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Saving the Day for Users in Web Platforms: A Chatbot-based Solution for Privacy

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***Abstract*—In the rapidly evolving online digital landscape, privacy is an issue of great importance for individuals, while the use of web platforms handling personal data has reached significant levels. Regulations like the European Union General Data Protection Regulation (GDPR) enforce systems to integrate an array of privacy features allowing users to exercise their privacy rights and shield their personal data. However, users tend to find themselves overwhelmed or even ignorant, unsure of how to locate and use them. Research also showed that users find privacy policies hard to read and tend to skip them. This work introduces a novel approach to addressing these privacy concerns by presenting a user-centric solution to enhancing user privacy in web platforms and empowering users in handling their own personal data: an easy-to-use chatbot-based solution. The tool aims to provide a user-friendly and intuitive all-in-one interface, allowing users to easily navigate and access privacy features and manage their personal data while retrieving information about privacy aspects effortlessly from one location. An admin panel enables the customisation of important privacy parameters. We present the design and development process, evaluation and results.**

***Index Terms*—Privacy, EU General Data Protection Regulation, Personal Data Management, Chatbot, Usability**

I. Introduction

In this fast-paced digital era, in which web platforms have become central to our daily interactions[1], regulations like the European Union (EU) General Data Protection Regulation (GDPR) [1] enforce developers to integrate an array of privacy features into their systems. However, users often find themselves overwhelmed or ignorant [2], [3], unsure of how to wield these tools effectively. It is, moreover, a reality that people tend to avoid reading the privacy policies of systems [4], but even when they do, they find them long to read and incomprehensible [5]–[8], even more so with the enactment of the GDPR [9]. Based on a study conducted by the authors in [4], the average privacy policy reading time in their experiment was 73 seconds before accepting it, while the average adult reading speed suggests it should have taken 29–32 minutes. On the other hand, people, when asked, state that they give great importance to privacy in systems [10]. This is the privacy paradox as defined in [11], [12].

In this work, we propose a novel approach to addressing these privacy concerns by presenting a user-centric solution to enhancing user privacy in web platforms and empowering users in handling their own personal data: an easy-to-use chatbot-based privacy solution. The chatbot aims to assist users in understanding, locating and using all the privacy features embedded in a platform by giving them all the needed information in a simple format and equipping them with the tools needed to harness the full potential of embedded privacy settings effortlessly and effectively while navigating web platforms. In specifics, the chatbot allows users to find all GDPR-imposed information and use all their GDPR-defined rights on their personal data, like accessing, editing or deleting them, all through the usable and intuitive user-friendly chatbot interface. At the same time, the tool offers an admin panel to guide the platform owner or developer on including all needed GDPR-based privacy features in the system [13] and in its policy [14] and to provide customised privacy information to the users based on specific privacy parameters.

We opted to develop a chatbot-based solution, inspired by the growing popularity of chatbots among web users[2], but also by its alignment with Nielsen's usability heuristics [15]. These heuristics emphasize the importance of providing prompt feedback to users, clear communication, and designing interfaces that speak the users' language. Following this decision, we thoroughly designed our tool by studying the GDPR and extracting specifications to cover important privacy aspects, sketching all the potential interaction scenarios between the chatbot and the users and a decision tree necessary to dictate the conversational paths, and preparing prototypes. Then we implemented it as a WordPress Content Management System (CMS)[3] plugin, which was integrated into an e-commerce web platform as a case study to demonstrate its usage. In the end, we conducted a user evaluation in terms of usability and user experience through the standardised User Experience Questionnaire (UEQ) tool with 27 participants, out of which we obtained positive results in comparison to benchmarking values, including a mean score of 2,01 (Excellent) for Attractiveness defining if the users liked the tool, and 1,91 (Good) for Perspicuity showing if it is easy to get familiar with the product. Additional questions were included examining the change in users understanding and users' trust in web platforms' privacy upon using the chatbot, with positive results.

The rest of the paper is organised as follows: Section II dis-

[1] https://www.statista.com/statistics/617136/digital-population-worldwide/

[2] https://www.statista.com/statistics/656596/worldwide-chatbot-market/

[3] according to statistics https://www.bluehost.com/blog/wordpress-facts/ currently 43,2%of all websites worldwide use WordPress

cusses the background and related work, Section III elaborates on the design and development process, Section IV showcases the developed chatbot and admin tools, and Section V examines the user evaluation process and results. Finally, Section VI concludes the paper, highlighting future work potentials.

II. Background & Related Work

Privacy of personal data, has emerged as a challenge across various fields, including online software systems [16]. The GDPR [1] came into effect on 25th, 2018, to establish privacy in a legal framework, imposing rights and provisions to all systems handling personal data[4] of EU residents. Software systems and web platforms are also obliged to comply by incorporating several different privacy options for the users [17], giving them the power to control their data on the web while carrying out various activities [18]. At the same time, research works are exploring the effect of privacy on User Experience (UX) and vice versa [19]. UX is evolving, aiming to incorporate privacy considerations, beyond usability, as an integral component [20].

Users' trust and perception of privacy policies and personal data handling in the web or other software systems have been investigated [21], and mechanisms for protecting user privacy in the web [22] have been proposed. In [23], the authors studied individual GDPR rights that impact users' experience, and results revealed a lack of awareness of the GDPR among the participants, with only a small percentage having prior knowledge of the GDPR and lacking a clear understanding of the implications and practical implementation of their rights.

Integration of GDPR features in online tools was studied, like in [17], in which the authors study the application of GDPR rights in the design and development of web platforms, demonstrating their findings with a GDPR-compliant implementation of a case study platform, or [24] which provides insights on developers' challenges in implementing privacy protection within software, including web platforms and tools, and recommends practical solutions for software development for privacy-related tasks. In [25], a system was developed for checking websites for compliance with the GDPR. In specifics, they present an implementation of a web application that validates a customer's site for compliance with the standard and issues a practical report with recommendations and notes in accordance with the list of fixes to the standard.

Furthermore, studies have been investigating the impact of the GDPR on the landscape of online privacy policies [26], [27]. The results of their studies suggest that the GDPR imposed major changes on privacy policies, and the web became more transparent, but there is still a lack of both functional and usable mechanisms regarding users' comprehension and knowledge on the processing of their personal data. In [9], the authors look into the issue of how privacy policies can be both GDPR-compliant and usable. They synthesise GDPR requirements into a checklist and provide a usable and GDPR-compliant privacy policy template for the benefit of policy writers. [14] studies whether the privacy policies of software systems are following the GDPR in this regard by including and communicating the needed information to the users.

To the best of our knowledge, while user's trust and perception have been investigated in the above works, tools for developers for incorporating privacy have been created, as well as privacy policy readability and usability were explored, there have been no works trying to facilitate user's experience in terms of easily accessing the privacy features and exercising their GDPR-imposed rights in web platforms or to provide them with a user-friendly privacy assisting tool. Our approach aims to bridge the gap between users' privacy concerns and lack of awareness, and platforms' personal data management practices, ultimately empowering users with greater control over their personal information.

III. Design and Development

This section outlines the steps followed to design and develop our chatbot-based solution, including a study of the privacy needs imposed by the GDPR; drafting all the potential user interaction scenarios; deciding on the set of questions for the admin panel; creating the chatbot decision tree; developing high-fidelity prototypes; and implementing the tool.

A. System Specification

To support privacy, we extracted our system specification from GDPR-imposed requirements by undergoing a thorough study of the regulation while exploiting our previous works on web platform policies [14] and GDPR compliance [17]. Based on the above, we decided to support the following list of GDPR-defined rights:

- *Right to erasure (Article 17)*: the user can ask for the deletion of their account at any given time, after which no personal data should be sustained or processed.
- *Right to rectification (Art. 16)*: the user can request the rectification of inaccurate or incomplete personal data.
- *Right of access (Art. 15)*: the user can obtain confirmation from a system as to whether or not their personal data are being processed and obtain access to that data and specific additional information.
- *Right to data portability (Art. 20)*: the user should be able to obtain all of their personal data processed in the system "in a structured, commonly used and machine-readable format" and has "the right to transmit those data to another controller".
- *Right to restriction of processing (Art. 18)*: the user can ask for their personal data to stop being processed until the user decides to resume.

Exercising these rights is dependent on the way the platform developers will implement and offer the respective functionality, and as such, we decided to provide an interface for the admin for customisation of specific parameters that can also be used as a checklist towards considering all necessary privacy settings and features to be included in the platform. Both the chatbot and the admin panel will support the same functionality from different aspects, i.e., the chatbot will be the

[4] According to GDPR, personal data are defined as information that relates to an identified or identifiable individual

interface for the users obtaining this information and accessing the privacy tools, while the admin panel will ask and receive information from the platform admin, to use them in the conversations with the users. We extracted our specifications from the GDPR rights to support, as presented in Table I.

	Functionality	Scenarios
1	Information on the Privacy Policy	6
2	Delete Account	4
3	Erase Personal Data	3
4	Edit Personal Data	2
5	Access Personal Data	4
6	Transfer Personal Data	3
7	Restrict Personal Data Processing	5
8	Information on Cookies	4

TABLE I
SYSTEM SPECIFICATIONS

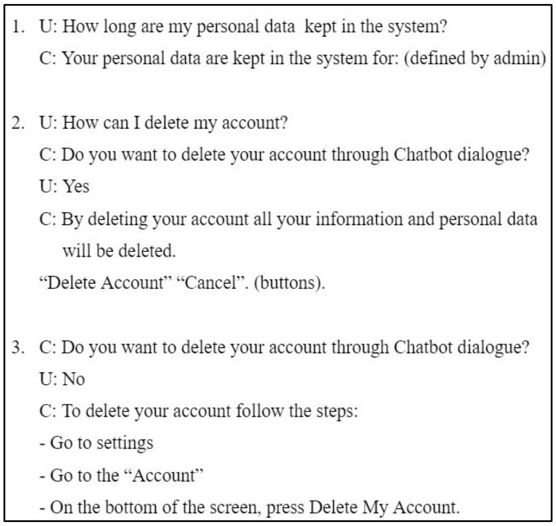
B. Design

We opted to design and develop a button-based chatbot to provide a clear, structured and usable tool that can guide the users through the possible privacy options without requiring them to have any knowledge to lead the conversation. Based on GDPR Article 12, a system is obliged to provide the user with clear, structured and direct information regarding privacy and personal data, and our solution aims to assist in this direction.

Our design process was distributed in stages. Firstly, we extracted all the possible interaction scenarios between the chatbot and the user based on the selected privacy rights and specifications; then, we decided on the set of questions for the admin panel; subsequently, we prepared the decision tree and prototypes based on the scenarios; and lastly, we created the architecture and database schema of our tool.

1) Scenarios: We drafted interaction scenarios for each one of the system specifications. In total, we produced 31 scenarios distributed in the different functionalities, as can be seen in the right column of Table I. All scenarios in which the chatbot guides the user on accessing and utilizing specific privacy features within the platform are designed to be customisable through the admin panel. Scenarios that provide the user with static information, are designed based on our GDPR analysis and the literature, to provide the most suitable answers.

Figure 1 presents three examples of such scenarios: 1. The user U asks for some information regarding the storage of their personal data, and the chatbot C responds with a customised answer based on the admin feedback through the panel; 2. and 3. The user U asks for information on deleting their data, and the chatbot C responds back with a question giving the user the option to delete their data through its own interface. If the user selects "Yes", then the functionality is available within the chatbot; otherwise, the chatbot explains how the user can reach this functionality from the platform navigation.



1. U: How long are my personal data kept in the system?
   C: Your personal data are kept in the system for: (defined by admin)

2. U: How can I delete my account?
   C: Do you want to delete your account through Chatbot dialogue?
   U: Yes
   C: By deleting your account all your information and personal data will be deleted.
   "Delete Account" "Cancel". (buttons).

3. C: Do you want to delete your account through Chatbot dialogue?
   U: No
   C: To delete your account follow the steps:
   - Go to settings
   - Go to the "Account"
   - On the bottom of the screen, press Delete My Account.

Fig. 1. Interaction Scenarios Example

2) Admin Panel Prompts: To achieve customisation in the privacy information given by the chatbot and the services offered, feedback from the platform administrator is required. We have drafted a set of prompts to incorporate in the admin panel, necessary for the user-chatbot interaction scenarios. The prompts are:

- Please provide the privacy policy link.
- Please provide the terms of use link.
- Are users' personal data being shared with other websites/organizations? If so, with which?
- How long are users' personal data kept in the system?
- How can a user delete their account?
- How can a user delete personal data?
- How can a user view their personal data?
- What is the Data Protection Commissioner's email?
- What is the Data Controller's email?
- What cookies does the page collect?

3) Decision Tree: Button-based chatbots, like the one we are designing, are built as decision tree hierarchies, requiring the user to make selections with which the user follows a conversational path. Following the interaction scenarios as a guideline, we developed the decision tree. Firstly, we divided all scenarios into four main categories (branches) as follows:

1) *"Privacy Policy"*, including all the interactions in which the user wants to learn information relating to the platforms privacy policy (functionality 1 in table I);
2) *"Cookies"*, including all the interactions in which the user wants to learn information about the cookies collected by the platform (funct. 8 in table I);
3) *"Delete Account"*, including all the interactions in which users want to delete their accounts (funct. 2 in table I);
4) *"Personal Data Actions"*, including all the interactions in which users want to learn about or act on their personal data (functionalities 3-7 in table I).

Each one of them subsequently has its own subcategories as branches and so on. As an example, Figure 2 presents the branch for the category "Personal Data Actions".

4) Prototypes: Aiming to design an easy-to-use, intuitive and usable tool for the end users, we developed prototypes for the system before its implementation to optimise the interface

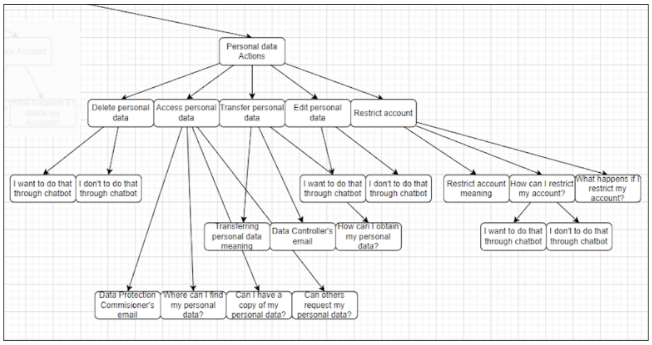
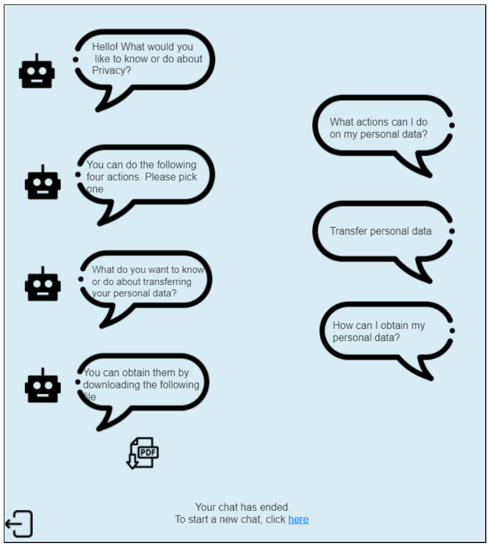

Personal data Actions
Delete personal data
Access personal data
Transfer personal data
Edit personal data
Restrict account
I want to do that through chatbot
I don't to do that through chatbot
I want to do that through chatbot
I don't to do that through chatbot
Restrict account meaning
How can I restrict my account?
What happens if I restrict my account?
Transferring personal data meaning
Data Controller's email
How can I obtain my personal data?
I want to do that through chatbot
I don't to do that through chatbot
Data Protection Commisioner's email
Where can I find my personal data?
Can I have a copy of my personal data?
Can others request my personal data?

Fig. 2. Chatbot Decision Tree "Personal Data Actions" Branch

and recognise any faults from this stage. For our prototypes, we followed Nielsen's heuristics [15] guidelines. We designed high-fidelity prototypes based on our produced decision tree. Using proto.io, we created 40 prototype screens for different interaction scenarios, the admin panel, and the chatbot landing page. Figure 3 presents one prototype example, in which the user wants to learn how to obtain their personal data, and the chatbot prepares a pdf with all their personal data and offers them the option to download it. Prototyping acted as an intermediate step between the interaction scenarios, the decision tree, and the implementation of the tool.



Hello! What would you like to know or do about Privacy?

What actions can I do on my personal data?

You can do the following four actions. Please pick one

Transfer personal data

What do you want to know or do about transferring your personal data?

How can I obtain my personal data?

You can obtain them by downloading the following file

Your chat has ended.
To start a new chat, click here

Fig. 3. Data Portability Prototype Example

C. Development

Figure 4 presents the architecture of our tool. Our solution was developed as a WordPress CMS plugin that can be added to web platforms storing and processing personal data. Its implementation into other similar CMS plugins or even as a standalone tool is straightforward. In order to showcase the functionality, we integrated it into an e-commerce platform as a case study. We selected e-commerce as they receive and use significant personal information, while their usage is increasing[5]. However, the same functionality could have been demonstrated in any kind of web platform that uses personal data. For setting up a functional e-commerce case study, we exploited the Woocommerce WordPress plugin. Additionally, we exploited the Ultimate Member WordPress plugin for user management functionality.

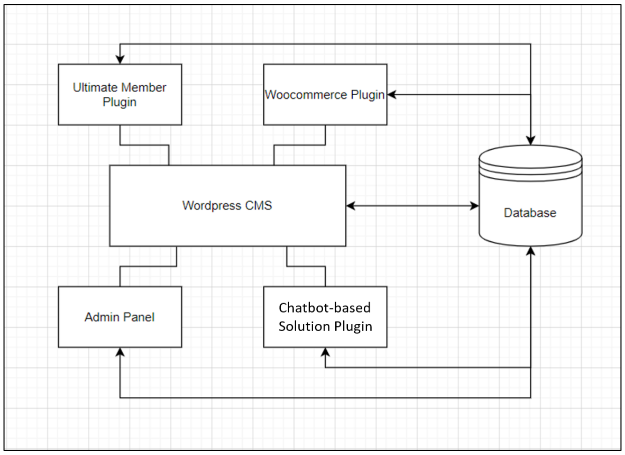


Fig. 4. System Architecture

The chatbot interacts with the WordPress tables in the database (DB) to access, edit or delete personal data or accounts. Further to that, a new table was created for the admin panel responses. For the chatbot and admin panel implementation, we used HTML, CSS, JAVASCRIPT, AJAX, PHP and MySQL.

IV. The Privacy Chatbot-based Solution

This section presents the developed chatbot-based solution, including (A) The Admin Panel; (B) The Chatbot. As shown in Figure 5, users interact with the chatbot via chat, while admins feed the admin panel with information on the privacy settings. The admin panel, in its turn, provides the chatbot with this information.

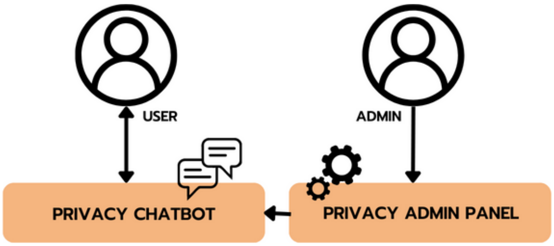


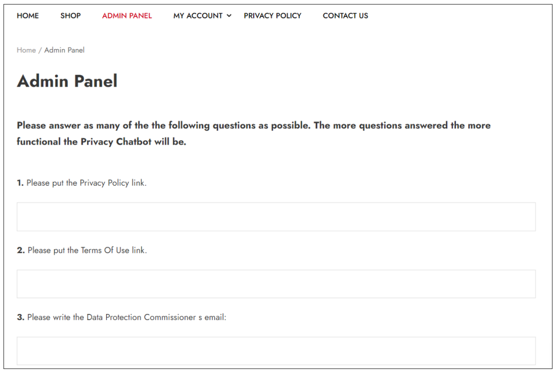
Fig. 5. Chatbot-based Privacy Solution

A. Admin Panel

As discussed, our solution incorporates some configurable privacy settings via a dashboard for platform administrators.

[5] Based on https://business.adobe.com/blog/basics/2023-ecommerce-statistics "In 2023, an estimated 2.64 billion consumers will have completed at least one purchase online."

For optimised results, the system administrator should fill in all the requested information in the admin panel before publishing the platform. This information will be stored in the DB and used by the chatbot to provide customised answers to the users. Additionally, the admin panel can act as a checklist for the privacy features that should have been included in the platform, either information like the data protection commissioner contact details or functionality-wise like deleting a user account. Admins can revisit the admin panel at any time to change any of the information provided. Figure 6 demonstrates a part of the admin panel, including the first three prompts.



Admin Panel

Please answer as many of the the following questions as possible. The more questions answered the more functional the Privacy Chatbot will be.

1. Please put the Privacy Policy link.

2. Please put the Terms Of Use link.

3. Please write the Data Protection Commissioner s email:

Fig. 6. Admin Panel

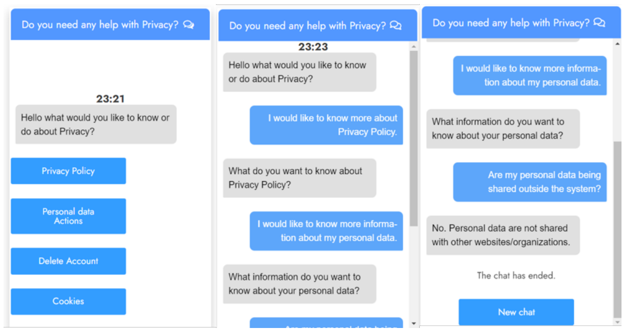
B. Chatbot

In the chatbot tool, there are two types of scenarios: (1) those that interact with the system DB either by reading information from the DB, updating information on the DB, or deleting information from the DB; and (2) those that are just informative. Table II presents all the scenarios that interact with the DB. The last two rows, shown in grey, refer to sets of interactions that have not yet been implemented in the tool.

Users can navigate in conversations with the chatbot by making selections from the provided buttons. Each time a response is selected, it appears automatically as conversation text within the chatbot. To explain this, we present two examples next. In Figure 7, the scenario in which the user selects to get more information about the privacy policy is presented, and specifically information about whether the user's data are being shared outside the system. This response is dependent on the response of the respective field in the admin panel. In Figure 8, we observe three different scenarios: in the first one the user asks how they can view their personal data within the platform; in the second scenario the user asks the chatbot about how they can delete their account, and next, they decide that they want to do that through the chatbot, so the chatbot provides them with a warning and the option to confirm deletion or not. If the user confirms deletion, then the account will be deleted from the DB of the system; in the last scenario, the user asks the chatbot to provide them with a copy of their personal data, and in return, the chatbot provides them with a downloadable pdf file with all the data included. The chatbot is also able to allow the user to edit their data through its interface, obtain any needed information and exercise all rights as defined in the specifications.

1	Privacy Policy → Terms of Use Link
2	Privacy Policy → Privacy Policy Link
3	Privacy Policy → Personal Data Info → Are my personal data being shared?
4	Cookies → What cookies does this site collect?
5	Delete account → How can I delete my account? → I want to do that through the chatbot
6	Delete account → How can I delete my account? → I don't want to do that through the chatbot
7	Personal data actions → Access personal data → Data Protection Commissioner's email
8	Personal data actions → Access personal data → Where can I find my personal data?
9	Personal data actions → Access personal data → Can I have a copy of my personal data?
10	Personal data actions → Transfer personal data → Data Controller's email
11	Personal data actions → Transfer personal data → How can I obtain my personal data
12	Personal data actions → Edit personal data → I want to do that through the chatbot
13	Personal data actions → Edit personal data → I don't want to do that through the chatbot
14	Personal data actions → Erase Personal Data
15	Data Actions → Restrict account

TABLE II
SCENARIOS INTERACTING WITH THE DB


Do you need any help with Privacy?
Privacy Policy
Personal data Actions
Delete Account
Cookies
Do you need any help with Privacy?
Do you need any help with Privacy?
New chat

23:21

Hello what would you like to know or do about Privacy?

23:23

Hello what would you like to know or do about Privacy?

I would like to know more about Privacy Policy.

What do you want to know about Privacy Policy?

I would like to know more information about my personal data.

What information do you want to know about your personal data?

I would like to know more information about my personal data.

What information do you want to know about your personal data?

Are my personal data being shared outside the system?

No. Personal data are not shared with other websites/organizations.

The chat has ended.

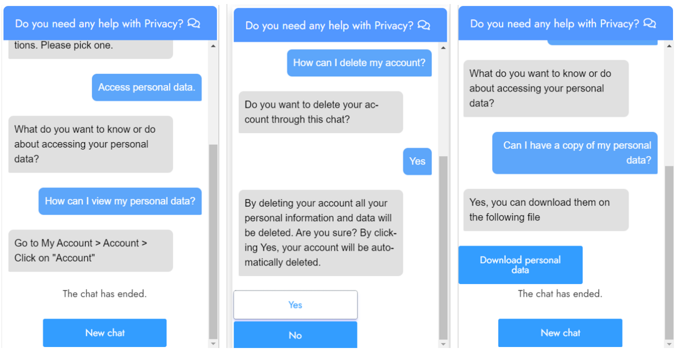
Fig. 7. Chatbot Interaction with the User Example 1

V. User Evaluation

A. Survey

We performed a user evaluation through a questionnaire survey. Participants were initially presented with a demo video showcasing the functionality of the tools. Subsequently, they were requested to complete the questionnaire, comprising scale-based questions from the standardised User Experience Questionnaire (UEQ)[6] and some custom multiple-choice questions focusing on the privacy chatbot functionality. UEQ aims for a fast and direct measurement of User Experience (UX) and Usability [28]. It includes 26 items, with each item consisting of a pair of terms with opposite meanings. Each item can be rated on a 7-point Likert scale, from -3 (fully agree with the negative term) to +3 (fully agree with the positive term). Half of the items start with the positive term, the rest with the

[6] https://www.ueq-online.org/



Do you need any help with Privacy?

tions. Please pick one.

Access personal data.

What do you want to know or do about accessing your personal data?

How can I view my personal data?

Go to My Account > Account > Click on "Account"

The chat has ended.

New chat

Do you need any help with Privacy?

How can I delete my account?

Do you want to delete your account through this chat?

Yes

By deleting your account all your personal information and data will be deleted. Are you sure? By clicking Yes, your account will be automatically deleted.

Yes

No

Do you need any help with Privacy?

What do you want to know or do about accessing your personal data?

Can I have a copy of my personal data?

Yes, you can download them on the following file

Download personal data

The chat has ended.

New chat

Fig. 8. Chatbot Interaction with the User Example 2

negative term (in randomized order) [28]. The user is called to select from a scale of 1 to 7 how close the product under evaluation is to one of the two adjectives. Additionally, we added the following three questions (yes/no):

(Q_1) Using the Privacy Chatbot, are you able to comprehend better the notion of privacy in terms of web platforms?

(Q_2) Does Privacy Chatbot help you trust web platforms more in storing and handling your personal data?

(Q_3) Do you believe it's useful for web platforms to incorporate the Privacy Chatbot?

B. Results

We collected 27 responses, which we analysed through the tool provided for UEQ. The results for each pair of terms are shown in Figure 9, observing positive results. Based on relevant literature [29], [30] the 26 UEQ items are categorised under six UEQ scales: (i) Attractiveness investigating whether users like or dislike the product; (ii) Perspicuity investigating whether it is easy to get familiar with the product; (iii) Efficiency investigating whether users are able to use the tool without unnecessary effort; (iv) Dependability investigating whether users feel being in control of the interaction; (v) Stimulation investigating whether it is exciting and motivating to use the product; and (vi) Novelty investigating whether the product is innovative, creative and interesting.

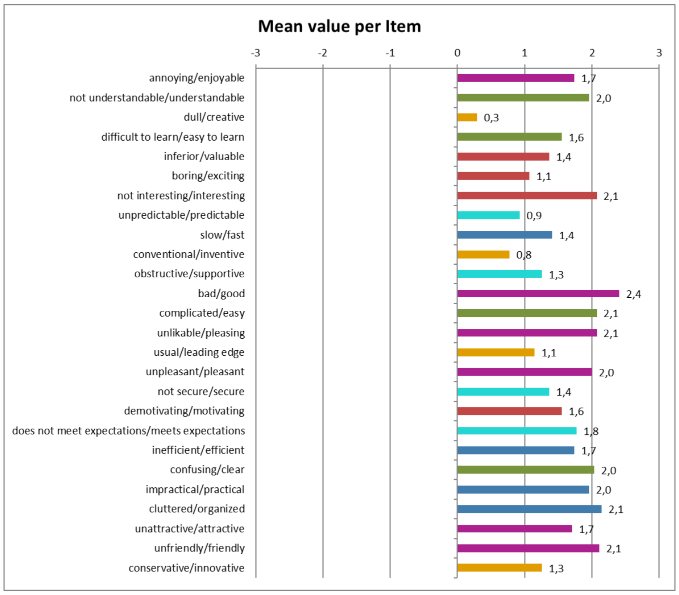


Fig. 9. UEQ questionnaire results for a total of 27 participants

We present our results for the six categories, in comparison to benchmarking data, in Figure 10. We observed positive results. Attractiveness with a mean of 2,01 is characterised as *Excellent*, meaning it is in the range of the 10% best results; Perspicuity with a mean of 1,91, Efficiency with a mean of 1,81 and Stimulation with a mean of 1,52 are characterised as *Good*, meaning there are 10% of better results and 75% of worse results; while Dependability with a mean of 1,33 and Novelty with a mean of 0,87 are characterised as *Above average*, meaning that there are 25% of better results and 50% of worse results. In regard to the three additional questions, we obtained the following results: in Q1, 96,4% responded "yes"; in Q2, 89,3% responded "yes"; and in Q3, 96,4% responded "yes". We consider these results positive as they indicate that people comprehend their privacy on the web better and trust privacy in web platforms more when using the chatbot while believing that it is a useful tool for web platforms.

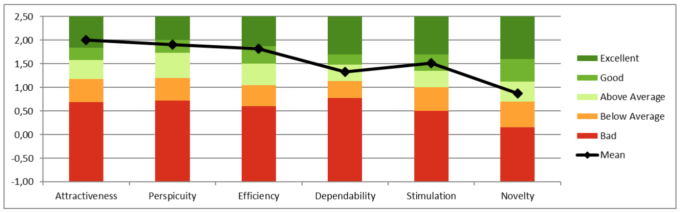


Fig. 10. UEQ questionnaire results in the 6 categories

VI. Discussion and Future Work

We envision further work in different directions. As mentioned before, there are a few interaction scenarios that have not yet been implemented. We plan on developing the complete version of the chatbot as immediate future work. On another aspect, as discussed, our chatbot is button-based and functions based on a predefined decision tree. A more intelligent chatbot system can be developed to accommodate custom interactions with the user. However, in this case, detailed research in human-chatbot interaction should be done to accommodate the initial aim of guiding the users to the possible options without requiring them to take initiative, have any prior knowledge or miss privacy options as a result of incorrect prompts towards the chatbot.

Finally, the user evaluation results were positive. However, there is space for improvements to reach *Excellent* in more categories of the UEQ. Moreover, a more extensive user evaluation is planned by integrating the tool in a number of real case scenarios, i.e., web platforms, and approaching a wider group of users.

VII. Acknowledgment

ChatGPT version 3.5 was used as a supportive tool in writing this paper.

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