Website User Interface Design Using Data Mining Task Centered System Design Method At National Private Humanitarian Institutions

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Article Info	ABSTRACT
	Humanitarian organizations that support social communities by providing work opportunities for employees. In actuality, a website is required to serve as a channel for contacting new contributors and publicizing the organization. In order to create websites for humanitarian organizations using the task-centered system design methodology, research was done based on these issues. Identification, requirements, design as a scenario, and walkthrough evaluation are the four stages of this process. The PACT framework is used to identify users and necessary tasks during the identification phase. The tasks that are actually required are then chosen at the requirements stage. The task-based design is then completed using the Figma program during the design as scenario stage. The workflow and usability of the website, which was developed utilizing cognitive walkthrough and SUS, are also evaluated at this point. Based on the findings of the assessment, it can be said that cognitive walkthrough testing can be used to assess the components of an interface that are easy to learn, effective, and efficient, and that SUS can be used to assess the usability of the design outcomes. Based on the findings of the cognitive testing, a learnability and effectiveness score of 95% with the predicate "very good" and an average efficiency value of 0.1 goals/second with the predicate "very fast" were obtained. The SUS test then yielded an acceptable predicate and a SUS rating of 83. *Copyright © 2023 Puzzle Research Data Technology*

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1. INTRODUCTION

Humans are essentially monoplural creatures; that is, apart from having individual characteristics, humans are also social creatures who need other humans to fulfill their needs. To create a good social order, there must be positive interaction between fellow humans, namely by bringing out the human nature in each individual. Humanity is a characteristic possessed by a human being to create harmonious relationships between people by upholding and respecting the dignity of every other human being [1]. The nature of

humanity describes a sense of compassion, gentleness, respect, nurturing, and love for each other and the environment. The human nature in humans will encourage them to help each other with other humans when problems occur in the social environment, for example, when disasters, accidents, poverty, social inequality, and so on occur [2]. According to data from the National Statistics Agency, in 2020 there were around 26,424,020 people who were below the poverty line, 23,876,200 people experienced difficulties due to natural disasters, and it was recorded that in 2022 there would be 75,030 children in Indonesia dropping out of school. This is where the role of humanitarian agencies comes in: to collect aid and distribute it to those in need. Humanitarian institutions themselves are institutions that operate in the field of humanitarian assistance to help people affected by natural phenomena (floods, hurricanes, and tsunamis) and non-natural phenomena (poverty, war, and pandemics) [2].

The development of Information Technology has generated large amount of databases and huge data in various areas. The research in databases and information technology has given rise to an approach to store and manipulate this precious data for further decision making. Data mining is a process of extraction of useful information and patterns from huge data. It is also called as knowledge discovery process, knowledge mining from data, knowledge extraction or data or pattern analysis [3].

The Foundation is a humanitarian organization in Indonesia. Having a vision and mission in the scope of humanity and the environment has the aspiration to be a driving force in empowering society and building a better social order [4]. In short, it is one of the organizations or institutions that is under the auspices of the organization and has a vision and mission of caring for fellow humans and the environment. Therefore, it not only accommodates monetary donations but also donations of goods as well as selling pre-owned goods, where all the proceeds will be used for humanitarian activities [5]. Currently, humanitarian organizations are expanding their networks to gain support from the wider community because every process of collecting donations, whether in the form of goods, money, or other transactions, is carried out manually, through the organization's social media account or personal contact with one of the members [6]. This is less effective because donations and other transactions are not accommodated well [7]. Therefore, it is necessary to design and build a website to systematize the management of donations, make it easier for users and potential donors to make donations, and invite more people to buy pre-owned goods without having to visit sales stalls [8].

Fundraising and disseminating information about social problems can now be done easily and quickly using the internet. The National Statistics Agency notes that around 63 million Indonesians use the internet for an average of 8–9 hours every day. Based on the explanation above, the internet can be a solution for spreading campaigns and support to help mobilize aid and humanitarian support [9]. Websites are one of the technological developments that humanitarian agencies can use as a media for campaigns to support humanitarian aid. Accessing websites can be done via any platform and can save users' storage space; besides that, websites are easier and cheaper to develop. According to merdeka.com, as of July 31, 2021, there were 534,876.id domain users, as reported by the Indonesian Internet Domain Name Manager (PANDI). As of December 20, 2021, there were 554,330 registered domain names, including 529,241 domain names registered by Indonesians and 25,089 domain names registered by people from abroad. The use of websites for humanitarian organizations is useful for social campaigns and actions to gather support and assistance for social communities. Apart from that, the costs incurred are cheaper, and the website can contain information about institutions that is more complete and complex than other social media, so the website can become a forum for increasing the effectiveness of the performance of humanitarian institutions in gathering aid and support [10].

A website is a collection of pages that are connected to each other and contain several items, such as documents and images stored on the web server. A web app is an application on a web server that can be accessed by users via a browser. Apart from that, a website is a collection of documents that reside on a server and can be viewed by users using a browser [11]. The document can consist of several pages, each providing various information or interactions. Information and interaction can be in the form of writing, images, videos, animations, sounds, and so on. From the explanation above, it can be concluded that the website platform provides various conveniences for users in accessing the information they want. However, in reality, sometimes this information does not match the criteria expected by users [12]. Often, the website display design is less attractive even though it has high functionality, so users are not interested and bored. On the other hand, an attractive website design does not provide good enough functionality for users, so they are reluctant to reopen the website. To overcome this problem, the author intends to develop an interface design for the Foundation website by paying attention to user experience. The author will make observations that can later be used as a reference for designing user interfaces. The website will later become an organizational website that displays the institution's profile, containing brief information regarding the direction of movement and vision and mission of the institution, contacts who can be contacted to establish cooperation, work programs that have been implemented, used goods donation forms, and goods sales catalogs. The display design will be dominated by The three main colors characteristic of the institution are green, white, and yellow. The website that will be built has a slightly different concept from most organizational websites in general, namely by adding a catalog

feature for selling and donating used goods. In this case, humanitarian organizations want to use the website not only as an information platform for institutional profiles but also as a platform to invite users to take part in donating used goods that will benefit others [13].

Based on interviews with institutional officials, it is their hope that the website will have features, format, and design that can describe the organization well and be attractive in terms of appearance, design, and layout structure so that users do not get bored of visiting it repeatedly. Humanitarian organizations also want a feature to include articles about the activities or programs they have implemented so that there is transparency for the public regarding the distribution of donations and support that has been given and entrusted [14]. The website that will be built is expected to describe the profile, vision, and mission of the organization as an institution operating in the humanitarian sector, as well as attract the public to support and become donors in the used goods donation program, which will be the main feature on this website. Based on the benchmark results using the ISO 9126-usability standard, it can be concluded that there are several aspects that must be considered in designing a website, namely understandability, learnability, operability, and attractiveness. Understandability is the software's ability to be easy to understand; learnability is the software's ability to be easy to learn; operability is the software's ability to be easy to operate; and attractiveness is the software's ability to attract users [15]. From the explanation of the ISO 9126-usability standard, it can be concluded that software, in this case a website, must be easy to understand, learn, and operate and must have the ability to be attractive to users. A good website requires a neat appearance, the boundaries between content must be clear, and it must contain important information about the organization such as the organization profile, contacts, used goods donation features, used goods sales catalogs, as well as transparency in the distribution of donation proceeds. Apart from that, in terms of aesthetics, this design must also pay attention to aspects of beauty, so it is necessary to pay attention to color combinations, font selection, layout arrangement, and use of icons to provide a good interface experience for users [16].

Based on the benchmarking results, it can also be concluded that a good website can ideally fulfill four points: understandability, learnability, operability, and attractiveness [17]. A good website should be able to be understood, studied, and operated well, and have a design that is attractive to users. Humanitarian organization websites must at least provide complete and concise information about the organization, provide donation features that are easy to click and understand, pay attention to the color combination on each button, and provide information on donation distribution activities. In designing applications, both website-based and mobile, interface design has an important role in providing an attractive appearance for users so that they don't get bored when exploring the application [18]. The user interface is the part of computers and software that can be seen, heard, touched, talked to, and understood directly by humans. It can be said that the user interface is the technique and mechanism for displaying the interface to interact with users. The user interface is the part of the computer and software that organizes the interface for the user and facilitates pleasant interactions between the user and the system [19]. When designing a website interface, it is important to understand each task that will be carried out in the application to optimize the user interface design that will be created. The Task-Centered System Design (TCSD) method is a method that focuses on user interface design based on the task needs of the users [20]. This method is used to identify tasks and user needs. The TCSD method itself includes four stages: identification, requirements, design as a scenario, and walkthrough evaluation. Because in user interface design, it is very important to understand each task so that you can optimize the user interface design. TCSD is a user interface design method based on specific tasks that users will carry out using the existing system [21].

Based on previous research, the TCSD method is considered effective for use in building applications because it is systematic and can reveal imperfect parts after the research is complete. The TCSD method is easy to understand and easy to use, with a focus on the specific task that needs to be carried out by the user. This method is able to identify user needs and provide recommendations for designing a good user interface. The main principle of user-centered design is to place the user at the center of the design activity. User tasks, user participation, and user evaluation summarize the essence of the approach [22]. When compared to the Double Diamond and HCD methods, the DD method focuses on problem analysis as a basis for creating solutions. Meanwhile, HCD is oriented towards humans as a whole and not focused on potential users. So TCSD is a process where planning, designing, and product development focused on users will be implemented in the prototyping process with the hope of increasing usability optimization. Usability itself comes from English, namely usable, which means "can be used well". Something can be said to be useful at least if it can reduce errors during its use or even eliminate them and can bring benefits and satisfaction to its users [23].

In designing the interface of an application, it is important to have usability testing to find out whether the interface that has been designed is usable or not. Usability testing is a method for finding out and getting information about activities that users have actually carried out by observing the processes that users carry out when using the application [24]. An application is said to have good usability if it is easy to use and its function or purpose of use is as desired. In this research, the author will use the SUS (System Usability Scale) method

to test the usability of the interface that he has designed. This method, created by John Brooke in 1986, is a technique used to evaluate a variety of products and services, including hardware, software, mobile devices, websites, and mobile applications [25]. SUS has 10 questionnaire statements that can be used to assess a product, which respondents can answer using Likert scale rules: strongly agree, agree, neutral, disagree, and strongly disagree. The SUS method is used because this method considers time, cost, and a small sample but provides adequate, validated, and proven reliability results.

2. RESEARCH METHOD

In this research, the author used the task-centered system design method, which consists of four processes: identification, requirements, design as a scenario, and evaluation walkthrough. Before using this method, the author first conducted a literature study, interviews, and observations. At the identification stage using user personas, pain points, the PACT framework, and requirements tables, at the requirements stage using task analysis and task flow, at the scenario stage where wireframes, mockups, and prototypes are designed, and at the final stage, namely the evaluation stage using a cognitive walkthrough and a system usability scale. In this research, the author used methods to collect data, namely observation, literature study, and interviews. The author measures and analyzes the extent of the usability of a website using the benchmark method. In this research the author identifies the results of observations on several similar websites using the ISO 9126-usability standard reference which refers to four points, namely: understandability, learnability, operability, and attractiveness. In this benchmarking, the author refers to three existing charity websites, namely: Dompetdhuafa.org, baznas.co.id, and rumahamal.org.
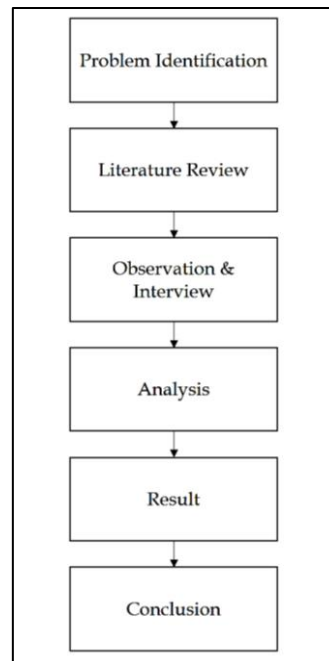

Figure 1. Research Flowchart

The following is an explanation of each stage in the task-centered system design used in this research: In the first stage, the author identifies specific users of the system and articulates examples of realistic tasks that they will carry out. The goal of this stage is to generate a manageable list of representative users and tasks. To achieve this goal, you must first know the specific tasks carried out by the user, in this case the repository user, and write them down as a task description. The task description is then validated to ensure that it represents reality. Identification at this stage uses the PACT (people, activities, context, technology) method to identify user tasks, and then a requirements table is created to select the tasks needed by the user. Requirements is the stage of analyzing system requirements by entering or removing the tasks that have been collected. At this stage, each task will be selected according to the user's needs and website design goals, taking into account the usability of the system. After identification, each task will be selected and arranged according to the user's and application's needs. Design as scenario: at this stage, the interface design begins to be carried out that will support the workflow that has been created, starting with creating a conceptual model in the form of subtasks, layout, elements, information, and the expected response. This conceptual model then becomes a guide for designing wireframes, mockups, and prototypes.

Prototype: At this stage, a design is carried out based on the results of the design as a scenario to be used as a solution to existing problems. At this stage, the author places text, images, and other elements and creates a user interface based on the analysis carried out in the previous stage. At this stage, the author will create a mockup and prototype. Walkthrough Evaluate: This stage carries out a final evaluation of the system design after going through the identification, requirements, and design stages as scenario stages, building a system based on the three previous stages, and then evaluating the system using the cognitive walkthrough method to find out the relationship between each task and to what extent the system has been successfully built. Test: At this stage, the author carries out a test regarding the usability of the system using a formative method in the form of a cognitive walkthrough and a post-test questionnaire in the form of a system usability scale to test each task and find out the usability value of the website that has been created for respondents who will represent the wider community. The score from the test will be a benchmark for the success of website development and an evaluation for future improvements. Referring to the book Human-Computer Interaction by Prof. Dr. Keith Andrews, evaluation uses a formative method in the form of a cognitive walkthrough requiring at least three evaluators and a post-test questionnaire requiring at least 20 respondents. In the cognitive walkthrough evaluation, the author targets four evaluators who will evaluate the website based on the tasks that have been designed, namely one staff member and three specialist implementers who have experience in system testing. Then the post-test questionnaire with SUS, targeting 50 respondents to assess the usability of the website from the perspective of users from the general public, was created to maximize the assessment results of the user interface created.

3.   RESULTS AND ANALYSIS
3.1. Cognitive Walkthrough

Cognitive walkthrough is a usability testing method with one or more aspects assessed through several task scenarios and a number of questions to explore problems from the user's perspective. Cognitive testing was carried out on four respondents, one of whom was a humanitarian agency to assess the interface that had been designed, and the other three were experts in system analysis and implementation and worked in this field. The selection of respondents is intended to maximize the cognitive test assessment so that it is objective based on the respondent's experience and knowledge. Before testing, the author first creates a task scenario, which contains the tasks and details of the tasks that must be carried out by the respondent. The assessment aspects used are learnability, effectiveness, efficiency, and usability. Learnability, effectiveness, and efficiency will be assessed in the cognitive walkthrough test process, while usability assessment will be carried out through testing using SUS. A cognitive walkthrough is carried out by referring to the task scenario that has been prepared previously, and then the respondent will carry out the task scenario based on the details of the task given by the author. Each task has a step weight that is different from the other. The total tasks in this cognitive testing are 10 tasks obtained from the results of task analysis at the requirements stage for admins and 15 tasks for potential donors.

The learnability aspect can be obtained by calculating the success rate. The success rate is the percentage of task scenarios that can be completed correctly by respondents. The way to calculate the success rate is to divide the completed tasks by the total tasks and then multiply by 100%. The way to calculate the success rate is to divide the number of successful tasks by the total tasks, then multiply by 100%. Based on calculations using the success rate formula, an average value of 100% was produced for the admin display and a figure of 95% for the donor display, both of which fall into the very good category, namely in the range of 84%-100%. Based on the success rate graph in the admin display, all respondents were able to complete the task without problems, and in the donor display, there were 2 out of 4 respondents who had problems completing the task scenario, namely R1 on TS12 and R4 on TS5 and TS6. The effectiveness aspect can be obtained by calculating the completion rate. The completion rate is the percentage of task scenarios that can be completed correctly by respondents. If the respondent can carry out the task, they will get a score of 1; if not, they will be given a score of 0. Of the four respondents who carried out the cognitive walkthrough test. Based on the data obtained, in the admin display, all respondents were able to work on and complete a total of 66 scenarios well, while in the display for donors, there were 3 task scenarios that failed out of a total of 60 task scenarios carried out by all respondents, namely on TS5, TS6, and TS12. So it affects the completion rate value, which is 75% for each of TS5, TS6, and TS12. Next, the average calculation of the total task completion scores is carried out, which is 95%. According to the ISO 9126-4 standard, the average success value from the effectiveness aspect is 78%. Therefore, it can be concluded that the effectiveness aspect of designing the website prototype has met the criteria, namely 95%.

The efficiency aspect of this research uses a time-based efficiency calculation method, namely by calculating the average time of all respondents in completing the task scenario. Calculations are based on the time it takes to complete this task to get the efficiency value of a system, in this case the prototype. Based on data on the time for completing task scenarios carried out by respondents, it produces an average value of

0.07605 goals/second for the admin display and 0.100012947 goals/second for the donor display, both of which are included in the very fast category. Based on the graph of the TBE calculation results, the task with the highest TBE for the admin display is in TS10 at 0.097979323 seconds, while for the donor display it is at TS7 at 0.283333333 seconds, and the lowest TBE in the admin display is at TS3 at 0.038504331 seconds, and in the donor display, namely on TS6, it is 0.030213675 seconds. Therefore, it can be stated that TS3 admin and TS6 donor require the most time among all the other task scenarios because TS6 donor is related to the purchase of pre-owned goods, which, even though it only has 8 steps, is quite complicated because the user has to be more careful when checking out the goods.

3.2. Task Analisys

Task analysis was carried out to become a reference in the SUS assessment carried out by respondents. In the task analysis, a prototype trial was carried out by the author giving orders to the respondents. Given several commands to complete on the website display. The following are the commands to perform task analysis on the customer view: Click the account icon in the top-right corner. Register by clicking the "register" button and filling out the registration form. Click "OK" on the notification that appears to continue. Fill out the login form, then click the "login" button. Login successfully. Click the "info" button in the navigation menu to read the news article. Click on the article title "Looking for ways to free the earth from plastic waste" to see the full article details. Go back to the "info" menu and scroll down, then click "Cianjur earthquake donation report" to see the donation report, then go back by clicking the "back" tab available in the browser. Click "program" in the navigation, then click "more" on the barter for green program. Clicking on the "contacts" navigation and seeing the contacts you can contact. Return to the homepage and click the "other documentation" button to view activity documentation. Return to the homepage, then click the "more reviews" button to see other reviews. Click the testimonial box and enter the testimonial, then click the "submit review" button. Return to the homepage, then click the "other campaigns" button to see more donation campaigns. Click the "donate" button on the "help build a literacy garden" campaign to donate. Enter the amount you want to pay, then fill in the message column (optional). Select the payment method by checking the "funds" box, then check the "I agree to the applicable conditions" box to continue making the payment. Click "make payment" to pay the donation, then click "ok" on the pop-up that appears.

Click the "donate now" button in the navigation. Choose a monetary donation. Select the donation designation "blessed Friday," then enter the nominal amount. Select the "funds" payment method, then click the "pay" button to make a donation payment. Click the "donate now" button in the navigation, then click "donate goods" to donate goods. Enter item data, then click the "please upload a photo of the item" button, then click "upload" in the popup that appears. Click the "insert" button to upload the image, and click "ok" on the popup that appears. Select the "fast" pickup fleet, then click the "donate" button and click "ok" on the pop-up that appears. Click on the "preloved corner" in the navigation to see the catalog of preloved items that are currently available. Search for "sweaters" in the search field, then click "women's sweaters" in the search recommendations. Click the "buy" button on the available button. Choose the "gosend sameday" courier service and the "fund" payment method. Click the "checkout" button to checkout the goods. displays the checkout page, then checks the data, then clicks the "checkout" button. Click on the account icon in the top right corner, then select "account" to see your personal data. Clicking the "back" button, then clicking the account icon again and selecting "sign out". After the respondent has carried out the task scenario given by the author, each respondent will fill in the answers to the SUS questions that the author attached in the word file given to each respondent, and then the results of the SUS assessment are processed to determine the usability results of the website interface that has been designed.

3.3. System Usability Scale

The System Usability Scale (SUS) is an evaluation method using 10 questions based on an existing template. In the available system usability scale template, a scale is given to answer the available questions. The scale is worth 1 to 5, where 1 represents the answer "strongly disagree" 2 represents the answer "disagree" 3 represents the answer "neutral" 4 represents the answer "agree" and 5 represents the answer "strongly agree". In testing using the system usability scale method, prototype testing is carried out by filling in forms based on the scenarios provided. Testing with the usability scale system was carried out by 50 respondents with age criteria ranging from 18 years to 55 years. Post-usability evaluation requires at least 20 respondents; sample sizes for qualitative research range from 5 to 50 respondents. The age criteria for respondents range from 18 to 55 years, namely the general public from various backgrounds who are quite familiar with current technology. In testing with 50 respondents, the average results were obtained in the two tables above. In testing using a usability scale system, a scale of 1 to 5 is given to each question. Then the scale that has been filled in by the participant is calculated based on the usability scale system calculation formula to determine the score value for each test result.

There are several rules for calculating scores on test results with the usability scale (SUS) system, namely: For each odd-numbered question, the score result is reduced by 1 [participant's assessment (odd questions) - 1 = odd-numbered question score]. For each even-numbered question, the number 5 is subtracted from the resulting score [5: participant's assessment (even question) = even question score]. To calculate the SUS score (total score), all the scores are added up, and the results are multiplied by the number 2.5. [[1st participant's total score] + [2nd participant's total score] +... + [nth participant's total score] * 2.5 = participant's score]. To find out the overall SUS score results, add up all the scores for each participant that have been calculated using the provisions or steps 1 to 3 above, then calculate the average value. [Total participant score] / number of participants = SUS score result. The results obtained in the SUS calculation were 84.15 for the admin display and 83 for the user/potential donor display. Then the results obtained are compared with the interpretation scale of the SUS score results. Grades (rankings) for SUS score results can be grouped into several ranks ranging from A+ to F, where A+ means very good and F means very bad. The SUS score results based on the table above are at grade A, which can be said to be "excellent" or "perfect". The design score results have a score value with an acceptance level, namely "acceptable." If the score is above 71, then the acceptance level is "acceptable." If the score is below 51, then the acceptance level is considered "unacceptable." A score between 51 and 71 is considered "marginally acceptable."
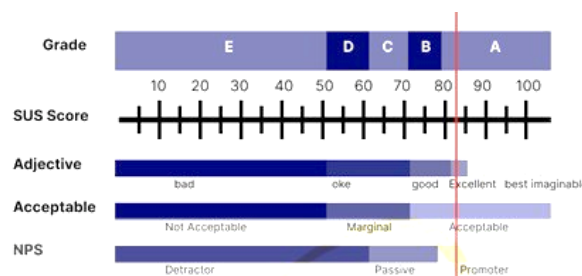

Figure 1. Scale Graph of SUS Testing Results User Display

Based on the data above, it can be concluded that the design prototype received a grade of A, where the admin appearance was included in the best imaginable predicate and the customer appearance was included in the excellent predicate, and both were acceptable to respondents.

4. CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that this research produces an interface design that suits user needs and is acceptable. The Task Centered System Design (TCSD) method used in this research is able to map user task requirements in designing the website by paying attention to what tasks are needed. At the identification stage, an analysis of the needs of all tasks is carried out and all the required tasks are obtained from the results of interviews, literature studies, observations and benchmarking which are described in user personas, pain points and task analysis. Then, at the requirements stage, a review is carried out by creating a table of tasks, user tasks, page results, and required features. Then the design plans and concept ideas are defined in the third stage, namely design as scenario, where at this stage the wireframe begins to be drawn and the design results are in the form of mockups and prototypes. Then, in the final stage, namely walkthrough evaluation, an evaluation is carried out using a cognitive walkthrough for the inspection method and a system usability scale to test the usability of the interface design that has been designed. At the evaluation stage, using a cognitive walkthrough with 4 respondents referring to the learnability, effectiveness, and efficiency aspects, the result was a score of 100% on the admin display and 95% on the donor display for the learnability and effectiveness aspects, which were in the very good category, and for the efficiency aspect. The results obtained were 0.07605 goals per second for the admin display and 0.100012947 goals per second for the donor display, both of which were in the very fast category. Then, in the SUS test using 50 respondents and providing a task scenario to carry out interactions with the prototype that the author has designed, it produces a SUS value of 84.15 for the admin display and 83 for the donor display, both of which are in grade A with the adjective values "best imaginable" for the admin display and "excellent" for the donor display, which means the interface design can be well received by potential users.

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