

Users' Evaluation of a Digital Government Collaborative Platform (DGCP) in Sri Lanka

Abstract

Purpose – The paper aims to evaluate the Digital Government Collaborative Platform (DGCP), which facilitates collaborations between the citizens and the government to address environmental issues in Sri Lanka. The DGCP is an artifact developed by the value-sensitive design (VSD) approach.

Design/methodology/approach – The DGCP is evaluated following the Framework for Evaluation in Design Science Research (FEDS). Two hundred and twenty-four citizens participated in the survey based on the User Experience Questionnaire (UEQ) and open questions about human values embedded in the design. Fifteen government officers were interviewed to enhance the evaluation.

Findings – The DGCP received positive evaluations from the citizens and government officers. The platform is attractive, novel and pragmatic, also generating hedonic experiences for the citizens. The users believed that human values are reflected in the DGCP. Further, they shared a few suggestions to improve it.

Originality – The paper contributes knowledge to evaluating digital government systems, especially in developing countries. The human-value-centered DGCP was evaluated using multiple methods of quantitative (i.e., UEQ Survey) and qualitative (i.e., qualitative interviews with stakeholders) techniques. Further, the systematic process of DGCP evaluation produces a case-based guideline for evaluating related and similar digital government systems using FEDS.

Keywords – User evaluation, Digital Government Collaborative Platform, value-sensitive design, environmental sustainability

Introduction

Environmental sustainability is one of the sustainable development goals (SDGs) (Arora and Mishra, 2019). A country's government is responsible for developing and implementing digital solutions to achieve this goal (Medaglia *et al.*, 2021). Exploiting citizens' interests and collaboration in addressing environmental issues is essential for achieving this sustainability goal (He *et al.*, 2017). Researchers are becoming increasingly interested in studying digital platforms to improve the collaboration between government and citizens (Falco and Kleinhans, 2018). These digital platforms go beyond information sharing to more engagement of government and citizens to produce better results. The most important aspect of these platforms is citizens' responsible and committed behaviour and the regular engagement of government officers on the platform. However, most platforms are used in developed countries for different purposes and focus less on solving environmental issues (Feroz *et al.*, 2021; Johnson *et al.*, 2021).

To facilitate collaboration between the government and the citizens to address environmental issues in Sri Lanka, a Digital Government Collaborative Platform (DGCP) is designed and

developed by adopting the value-sensitive design (VSD) approach (Authors' own publications). A rigorous evaluation of the DGCP is required to ensure that the platform fulfills the design requirements and meets the needs of the stakeholders. However, we find limited knowledge about how to conduct the evaluation of a digital government design (Lyzara *et al.*, 2019). In the meantime, in e-government research, studies with distinct design orientations are scarce (Goldkuhl, 2016). Also, the human-centered design of the VSD approach is applied in various study applications, such as engineering, health science and information systems, but not many in the digital government. Furthermore, most of the e-government systems, especially in developing countries, have failed due to a lack of attention to citizens' evaluation of the digital government systems (Idoughi and Abdelhakim, 2018). Hence, new ways and methods are needed for evaluating digital government artifacts.

To fulfill the research aim and to address the research gap, the focus of this paper is to conduct an ex-post evaluation of the workable solution of the DGCP by following the Framework for Evaluation in Design Science Research (FEDS) (Venable *et al.*'s (2016). To understand the stakeholders' experience of using the DGCP, the User Experience Questionnaire (UEQ)(Schrepp, 2019) is adopted in the survey. Additionally, the questions regarding how human values are reflected in the DGCP are included both in the survey and interviews with the government officers.

The paper is structured as follows. First, the relevant literature is reviewed, e.g., Digital Government, Collaboration and Environmental Sustainability, user evaluation of e-government systems and UEQ, and the proposed DGCP is described. Then, the research method is introduced, including data collection and analysis methods. Subsequently, the evaluation results are presented. Finally, the paper ends with a discussion and conclusion.

Research Background

Digital Government, Collaboration and Environmental Sustainability

Janita and Miranda (2018, p.2) define the digital government as "a system for the management of public services that, based on Information and Communication Technologies (ICTs), aims to improve the quality of the services provided by the government to its stakeholders (citizens, companies, employees other governments, etc.), and increase its transparency, make improvements to its operation and achieve more efficient management in the different environments in which it operates." The digital government fosters collaboration between the citizens and the government over the traditional offline mode.

There are various digital platforms in practice, such as social media, mobile operating systems, and peer-to-peer platforms (Qiu *et al.*, 2022). Similarly, a dedicated digital platform can be established for collaboration and coordination between the government and the citizens. These digital platforms allow collaborations via citizens-to-government, government-to-citizens and citizen-to-citizen communication (Linders, 2012).

The Digital Government initiatives contribute significantly to attaining the United Nations' Sustainability Development Goals (SDGs)(Medaglia *et al.*, 2021). In sustainable development and the SDGs, environmental sustainability is a major element. (Burki *et al.*, 2021). Burki (2021) provides an understanding of and establishes the importance of carrying out more studies and digital government initiatives toward environmental sustainability. Nevertheless, to achieve the United Nations' SDGs by 2030, the steps taken by the government are not adequate, and very slow progress has been made in working toward achieving the goals related to the environment (Arora and Mishra, 2019). This highlights the need for the government to work on more digital transformation initiatives to protect the environment and stop degradation (Feroz *et al.*, 2021) in achieving environmental sustainability.

User evaluation of digital government systems and User Experience Questionnaire (UEQ)

A recent systematic literature review conducted on e-government usability evaluation (Lyzara et al. 2019) listed three main evaluation methods. The three main evaluation classes are: usability testing, inspection and inquiry. Each of these classes uses various methods to perform the evaluation (E.g., the Usability inquiry method, focus group, interview, questionnaire, user feedback and field observations) (Lyzara *et al.*, 2019). The same review shows that most of the e-government evaluations are carried out using automated testing and heuristic evaluation. These two evaluation methods are known as non-user involvement methods (i.e., a single evaluator can do the evaluation). In addition to the above methods, to specifically measure the User Experience (UX) aspect, UEQ is an easy and free tool that provides the required resources. In a study conducted in Indonesia to measure the UX aspects of e-government service applications, UEQ was applied and produced effective results (Prakoso and Subriadi, 2018).

Providing a good user experience is predominant for the successful adoption of e-government services. Here, the UEQ is suggested to check the level of user experience of the DGCP as an e-government service and identify areas for improvement. The UEQ is considered an effective method that allows the respondents to provide fast and immediate feedback soon after experiencing a product or service. It considers the pragmatic (i.e., practicality and functionality) and hedonic quality (i.e., users' desire for pleasure and avoidance of boredom and discomfort) aspects of a product or service under evaluation (Schrepp, 2019; Schrepp *et al.*, 2014). The scales of the UEQ can also be grouped into three dimensions: attractiveness; pragmatic quality, including the scales of perspicuity, efficiency, and dependability; and hedonic quality, including stimulation and novelty scales. Pragmatic quality describes task-related quality aspects, and hedonic quality refers to the non-task-related quality aspects. The UEQ possesses six scales and 26 measurement items (See Table I for the relationship between scales and measurements). Each of the 26 items allows the respondents to select a choice from one to seven (i.e., see an example for one of the measurement scales of “annoying/enjoyable” in Figure 1).

UEQ Scales (Schrepp, 2018)	Measurement items
1. Attractiveness – Users have an impression (like or dislike) of a developed DGCP.	1. annoying/enjoyable 2. bad/good 3. unlikable/pleasing 4. unpleasant/pleasant 5. unattractive/attractive 6. unfriendly/friendly
2. Perspicuity – Users can quickly get familiar with and adapt to the DGCP.	7. not understandable/understandable 8. difficult to learn/easy to learn 9. complicated/easy 10. confusing/clear
3. Efficiency – The ability of users to solve the tasks in the DGCP without any extra effort.	11. slow/fast 12. inefficient/efficient 13. impractical/practical 14. cluttered/organized
4. Dependability – Users can control the interaction flow in the DGCP and feel secure.	15. unpredictable/predictable 16. obstructive/supportive 17. not secure/secure 18. does not meet expectations/meets expectations
5. Stimulation – The DGCP is inspiring and motivating to use.	19. inferior/valuable 20. boring/exciting 21. not interesting/interesting 22. demotivating/motivating
6. Novelty – The DGCP is designed creatively, and is interesting to use.	23. dull/creative 24. conventional/inventive 25. usual/leading edge 26. conservative/innovative

Table I: UEQ scales and measurements



Figure 1: User response to a seven-scale measurement item in UEQ

Digital Government Collaborative Platform (DGCP) to facilitate collaboration for environmental sustainability

The primary purpose of the DGCP is to facilitate the collaboration between the citizens and the government and find consensus on the environmental issues in Sri Lanka (i.e., <https://greensl.netlify.app/>). The distinctive feature of the DGCP is its design, embedding human values by using the VSD approach (Table II).

The VSD is a design framework and systematic approach incorporating human values in designing and developing technological solutions (Friedman et al., 2003, 2013; Friedman and Hendry,

2019). There is a growing tendency among scholars to consider human values in systems design to make sustainable systems (Winkler and Spiekermann, 2021). From its inception to now, the VSD as a design framework has been applied in various system designs and applications (Winkler and Spiekermann, 2021). In a high-level overview of the VSD, the tripartite investigations to be carried out: conceptual, empirical and technical, are discussed. Conceptual investigation identifies the impact of discovered human values on the direct and indirect stakeholders of the system. In the empirical investigation, studies are carried out using various surveys, interviews, observations, and other methods to confirm the findings of the other explorations. These findings will assist in designing and shaping the artifact, which is a core of technical explorations (Friedman *et al.*, 2002).

We have used the appropriate techniques of VSD to develop DGCP. In a prior study (Authors' own publication), fifteen human values were identified (Table II) and converted into design requirements using the values-norms-design requirements method (Poel, 2013). These features are embedded and represented in the developed system (Authors' own publications).

Discovered Human Value	Description
1. Transparency	All the stakeholders share accurate information.
2. Safety	No harm is caused to any of the system's users due to sharing information in the system.
3. Universal usability	Any user can quickly adapt to the system.
4. Feedback	The status of the information being processed is shared with the user.
5. Authenticity	Users are liable to share only accurate information in the system.
6. Fairness	Reasonable answers are provided to the users without any prejudice.
7. Representativeness	The system is designed to encourage every user to use the platform.
8. Accountability	Users justify and take responsibility for the action.
9. Legitimacy	Provided suggestions are enacted with laws, policies and procedures of the country.
10. Informed consent	User approval is obtained to process further.
11. Autonomy	Users have been given the freedom to express ideas without any influence.
12. Awareness	Act as a central repository to share any related information.
13. Human welfare	Users think about the benefit to the whole of society.
14. Attitude	Motivate users with the provided information.
15. Trust	Increase government engagement.

Table II: Fifteen human values and description (authors' own publication, 2021 b)

The DGCP is primarily used by three users, namely, citizens, government officers and administrators. The system administrator's main role is to manage the system and its users. Citizens play a major role in the system. Related functionalities of the citizens are broadly categorized into four: report/complaint, propose new ideas, post information, and learn or discover knowledge. Government officers, as users of the DGCP, have been given some functionalities in the system. They respond to the citizens' complaints and regularly update valuable information useful to the public. The evaluation of the DGCP prototype (Authors' own publication, 2022b) has raised concerns about improving the User Interfaces and User Experience (UI/UX).

Research Method

The FEDS framework (Venable et al., 2016) is chosen as it is especially suitable to evaluate a design artifact. Figure 2 depicts the FEDS processes followed in the evaluation. The approach is summative (i.e., assess the artifact once it has been finally designed and developed) and ex-post (i.e., evaluate the completed artifact) evaluation. The DGCP is evaluated in a real environment by actual users using the naturalistic approach (i.e., government officers and citizens as real users in a real environment).

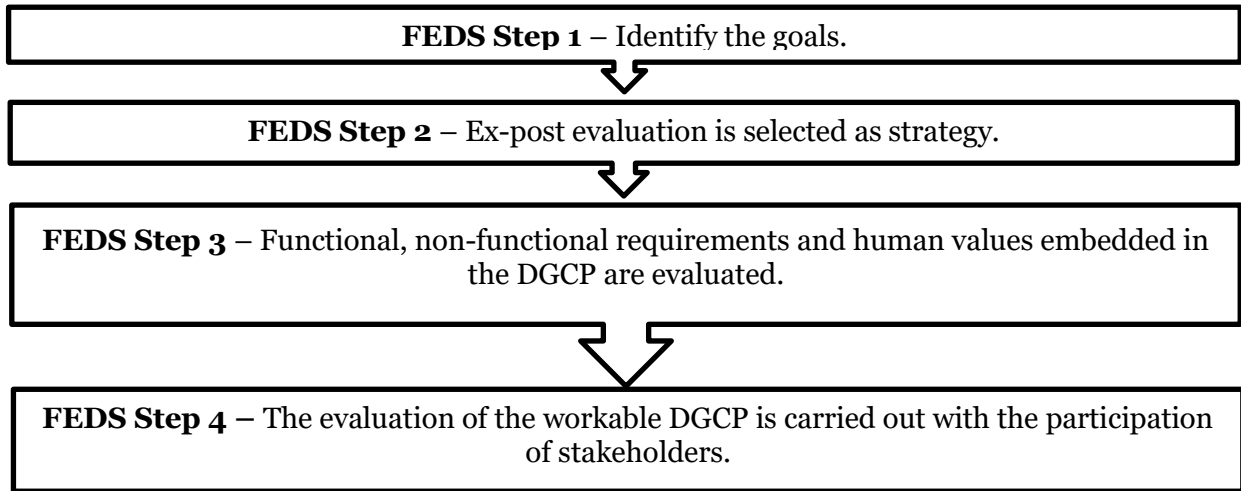


Figure 2: FEDS Process to evaluate DGCP

The goal of the evaluation is to ensure that the DGCP fulfills the design requirements and meets the needs of users. The feedback, suggestions and changes provided in the prototype evaluations are made in the workable solution. Further, the user acceptability of the DGCP is measured using User Experience (UX) related evaluation methods. Also, the digital platform is designed using a human-values-centered approach; and it should be embedded and reflected in the system (FEDS Step 1). As a strategy, ex-post evaluation is chosen as the solution is almost developed (FEDS Step 2). The properties evaluated are the user experience aspects, functional and non-functional functionalities of the DGCP, and the fifteen human values implicated in the DGCP (FEDS Step 3). The UEQ, with 26 quantitative and qualitative questions, was provided to the citizens and government officers for data collection for the evaluation (FEDS Step 4). Besides the quantitative evaluation approach, interviews were conducted with the government officers of the environmental authorities during the evaluation. These qualitative research methods are applied in VSD-based studies to evaluate and get stakeholder feedback on the artifact (Davis, 2008; Freier, 2008; Yoo et al., 2013).

Data Collection

Data collection was carried out for nearly three months (Mid May 2022 to Mid July 2022), mainly from two groups of respondents, citizens and government officers. These groups are the main stakeholders of the DGCP and direct users to provide feedback.

Citizen Survey

In total, 224 citizens participated in the study. Their primary condition as respondents was their willingness to experience and evaluate the DGCP workable solution. To this end, we first found the respondents interested in contributing to environmental preservation activities and desired collaboration with the government through a digital platform. Then, snowball sampling was implemented to select respondents. In the sampling process, different demographics were considered. Most importantly, we ensured that there were respondents from the country's nine provinces (Table III).

First, we informed the citizens about the survey objectives and obtained their consent for participation. Once the citizens agreed to participate in the survey, the workable DGCP was demonstrated to them. Further, the Uniform Resource Locator (URL): <https://greensl.netlify.app/> of the hosted solution and the URL of the short video uploaded to YouTube (<https://www.youtube.com/watch?v=NR82IDSSt-c>) describing the DGCP functionalities was shared with the respondents. Subsequently, a set of instructions, along with quantitative and qualitative questionnaires, was sent to the email given by the respondents. The quantitative question set contains questions to collect demographic information, followed by the UEQ. The UEQ questionnaire contains 26 questions (i.e., these 26 questions represent the 26 measurement items provided in Table 1). It is available to download (i.e., <https://www.ueq-online.org/>) and included here to evaluate the DGCP (Schrepp, 2018). Two open-ended questions were included in the same questionnaire to receive further feedback and suggestions. The first question was to evaluate whether the improvement suggested in the previous evaluation study is now effectively applied in the workable solution (i.e., Is that system you used and experienced easy to understand and provide you with easy ways to perform the tasks? Is there any user interface, instructions, or other places you need help understanding or finding difficult to use?). The citizens answered this open-ended question, following the 26 quantitative questions especially related to the UI/UX. The second question was to check how the 15 human values discussed above are appropriately represented in the design (i.e., Are the 15 human values explained below reflected in the system you used? Is any human value (or values) not reflected in the design, or should it be improved to be included in the design?). This question is posted to the respondent with the definitions of values and background information.

Gender (%)	Age group (%)	Education (%)	Province
Male – 46.43%	15 to 20 – 1.34 %	Ordinary level – 5.36%	Western – 39.00%
Female – 53.57%	20 to 25 – 51.00%	Advanced level – 11.16%	Central – 10.27%
	25 to 30 – 20.54%	Bachelors – 40.60%	Southern – 15.18%
	30 to 35 – 17.23%	Postgraduate Studies – 0.89%	Eastern – 3.98%
	35 to 40 – 5.45%	Masters – 4.46%	North Central – 3.57%
	40 to 45 – 4%	Ph.D. – 2.23%	North Western – 9.38%
	45 to 50 – 2.23%		Uva – 7.14%
			Sabaragamuwa – 8.04%
			Northern – 3.45%

Table III: Summary details of citizens

Government officers: interviews

Fifteen government officers conducted semi-structured interviews to evaluate the prototype (Table IV). The Snowball sampling method was used to recruit officers. We applied the same data collection procedure as those of the citizens. After explaining the primary objective of the study and obtaining their consent, the workable DGCP was demonstrated to the government officers. The demonstration was conducted in groups for each of the seven government organizations (See Table IV). Four were conducted virtually through the Zoom platform, and the other three physically at their respective organizations. Following the demonstration, the officers were requested to access the DGCP through the provided URL to experience the solution further. After they evaluated the DGCP, the questions were posted to the officers for their responses and recorded with permission for further analysis. The questions mainly included collecting demographic information, how the workable DGCP as a digital solution facilitates to improve the collaboration between the citizens and the government to find solutions to the environmental issues, implications of 15 human values in the solution, and sharing any other inputs and comments.

Organization	No. of respondents	Summary of profile
Information Communication Technology Agency (ICTA)	2	Male, Age – 62, Work experience – 25 years Male, Age – 45, Work experience – 12 years
Central Environmental Authority (CEA)	2	Male, Age – 51, Work experience – 22 years Female, Age – 49, Work experience – 22 years
Ministry of Environment (MOE)	3	Male, Age – 47, Work experience – 15 years Female, Age – 48, Work experience – 18 years Male, Age – 56, Work experience – 22 years
Mahaweli Authority of Sri Lanka (MASL)	4	Male, Age – 47, Work experience – 15 years Female, Age – 48, Work experience – 18 years Male, Age – 56, Work experience – 22 years Female, Age – 48, Work experience – 18 years
Department of Wildlife Conservation (DWC)	1	Female, Age – 51, Work experience – 23 years
Waste Management Authority (WMA)	1	Female, Age – 49, Work experience – 14 years
Department of Forest Conservation (DFC)	2	Male, Age – 51, Work experience – 22 years Male, Age – 58, Work experience – 25 years

Table IV: Details of the government officers

Data Analysis

Citizens' UEQ survey

The citizens' evaluation was analyzed using the UEQ data analysis version 10 (Schrepp, 2019). (i.e., The analysis tool is free and available to download via the URL: <https://www.ueq-online.org>). Once we enter the responses from the 224 citizens for the 26 questions (i.e., the

numbers from 1 to 7), the data analysis tool firstly transformed the numbers from 1 to 7 to -3 (horribly bad) to +3 (extremely good), then performed the statistical analysis to produce meaningful results from the data. According to the rules for interpreting the results of the UEQ, the values between -0.8 and 0.8 represent a neutral evaluation of the corresponding scale, values > 0.8 represent a positive evaluation, and values < -0.8 represent a negative evaluation.

Citizens' comments and government officers' interviews

Two open-ended questions were provided to the citizens. The thematic analysis of the qualitative data was performed by following the six steps (Braun and Clarke, 2006). In the questionnaire itself, the citizens had typed the comments and feedback. Most of the answers provided were short answers, and some other comments were in short paragraphs. All the comments were extracted into a single document, resulting in a total of 22 pages (5136 words). The audio-recorded interviews of the government officers were transcribed to 23 pages in total (6227 words). Out of 15 interviews, five of them were conducted in the local language of the country and later transcribed and verified using a language translator. Both citizens' 22 pages and officers' 23 pages of content were read, re-read, and reviewed several times to generate the initial codes. Similar patterns of meanings were identified from the content. Subsequently, the related codes were manually identified, grouped and categorized into themes. Initially, the themes were identified, and certain names were provided for the themes. Later, defined themes were refined to make sure they offered proper meaning in the context. Finalized themes were documented and presented under the results section.

Evaluation Results

Citizens' UEQ results

The results of the citizens' UEQ show that all six scales are close to extremely good, and the lowest and highest range lies between 1.693 to 2.110 (See Table V). Similarly, pragmatic or task-related quality aspects and hedonic or non-task-related quality aspects show positive values. The pragmatic or task-related quality aspects show the higher value of 1.96 (out of 3) than the hedonic or non-task related quality aspects value of 1.84 (out of 3) (See Table VI).

The Cronbach's Alpha-Coefficient values are analyzed to present the scale consistency. All six items show a positive Alpha-coefficient value >0.7 in the citizens' dataset (Attractiveness = 0.86, Perspicuity = 0.79, Efficiency = 0.75, Dependability = 0.74, Stimulation = 0.82, and Novelty = 0.73).

UEQ Scales (Mean and Variance)		
Attractiveness	2.110	0.64
Perspicuity	2.090	0.69
Efficiency	1.998	0.70
Dependability	1.780	0.76
Stimulation	1.985	0.84
Novelty	1.693	0.75

Table V: UEQ Scales (mean and variance) for citizens

Pragmatic and hedonic quality	
Attractiveness	2.11
Pragmatic quality	1.96
Hedonic quality	1.84

Table VI: Pragmatic and hedonic qualities of citizens

The six scales above are derived from the 26 items in the UEQ, and the values for each item are listed in Figure 3. Citizens evaluate the DGCP as providing good experiences; all 26 items show positive values. They think the DGCP is good (value=2.4), clear (value =2.3), understandable (value =2.3), organized (value=2.2), and friendly (value= 2.2). This is evident in that out of the 26 items listed, 16 have a value of above 2.0 or above (62%). Among all the positive values for the DGCP, the lowest value is present to the “inventive” item with a value of 1.4 and the highest is for good with a value of 2.4.

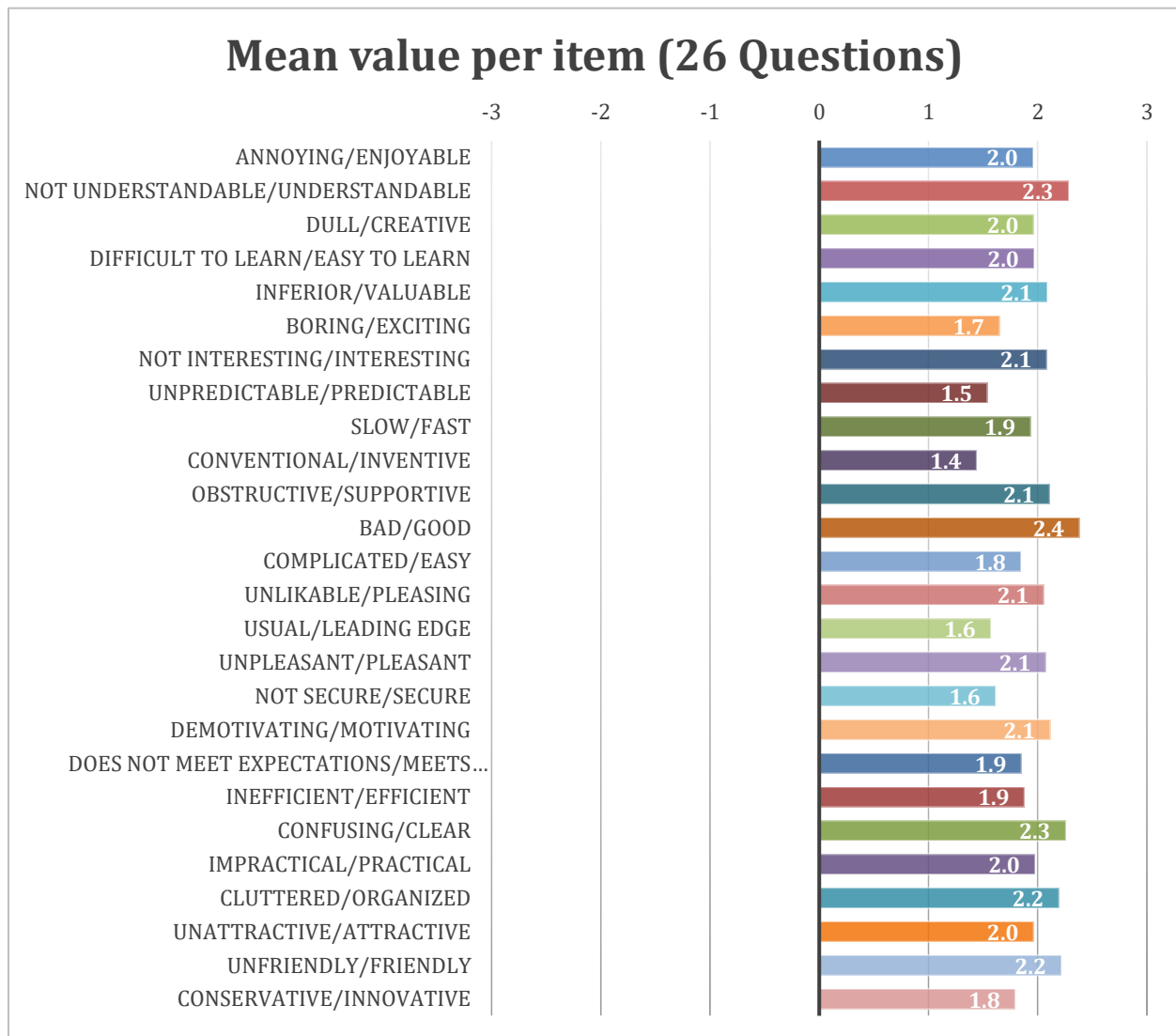


Figure 3: Mean values for each of the items (26) in the UEQ from citizens

Citizens' comments and feedback

The results of the thematic analysis produce four themes (Table VII). The first theme is on evaluation of the User Experience (UX)/ User Interface (UI) aspects (Theme 1). The next theme concerns citizens' recommendation of digital platforms for collaboration, especially in environmental sustainability (Theme 2). Following the third theme is suggestions for improvements (Theme 3), and the last theme introduces that most citizens agree that almost all human values are implicated in the workable DGCP (Theme 4).

Main theme	Sample supportive statements
1. Easy to use	"It's a very simple and user-friendly system." "We could easily navigate here and there."
2. Facilitate the collaboration	"I firmly believe this system will be strongly beneficial to society by facilitating collaboration with the government to address the environmental issues and overcome the challenges." "This is an excellent initiative. I don't think any digital systems accomplish the feat this platform is capable of."
3. Improve the accessibility	"We should create public awareness. They should be familiarized with the solution with local people." "And it better if we can add a mobile app too, which is more convenient to be used by people."
4. Well-implicated human values	"The given 15 human values are almost reflected in the system." "Yes. Those values are well converted in the solution."

Table VII: Main themes derived from the citizens' feedback

The citizens suggested implementing an awareness campaign among the public to bring to their attention the existence of the DGCP. They believe that with the citizens' increasing interest in engaging in green movements and increasing use of platforms like social media, there is more significant potential for the DGCP to become a popular collaboration platform. This argument is further supported due to the challenges in transportation, resources use, etc., caused by the current economic crisis in the country. Another concern of the citizens is to convert the current web version of the DGCP to a mobile application. At present, a web application is designed because citizens are reluctant to install a mobile application using their mobile device until they feel it is as extremely important to their life. The advantage of using a mobile application is that users who use mobile devices feel much more comfortable, and certain features, such as capturing an image using a mobile camera and reporting or posting, are much easier.

Government officers' interviews

The government officers' interviews produced several themes (Table VIII). The first theme focused on using the system with the basic skills of using ICT devices and applications (Theme 1). The next theme discussed the importance of such a digital platform for a government organization or country (Theme 2). Another theme discussed the potential challenges (Theme 3). The last theme was related to enhancements and suggested implementing inter-departmental communication through the DGCP (Theme 4).

Main theme	Sample supportive statements
1. Easy to use	"I started to use the system reluctantly because I thought it would be complex. But later, I felt it was not as I thought. It is easy to use", "Tasks can be accomplished with a few steps."
2. Digitalization is key	"One of the key components of Digital Government/Governance we recognize is active citizen participation in the work of the government" "Citizens are now really busy, and they seek easy ways to interact and get their work done through us. Another way it makes our life easy is to involve them in certain tasks."
3. Challenges in the real world	"For instance, certain concerns or complaints are complex and complicated. Perhaps single officers cannot give solutions in such situations", "We do not have officers good at several languages."
4. Inter-departmental communication	"It is better to include a way to have inter-departmental communication.", "Sometimes, we need several officers of the different departments to provide an answer or a solution."

Table VIII: Main themes derived from government officers' interview

The government officers point out a few challenges in terms of the use of the DGCP and some suggestions to consider for the next development cycle. In terms of solving citizens' complaints, it becomes complicated as most of them are solved through the collective effort of different government authorities. Hence, the officers suggested planning for inter-government communication and integration to provide solutions to make citizens satisfied. In the future, if a department receives many queries with scarce resources, authorities will struggle to provide solutions, or it may take time to solve problems. The government lacks the human resources capable of handling multi-language communication. Furthermore, some challenges are unique to the study context of Sri Lanka. For example, the lack of resources and access to technology, how to overcome the digital divide through skill development, and public sector employees' resistance to change is the main e-government challenges in Sri Lanka as a developing country (Jayakody, 2017).

Discussion and conclusion

The paper aimed to evaluate the workable solution of the DGCP. Overall, citizens and government officers are satisfied with the platform as a digital tool to facilitate collaboration to address environmental issues in Sri Lanka. The UEQ results with six scales show positive results, with the highest mean value of 2.110 (out of 3) for attractiveness and 1.693 (out of 3) for novelty. The task-related and non-task-related quality aspects of the DGCP (i.e., pragmatic and hedonic) show positive results. In addition to the user experience of the platform functionalities, the citizens and government officers believe that the fifteen human values implicated in the design are reflected in the DGCP. Both groups shared some suggestions to consider the operational issues of the DGCP and a few further suggestions to enhance the DGCP in its subsequent development cycle, such as increasing mobile responsiveness and multilingual use.

The paper contributes new knowledge to the digital government system evaluation. First, the paper assesses/evaluates a human-value-centered digital government platform by combining multiple methods, e.g., UEQ and qualitative interviews with the stakeholders, which provide an advantage and conduct an effective and efficient evaluation. Most of the current practice e-

government usability evaluation, the literature shows lack of user-involved evaluation (i.e., primarily automated and heuristic evaluation with less user involvement) and use a combination of the quantitative and qualitative approaches used for evaluation (Lyzara *et al.*, 2019; Qureshi *et al.*, 2017). Hence, the UEQ, with 26 questions and six scales, is used in the User Experience(UX) evaluation and is an effective method to receive feedback soon after a user experiences the developed design solution. The UEQ-based quantitative approach enables us to collect many responses during the evaluation.

Another contribution is a case-based guideline for evaluating related and similar systems using FEDS. The FEDS is exemplified in this paper as a suitable approach to evaluate e-government design. The paper provides clear guidance using FEDS to evaluate a developed e-government system designed and developed using the VSD approach. FEDS is a highly relevant framework for evaluating a design and provides clear steps and guidelines (i.e., evaluation strategies that suit the scope of an e-government solution) (Venable *et al.*, 2016). The four steps provided can be well adapted to the e-government design solution evaluation. As a part of the FEDS process, the methods used in the data collection (i.e., survey with a combination of qualitative and quantitative questions), engagement of the direct users (i.e., citizens and government officers of the relevant authorities), the approach of data analysis (i.e., comprehensive UEQ data analysis tool, thematic analysis), way of conducting the evaluation (i.e., allowing the users to use the system in a real environment and then to perform the evaluation), and producing the results as reports (i.e., tables, figures and themes) are guidelines to evaluate any similar systems.

There were limitations in data collection from the citizens. More than 70% (out of 224 citizens) represented the 20 to 30 age group. This was due to the trend among the interest of youth or the younger generation in involving green initiatives primarily through ICT interventions. The other respondents, government officials, represented seven government organizations/authorities. But there were more organizations and officers representing the related environmental entities. The officers' work schedules made engaging them in the evaluation challenging.

The workable DGCP solution is proposed and evaluated in a natural user environment. However, it is appropriate to deploy the DGCP and allow citizens and relevant officers to use it for longer. A future study is planned to re-evaluate the DGCP after a few months of use by the citizens and government officers. The suggestions received in the current evaluation and comments and feedback can be reviewed and implemented in the new version of the DGCP. Without limiting the user experience evaluation, other software or digital systems-related evaluations, such as security testing performed through security experts, measure the system's performance under high-demand requests and source code level evaluation to improve the system's efficiency.

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