Evaluating User Centricity along the Citizen Journey – a Situational Method for E-government Portals

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Abstract

User centricity is a well-known concept to describe a central criterion for the success of digital products and services. An important user perspective on e-government portals is constituted by citizens who want to apply for a public administration service. The citizen journey describes the use of an e-government portal from the user's perspective and enables insights into the user experience. Evaluating the user experience can produce meaningful and comparable data for improving user centricity. This paper presents an evaluation method that combines the citizen journey model with a quantitative assessment of the pragmatic and hedonic quality based on a questionnaire. For the construction of the method, a situational method engineering process is utilized, including validation with three cases from Germany, Poland, and Ukraine.

Keywords

User Centricity, User Experience, Hedonic Quality, Citizen Journey, E-government Portal

1. Introduction

A fundamental instrument for the digital delivery of public administration services to citizens and companies are e-government (e-gov) portals and mobile apps allowing online service usage without a mandatory physical visit to a physical authority [1]. A look at various European countries shows that the approaches to improving access to e-gov services have some similarities, but also clear differences. In Germany, web portals have existed in parallel for years at federal and state level and in numerous municipalities. Because of the strict separation of the administrative levels in the federal system, it was enacted to achieve interoperability by implementing a portal network. Other countries such as Poland and Ukraine provide centralized apps for e-gov services. All approaches have in common that they aim to increase the attractiveness of e-gov services by focusing on the user's perspective when designing them.

The focus on user centricity (UC) as a critical success factor of e-gov services represents the current state of a discussion in which the emphasis on the customer perspective adopted from marketing is increasingly moving into the center of service design [2, 3]. In the research literature, various definitions of UC are offered. Since our evaluation object is the front-end of e-gov

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portals, we draw on the definition of human-centered design (HCD) of the International Organization for Standardization (ISO), which refers to interactive systems and defines HCD as an "approach to systems design and development that aims to make interactive systems more usable by focusing on the use of the system and applying human factors/ergonomics and usability knowledge and techniques" [4]. As the main characteristics for determining HCD, the ISO standard describes usability, user experience, accessibility, and avoidance of harm from use. In this paper, we concentrate on usability and user experience as core elements of UC. User experience (UX) refers to the subjective perception of users during the utilization process [4]. The UX extends to the expectations before use, the use itself, and the degree of satisfaction achieved after use, whereby usability refers to the direct experience of use or the quality of the system discussed. Accessibility and the avoidance of harm from use are beyond the focus of this work, as the UX measurements to be used are methodically tailored to usability and UX.

The citizen journey (CJ) model is an adaptation for e-gov of the original customer journey known from marketing research to explain the UX emergence from using e-gov services. According to Scholta et al. [5], the CJ describes the metaphorical travel route along the points of contact with public authorities from the citizen's perspective. This view enables a deeper understanding of the citizens' needs to improve e-gov services and increase public value [5].

Against the background of the existing CJ research, this study aims to design an evaluation method for UC performance along the CJ of using e-gov portals (web or mobile apps). The underlying research question is: *How can the citizen journey concept be operationalized to evaluate user centricity performance of e-government portals?*

With the investigation of the CJ concept for UC evaluation in the e-gov domain, we strive to extend the existing methods with a specific focus on UX. The practical implications arise from enhancing UC performance of e-gov portals based on a systematic evaluation. To examine the method's validity, three case studies were conducted by using the method for evaluating the CJ of requesting an identity card (ID card) online in the two EU member states Germany and Poland as well as in the non-EU member Ukraine.

The remainder of this article is organized as follows: section 2 gives an overview of relevant concepts and related research, followed by a description of the research design and the methods applied in section 3. Section 4 presents the situational evaluation method before section 5 describes the use of the method for the evaluation of e-gov portals in Germany, Poland, and Ukraine for validation. The results of applying the method are compared and discussed in section 6, followed by a conclusion.

2. Theoretical Background and Related Work

Throughout the reflection of UX and UC in the e-gov literature, the question of how to evaluate and measure the user's perception of a service/product and the satisfaction with the value created is of high relevance. In their model for evaluating e-gov portal acceptance and satisfaction, Lai and Pires [6] integrated elements from models of technology acceptance and IS success into the four dimensions information quality, system quality, perceived effectiveness, and social influence. Weigl et al. [2] focused on UC and conducted a systematic literature review on the relationship between UC and public values, resulting in an extended taxonomy of public values for UC. The approach by Bournaris et al. [7] for measuring user satisfaction with an e-gov portal incorporates five criteria: navigation, design, accessibility, interaction, and content. Yildirim

and Bostanci [8] explore the key factors in achieving an efficient e-gov portal management system from a citizen perspective with the case of a Turkish e-gov portal. As a result, they identified user type, digital platform options, security/access options, and digital public service classification as important factors.

The more recent shift to UX can also be found in the e-gov literature, both as foundational studies on how to transfer the UX concept to the citizen perspective [9] as well as analytic research on how to evaluate UX in e-gov. Kumar et al. [10] investigated how citizens experience e-gov services and how that experience influences their behavior in a qualitative study based on interviews with citizens of India. In their findings they highlight the importance of ease-of-use, convenience, customer support, and security for changing citizens' behavior and attitude towards using e-gov services. Another exploratory study was prepared by Basri et al. [11] and revealed content, design, and information architecture as main themes by utilizing the Think-aloud method in Malaysia. A different approach is proposed by Sivaji et al. [12] who use the eight characteristics for quality-in-use and product quality of the ISO 25010 standard for measuring UX. One of the latest developments is the adaptation of the customer journey concept to the citizen role in e-gov [13]. Our review of the available literature showed no results regarding the utilization of the citizen journey for evaluating e-gov portals so far.

3. Research Process and Methods

Following our research question, we address a real-world problem and strive to construct a methodical solution. With this perspective, we position our work within the design science research paradigm and adopt our research process from the situational method engineering (SME) approach [14]. We consider SME appropriate for our problem because it focuses on reuse in method construction through adaptation, extension, and configuration of existing methods for specific problem situations [15]. The existing studies and methods for evaluating the UC of e-gov services pursue different approaches depending on the question being asked. Their results demonstrate the importance of prioritizing the user's perspective when designing digital services to find acceptance by citizens. As our focus is on UC in the delivery of e-gov services via portals, the existing methods need to be adapted. For this purpose, we selected the SME research process by Bucher et al. [15] and applied it to our problem situation.

The first step of the process investigates relevant existing methods concerning the planned evaluation method. For the quantitative UC evaluation, we draw on the recommendations for the construction of a questionnaire to measure the user experience of software products by Laugwitz et al. [16]. With step 2 relevant context factors are extracted through a systematic screening of research literature, e-gov strategies, standards, and national laws/regulations of Germany, Poland, and Ukraine. Also, technical characteristics of the portal architecture (e.g., web portal or mobile app) are considered. In step 3, the context of the CJ for ID card applications is analyzed. Finally, the new evaluation method is constructed in step 4 by adapting, extending, and configuring existing method blocks. The results of the three case studies are used to start a new engineering cycle for further improvements.

Since national user accounts are required to access the three test portals, the authors evaluated the German case themselves. The Polish and Ukrainian portals were each evaluated under the author's supervision by an additional person with the required citizenship and access.

4. A Method for Evaluating User Centricity along the Citizen Journey

The CJ concept is used to form a basic structure for the course of action to evaluate UC in terms of UX and usability of e-gov portals. For our purpose, we needed to adapt the more general CJ concept from Scholta et al. [5] for the comparability of the national portal solutions and related indicators. Since the focus is set on the user's perception of portal handling, the adapted CJ is designed to query items that are as cross-national and cross-service as possible. For this purpose, the CJ phase classification by Scholta et al. is used as a reference but adapted according to our research question. as shown in Table 1. The adapted phases especially support the investigation of the UX during the use of the portal for the service application, i.e., the path from the emerging need, through the search for information to the specific service and ultimately the application, which is the focus of this study.

Table 1
Adapted citizen journey phases based on Scholta et al. [5].

No.	Phase name	Description	Contact points/ functions
I	Authentication	User access via one or more authentication mechanisms	eID, user account, level of assurance
II	Information	Information and search options	Keyword search, full-text search, catalog
III	Service	Usage of the selected service, i.e., information and procedural steps.	Description, file up-/download, application form

During the CJ phases, the user interacts with the portal through specific contact points implemented by respective functions. For each phase, the UX during the interaction with the portal is measured quantitatively with a standardized questionnaire. This design was chosen because the existing methods measure the user's perception based on specific item definitions. Hence, in the event of negative results, they can only make limited statements about the reason for the poor handling of a service. Because in our design certain contact points with specific functionalities are distinguished in the individual phases, the respective score allows at least assumptions about the genesis of the results. By using established methods, this combination of quantitative and qualitative approaches should also be applicable to measure the implementation of UC in other contexts.

For performing quantitative measurements, the method uses the User Experience Questionnaire (UEQ) for software products by Laugwitz et al. [16]. The UEQ exists in a long version with six dimensions (attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty), to which 26 items are assigned for operationalization. There is also a short version (UEQ-S) in which only eight items must be asked on a seven-point scale [17]. The difference between the versions is that the long UEQ covers the pragmatic and hedonic quality according to Hassenzahl [18] as well as the very subjective attractiveness. Pragmatic quality is understood as the ability of a system to support the user in completing tasks, while hedonic quality is aimed at the user's emotional and aesthetic needs. The short version, however, is limited to four items of the pragmatic quality (obstructive/supportive, complicated/easy, inefficient/efficient, confusing/clear)

and four items of the hedonic quality (boring/exciting, uninteresting/interesting, conventional/inventive, and usual/leading-edge) [17]. Since for the method validation, a CJ for three different portals is to be queried, the short version of the UEQ is used. This pursues the goal of high practical applicability by keeping the collected data clear, comparable, and manageable. A sufficient UC is achieved if at least 42 out of maximum 56 points can be reached.

5. Evaluation of the Selected E-government Portals

The validation of the constructed method was carried out as a comparative study of e-gov portals in three countries: Germany, Poland, and Ukraine. Germany and Poland on the one hand were selected because of their poor results in the DESI 2023 survey [19], Ukraine on the other hand because of its strategic approach towards digital transformation in defense of the Russian invasion [20, 21] and the relatively large volume of relevant literature (e.g., [22, 23, 24]). While Poland and Ukraine each have central national e-gov portals, in Germany the national portal Bund.de redirects the user to one of 16 state portals depending on the competency in the federal system. Thus, for the German case a combination of the federal portal and the state portal of Saxony named Amt24 was used. Table 2 lists the selected countries and portals together with the portal type and URL/supported mobile operating system (OS):

Table 2
Selected countries and portals.

Country	Portal name	Type	URL/OS
DE	Bund.de	Web portal (federal)	https://verwaltung.bund.de/
DE	Amt24	Web portal (state)	https://amt24.sachsen.de/
PL	mObywatel	Web & mobile app	https://www.gov.pl/web/mobywatel, Android, iOS
UA	Diia	Web & mobile app	https://diia.gov.ua/, Android, iOS

The comparison of the implementation of UC in the selected e-gov portals was carried out according to the defined CJ along the three phases. This approach, rather than a comparison per country, makes sense because the sequence of phases differs according to the structure of the portals. While in the German portals the service is first searched for and authentication according to the required level of assurance is only required for the application, the Polish mObywatel (mCitizen) and the Ukrainian Diia are only accessible after authentication. The comparability of the CJ is strengthened by the fact that the individual phases are considered together across all portals.

Firstly, for each CJ phase the tasks to be executed are briefly explained. The special features and the available functionalities of the respective portal are pointed out together with the design of the GUI. However, it is not the technical background that is decisive for the evaluation of the concrete phases, but the impression made on the user during use. Only in the subsequent analysis, the technical implementation will be correlated with the scores achieved for UC. Afterwards, the scores will be explained in this context and a brief conclusion will be drawn at the end.

5.1. Phase I: Authentication

In the first phase, the user is supposed to authenticate on the portal using one of the methods offered to gain access to the available services. If no authentication option is available or required, a login should still be carried out to complete the evaluation scenario and ensure comparability between the cases. External processes such as the activation of the online ID card or the creation of a trusted profile are not considered here.

Germany

The German portals Bund.de and Amt24 require registration and authentication only when a specific service is to be requested. The technical options are based on the level of assurance defined for the respective service and on implemented authentication methods. Thus, for the German case authentication is not the first chronological step but the second. However, applying for a German ID card is a service for which electronic access to the application is explicitly excluded by the law on ID cards (§ 9 ID card law). As the ID card application is not a service at the federal level, the user is redirected to the responsible state portal for registration. Consequently, the focus of the German case is on the implementation of UC at Amt24.

The login page contains brief explanation texts which are supplemented by further information via tooltips and hyperlinks. This way, the user is provided with sufficient information during registration. Three ways to authenticate for a service account are URL: 1) registering for an account on Amt24, 2) registering via the BundID or via an account from other state portals or 3) via the eID in combination with the associated mobile app using Near Field Communication (NFC). The eID can be subsequently linked to a service account to ensure the highest level of assurance when applying for e-gov services.

The registration process is clearly structured, as it only requires first and last name, two e-mail addresses, and a password. Other personal data and documents can be stored in the service account for reuse. Due to the freedom of choice and the integration of the ID card function, authentication is perceived as inventive and, regarding the fact that eID is still little used in Germany, also as relatively leading-edge.

Because of the clear, simple page structure, the comprehensible registration process, and the interesting and (because of the eID) somewhat leading-edge access for the user, phase I achieved a score of 46 out of 56 possible points for Amt24. Thus, in this phase of the CJ the design was considered as sufficiently user-centered .

Poland

To authenticate with mObywatel for the first time, a registration is required for which three options are URL: 1) eDowód (eEvidence) for Polish citizens and persons with long-term residence permit, 2) Diia.pl for Ukrainian refugees and 3) a variant with a school or student ID and a PIN from the respective institution. As the tester for the evaluation is a Polish citizen, mDowód (mobile app for eDowód) was used. Again, there are three methods for confirming the user's identity: 1) login via an existing trusted profile, 2) via the eID or 3) via an e-banking account to create a trusted profile. Since the tester already had a trusted profile, authenticating with mObywatel only required his username and password.

Nevertheless, the choice from several options leading to the same result (a trusted profile) can be confusing, even if the arrangement of the options is clear, the icons are helpful, and the

brief explanations of the individual steps appear supportive. Authentication is particularly efficient if a trusted profile already exists.

The design does not arouse interest in the various authentication options, although the choice of freedom is quite inventive and the app design appears leading-edge. The many clicks throughout the authentication procedure led to deductions, and the effect of the choice on the user depends on personal technical knowledge. Because of the existing trusted profile, a good score of 43 points resulted, which is still considered a user-centered implementation.

Ukraine

Authentication is required immediately after starting the app to access the portal content. To do this, the user's identity must be confirmed by comparing the data contained in the public register with other factors, for which several options are available. There is authentication via eID, which must be combined with the tax number and a biometric passport photo, which can be taken and sent via Diia. A trusted profile can also be used, such as an e-banking account from a certified bank. The third option is authentication with a biometric passport plus NFC and a biometric photo for comparison. The latter variant comprises five steps for which additional assistance is available (e.g., video tutorial on YouTube).

The explanations on authentication are easy to understand and graphically supported. When the app was introduced first, problems with the biometric photos could occur. They often had to be taken several times to meet the requirements, which was confusing and complicated, leading to a reduced evaluation score of 45 points. Once the process has been completed, the portal functions are fully available, and the highest level of assurance is granted.

5.2. Phase II: The search for information

In the second phase, the task is to find information on the ID card service on the portals. If several options are available, the path that appears most effective to the user should be chosen.

Germany

The information on the ID card service is available on Amt24 as well as on the federal portal. To access this information, both portals offer a catalog that classifies the available services into various “life situations” (e.g., work & education, building & housing). Alternatively, a full-text search is available which also generates suggestions on entry. This search method is much clearer and easier to use and is therefore the primary focus of the evaluation in this phase. The search can be combined with narrowing down the local authority responsible by entering the zip code or town. The searches differ in the keyword specifications. While in the federal portal the first suggested keyword is “ID card”, Amt24 displays categories such as “staff” and the service searched for does not appear in the list of suggestions. These differences are reflected in the evaluation of UC, in which Amt24 receives fewer points than the federal portal, although both refer to the same service.

The catalog is a rather obstructive and inefficient method for searching for information given the wealth of options, which is why the search function was used as a more effective tool and therefore also influenced the score. Amt24 already offered the ID card service in the preview when entering “identity”, which strongly supported the search process and speaks for an efficient design. Basic search functions are not considered interesting or new. Overall, the result is a solid score of 38 for an information search design that is not yet sufficiently user-centered.

Poland

Like in Germany, the analog version of the ID card must be applied for in person at the relevant authority, although Poland implemented a digital twin in mObywatel with a service named mDowód. However, the Polish Ministry of Digitization explicitly points out that the digital ID card is not identical to the analog one and that they differ in features such as the serial number [25]. The start screen shows the available documents and frequently used services. These can be called up in full via "Show all" or by clicking on the corresponding service symbol in the menu bar. The eID is loaded into the app automatically after the first login and is therefore available immediately. It can be accessed by clicking on "mDowód" or via the "Documents" icon in the menu bar.

Two factors make searching for e-gov services simple and efficient: mDowód is available after initial login and the clear menu navigation provides the user with two ways to present the ID card. The start screen is clearly structured and the new design of the eID makes it more interesting. Furthermore, the automatic provision of the eID via mDowód is inventive. These consistently helpful aspects contribute to a very positive result with a score of 55 points.

Ukraine

After login, the user starts with the overview of the stored documents in a default order which may be customized. To search for services, a services icon in the menu bar leads to the catalog overview. All services are listed and described with simple, short titles and additional icons. Sometimes, it is not immediately clear which services are hidden behind the icons, as the selection is constantly increasing, but the catalog is still considered clear. It is displayed as a list by default, but the user can also click to switch to a tile view. There is also a free text search function above the list of services, but this was not given much weight in the test as it was not needed due to the clarity of the list/tile structure.

This visual design is well known from app stores and therefore looks familiar and interesting, especially as scrolling through the list leads to further services that motivate trial use (e.g., a choice of Ukrainian TV/radio stations), which is perceived as very inventive and leading-edge. This results in a high score of 49 points, although the number of available services sometimes requires longer scrolling or search times, which reduces the score a little.

5.3. Phase III: The administrative service

The third phase is about the implementation of the e-gov service itself, i.e., how the information about it or the required application is structured.

Germany

Since it was not possible to apply for a German ID card online, only the information on the application procedure on Amt24 was evaluated. This information includes mainly the description of the actual service, legal references, and the documents required. Furthermore, a link to the authority responsible for the citizen is provided, including contact options for making an appointment. The service description also indicates the required fee and important deadlines. Furthermore, links to the website of the responsible Ministry for general information on the ID card are provided. The score reflects that the information in the extensive menu structure is perceived as complicated and sometimes not easy to understand because of the level of detail,

which can quickly cause users to lose interest. The menus are based on conventional web technology and therefore appear not inventive in terms of UC, resulting in a score of only 16 points.

Poland

The evaluation of the application for an ID card via mObywatel faced two difficulties: 1) it was not possible to apply for an analog ID card online. Anyway, the application form is available as a PDF document. 2) mObywatel includes an alternative eID via mDowód that can be used as an official ID document on almost all occasions within Poland and removes the requirement to carry an analog ID card. As the consideration of additional portals within a single phase would weaken the comparison methodologically, the evaluation focused on the user-centered implementation of mDowód.

mDowód was updated to version 2.0 in July 2023 and shows a modern GUI design. It is easy and efficient to use thanks to the automated provision of the ID card. It offers a good overview through a reduced interface that only lists the most necessary data, which can be supplemented by a complete listing of the data set if required. The fact that mDowód appears directly on the start screen as a document seems logical, but as such it is neither particularly exciting nor original. This results in a score of 45, which means a good user-centered design in the implementation.

Ukraine

It is not necessary to apply for an ID card in Diia, as it is automatically taken from the register and stored in the document overview after the user has been authenticated. The user only needs to update the ID card after expiry by uploading and checking a new biometric photo via Diia. Further information on the document itself can be accessed via a corresponding button, as well as the generation of a QR code that can be used to present the ID card. Access to this service is therefore perceived as simple and efficient, the presentation as clear, whereby the extended presentation contains a lot of information, which causes a point discount. Otherwise, the automated provision from the register is perceived as an interesting and inventive approach. In total, this has a positive effect on the score of 53 points, because from the user's point of view, the service is available right from the start, and updating the document is also very simple.

6. Results and Discussion

The overall evaluation scores of the three countries are listed for each phase and on average in Table 3. With an average score of 33.34, only the German case is below the specified score for successful UC, particularly due to the low rating of the third phase. This result is primarily caused by the fact that citizens are not allowed to apply for an ID card online. From the UX perspective, the evaluation method rated both the pragmatic and the hedonic quality as moderate in phase III. The reasons for that lie in the unattractive presentation and the large amount of information, which is not considered beneficial from the user's point of view.

If we look at the scores for the pragmatic and hedonic quality items, it is noticeable that they differ across countries and portals in only two cases. Specifically, the German phase II and the Polish phase III score lower on the hedonic points than on the pragmatic points. Otherwise, both qualities differed insignificantly in their evaluation and the impression of UC was at a similar level.

Table 3
Overall results of the evaluation.

Country	Ph. I	Ph. II	Ph. III	Avg. score
Germany	46	38	16	33.34
Poland	43	55	45	47.67
Ukraine	45	49	54	49.34
Avg. score	44.67	47.34	38.34	

Phase I is rated very close together, which is initially surprising in view of the differing design of the functionalities, as Germany nevertheless scores comparatively well despite its lack of trusted profiles. It can be assumed that the advantages of the methodical approach via the three-phase CJ and the focus on UC are evident here. It was not the number of functions available that was evaluated, but rather their perception from the user's perspective, where a well-implemented, smaller set of authentication options can be perceived just as positively as the broadest possible set, provided it is implemented well. This is also demonstrated by the nine-point difference in the evaluation of the third phase in Poland and Ukraine, although the comparatively poor hedonic quality of the Polish mDowód was ultimately the deciding factor.

For the implementation of their e-gov portals, the three countries had to overcome similar challenges, including the provision of secure and yet user-friendly authentication methods as well as the linking of registers and the gradual digitalization of a large number of e-gov services. Another obstacle is the parallelism of different portals and services in the respective countries, which makes standardization and clarity more difficult. The example of the ID card found this in Germany and in Poland, both offering information for the application distributed on different portals. However, these different approaches of how to apply for an ID card as a public service, which is not yet digital in Germany, is available in a digital twin in Poland and is fully digital in Ukraine, qualified the cases for testing the methodology developed for this work. This methodological approach is intended to enable assumptions to be made about the implementation of UC independent of a certain e-gov service and the functionalities of a certain portal.

7. Conclusion

The goal of this research was to design and validate a situational method for evaluating UC of e-gov portals along the citizen journey. The resulting artifact is a combination of a CJ configuration for the problem situation based on Scholta et al. [5] with a quantitative UX measure approach utilizing the short version of the UEQ by Laugwitz et al. [16]. The CJ gives the evaluation a systematic structure with a focus on UX while the selection of the UEQ-S emphasizes pragmatic and hedonic quality. Furthermore, the design goal of high pragmatic usability is supported by this decision. The exemplary application of the method in the three cases of e-gov portals in Germany, Poland, and Ukraine demonstrated the practical feasibility and validity but also showed limitations and reference points for further improvement.

A major limitation of this research is the fact, that the cases were prepared with only one test person each, which reduces the validity of the findings outlined here. For further development, it is required to test several services with a larger number of users. To further investigate whether and to what extent the existing functionalities have a measurable effect on the perceived UC, the users should have different technical requirements for authentication. From the

data collected for the cases, it can be hypothesized that it is not the number of portal functions or the maturity level of the administrative service that is decisive for determining UC, but that the pragmatic and hedonic quality with their various characteristics should be a top priority for the portal design. A general limitation of questionnaires is the subjective character of the resulting data. Hence, the determination of UX should not rely on questioning the users only but also include more objective views, e.g., from subject matter experts like UX researchers or consultants.

Beyond the quantitative evaluation of UC/UX along the CJ, the method delivers first reference points for improvement measures regarding the GUI and functionality design. Investigating the influence of specific design decisions on the perceived UC in more detail is subject to further research.

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