while only 13.3% are from smaller municipalities. This may signal the need for expanding digital services in rural areas and additional training on the use of the system. (D) The largest group is employees in the public sector (41.6%) and the private sector (34.7%). This is important because the public sector may often use e-Citizens for various administrative procedures, while the private sector may have needs related to taxes and business permits. Only 9.8% of respondents are students, while the unemployed, retirees and caring parents together make up a smaller percentage, indicating that they are the most represented in the working population.; (E) Given the demographic data and users' responses on aspects they would like to improve, here are some recommendations: (E1) Simplification of the user interface and experience: The largest number of respondents indicates the need for a clearer, more intuitive and less complicated interface. Given the high level of education of users, but also the representation of those working in different sectors, the system should enable more intuitive search and consolidation of services in a single interface. Special attention should be paid to the integration of various subsystems (such as e-Health, e-Tax and e-MUP services) so that users avoid a fragmented experience and frequent re-login.; (E2) Improvements for specific needs of user groups: It is necessary to adapt certain functionalities depending on different user profiles. Older users (over 65 years of age) need easy-to-access options and educational content that can help them use services. Less digitally literate users will also benefit from simple guides for basic procedures, especially in segments that include important certificates and documents such as birth certificates, certificates

of no criminal record, etc.; (E3) Ensuring stability and consistency of login: System users are bothered by the frequent need for multiple logins when using different subsystems. It is recommended to introduce a consistent login through a central portal that would enable seamless access to all services once logged in.; (E4) Adding new services and accessibility through mobile platforms: Given the working age and mobility of users, as well as the highlighted needs for expanding services, it is recommended to add additional administrative and health services (e.g. availability of all health findings, pension-related certificates, easier access to CES services). Optimizing mobile applications would be useful for easier access, especially for documents and health findings. (E5) Promotion and education about services in smaller towns: Most users come from larger cities, which may reflect limited knowledge about the e-Citizens system in rural areas. It is recommended to conduct information campaigns and education in smaller towns to encourage use of the system among people who find online access to administrative services more difficult. Finally, according to the responses and demographic characteristics, users are mostly satisfied, but primarily emphasize the need for a more transparent, integrated and functionally stable interface.

4. CONCLUSION

The analysis of the obtained results revealed that although users recognize the value of digital access to public services, they often encounter obstacles in using the services themselves, the most prominent of which is the lack of adaptation of the interface to different demographic groups. Difficult access to services causes a sense of frustration among users, while the lack of a comprehensive centralized approach further complicates the use of the system. The results indicate the need for strategic improvements aimed at a simpler, more transparent, and more user-friendly experience for a wider spectrum of the population. In the broader context of the digitalization of public administration, this research confirms the key role of digital systems in the process of modernizing administration and improving the availability of public services. The digital transformation of the public sector represents not only an opportunity to improve the logistics of software services and their improved maintenance, and an opportunity to increase the efficiency of public administration, but also a potentially powerful tool for strengthening transparency, reducing bureaucratic obstacles and adapting services to the needs of modern society. The analyzed e-Citizens system, despite the progress achieved, still shows several technical, logistical and structural shortcomings, which indicate the need for further research and adjustments through the improvement of software service logistics and their improved maintenance. The integration of various digital services into a single and coherent system, while ensuring the stability and reliability of functionality, remains a key challenge for the future development of e-Citizens. The introduction of modern technological solutions, such as a user-friendly interface and advanced personalization of services, could significantly improve the user experience. Also, the application of user needs research methods and iterative functionality testing could contribute to improving the intuitiveness of the system. Only systematic digitalization, which includes cooperation with experts from UX/UI design, sociology and informatics, can ensure long-term user satisfaction and citizens' trust in the e-Citizens system. Therefore, it is necessary that future initiatives within the framework of the digital transformation of public administration follow the results of scientific research and technological progress, so that public administration systems are adapted to the needs of all citizens and fully utilize their potential for improving the quality of life in the digital environment. Based on the research conducted, the following conclusions can be drawn in relation to the hypotheses set: (A) Hypothesis 1: The research results confirm that the e-Citizens system is indeed a significant step in the digitalization of public administration. Users have recognized this as a positive development. However, the research also showed that the user interface is not intuitive enough. Users encountered difficulties in navigation and finding their way around, which affected their satisfaction. These findings confirm the first hypothesis, suggesting that improving the user interface can further improve the user experience through improving the logistics of software services and their improved maintenance.; (B) Hypothesis 2: The research showed that users feel limitations in the functionality of the system due to insufficient integration with other related systems. It was observed that users cannot always access the complete information and services they need. The research indicates that the e-Citizens system represents an important advance in digital public administration, but there is room for improvement in terms of the user interface and integration with other systems. By developing a more intuitive design and better networking, through improved logistics of software services and their improved maintenance, the system can become even more useful and efficient for citizens.

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