Building a Mobile Reporting Dashboard System Based

by Reonal Regen

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Building a Mobile Reporting Dashboard System based on Android using Web Service Restful for Congregation data

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Abstract : The development of the Church is increasingly growing marked by the increasing number of people who attend the church. The church needs to utilize technology in paying attention to spiritual growth in existing congregations. But to do that, there needs to be a system that can see data that is well visualized and can be used by the church. It is not easy to visualize data manually so a practical and portable system is needed. The purpose of this study is as a material consideration in seeing the development of the Church in the Church and improve efficiency without having to use a computer. The process of gathering congregational data comes from the data warehouse of the Indonesian Christian Church Synod in the Central Java Region which is obtained from the Church Information System called SISWA which is local in every church. The interface design process is also carried out using User Centered Design which is centered on the user. This system will be designed using Restful web Service which has better capabilities than other web services. By building this system, it can facilitate the church in seeing the development of the church and can be taken into consideration in making decisions by the church.

Keywords: Dashboard, Android Dashboard, Web Service, Restful, User Centered Design, Reporting, Mobile Reporting

1. Introduction

The church is a place for Christians to worship. Over the years, the number of people attending church services has always increased. With that, the Church must have congregational data. Indonesian Christian Church already has a desktop-based program to record Church and Church data such as congregations, sympathizers / non-congregants, baptism, worshipers, priests, elders, administrators, commissions, region and worship activities such as meetings and services. To be able to see the spiritual growth of each church congregation, it is necessary to utilize existing information technology even though the number of congregations continues to grow, the church must still be able to pay attention to the congregation one by one.

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Therefore, the need of a portable system that can monitor the development of congregations in a Church, namely by using the Android-based Mobile Reporting Dashboard system.

There are several ways that can be implemented in the Android system, as Progressive Web Application, Hybrid and Native. Progressive Web Application involves HTML, JavaScript and CSS. Hybrid is a special category of web applications that extends the web-based application environment through the use of native platform APIs that are available on certain devices [7]. Native is the development of applications that are made in accordance with certain platforms which require platform features such as Contacts, Calendar, GPS and so on. In making this system, using Native because Native runs the application directly without going through certain layers which will produce maximum performance, offering the best graphics and animation on the platform [5].

This Reporting System will be designed using the RESTful API web service considered capable of retrieving data. RESTful 3 is an implementation of the API (Application Programming Interface). REST (Representational State Transfer) is an architecture of communication methods that uses the HTTP protocol for data exchange and this method is often applied in application development. Where the aim is to make the system designed to have good performance, fast and easy to develop (scale), especially in the exchange and communication of data [6]. After getting the congregation data using the Restful API it will be applied to the Android-based Mobile system. The data to be obtained is used for Android-based Mobile Reporting Dashboard.2.

2. Literature Review

The method used in this study uses a web service that is restful and User Centered Design that is used to design the system interface.

2.1 Android

Android is the name of the operating system used on many smart phones and tablets. Owned and managed by Google. Google bought Android in 2005 and launched it for cellphones and tablets in 2007, in the same year Apple released the first iPhone. This Android system dominates the market by 88% in the second quarter of 2018. This Operating System is open source which allows changing the operating system code and no license fees. The very large spread of Android caused this system to be built based on Android.

2.2. Web Service

Web Service is a technology that is widely used to exchange data between applications and the scope of their use has expanded even more in recent years [12]. Web Service is also a software module that is designed to perform a specific set of tasks. Web Service can be searched through the network and can also be called accordingly. When called Web Service will be able to provide functionality to clients who call the Web Service.

Web Service uses the XM messaging system. XML is used for communication to the Web Service. For example, the Client invokes the Web Service by sending an XML message, then waits for the appropriate XML response. Because all communications are in XML, Web Services are not tied to one operating system or for example in the Java programming language can talk to Perl and Windows Applications can talk to Unix applications.

1) Web Service Architecture: In Web Service, there is an architecture that consists of three different roles and can be seen in re 1:

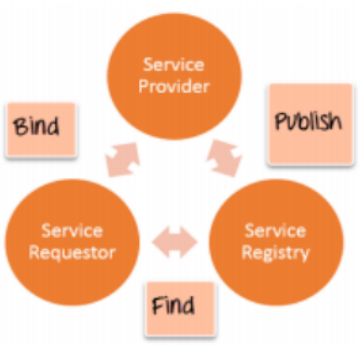

Fig. 1. Architecture on the Web Service

The following explanation of the web service architecture in Fig 1 [9]:

1. Service Provider Service Providers function to distribute the system through public networks.
2. Service Requestor Service Requestor is needed in detecting a service needed to obtain information.
3. Service Registry Serves to provide services / services and process a registry so that these services can be available to users.

10 Following is the explanation of Interaction between architectures as shown in Fig 2.5:

1. The Publish Service Provider informs the Service Registry of the existence of the Web Service by using the publish Service Registry interface to make services accessible to users.
2. Find Service Requestor consult with the Service Registry to find the published web service
3. Bind With information obtained from the Service Registry about the Web Service, the applicant can bind, or request a Web Service

2.3. Restful Web Service

REST is a set of coordinated architectural constraints that seek to minimize latency and network communication while at the same time maximizing the independence and scalability of component implementation [4].

Four properties in the RESTful service system are uniform interface, addressability, statelessness, and connectedness. In the RESTful Web service, this property is manifested in resources, URIs, representations, and links between these properties [9].

This basic REST principle of design establishes a one-to-one mapping between creating, reading, updating, and deleting (CRUD) operations and HTTP methods. Following are the methods that support REST:

1. GET is used to get data that only needs to be read only. Examples: GET / id Congregation: Returns the Congregation list. GET / CommunityID / 123: Returns community ID data with ID 123.
2. PUT, to be used to create new data. Here's an example: PUT / idCongregation/ 123: Creating a new Congregation data with ID 123
3. DELETE, to delete a data. Following Examples: DELETE / idChurch / 123: Delete the data of the church id with ID 123.
4. POST, to update a data. Following Examples: POST / idChurch / 123: Update user data with ID 123.

2.4. Dashboard

In general, a Dashboard is a collection of data (production data, financial data, etc.) displayed in a graphical layout (graph or chart). Dashboards are used to measure levels of achievement, simplify and centralize information, save time, make adjustments to determine policies, or a number of other types of analysis. The Dashboard concept has evolved from one reporting screen display to include an interactive interface with several views and goals, including communication, learning, and motivation, in addition to the classic Dashboard allowance which is about monitoring and decision support [1].

In the journal "How to build sustainable and useful Dashboards to support software development and maintenance", the Dashboard selection model consists of seven categories that describe the seven aspects of Dashboard [11] such as

1. Dashboard Types Determine what kind of visualization is needed. Many Dashboards are used as reports where stakeholders enter data and require flexibility of format while some require strictly pre-defined visualization with the same structure for each update - alternatives set as Dashboards.
2. Data acquisition Defines how data is entered into the tool. In general stakeholders / employees can enter data into the tool / manual or they can have data imported from another system / automatically. The selection of the previous dashboard for visualization is quite often correlated with automatic data selection.
3. Stakeholder Defines the type of Stakeholder for the Dashboard. Dashboards used as so-called information radiators often have entire groups as stakeholders, for example the project team. However, many Dashboards designed to support decisions often have an individual stakeholder who can represent a group.
4. Delivery Defines how data is given to stakeholder. On the one hand information can be conveyed to as a Stakeholder in a form such as e-mail or MS Sidebar gadget or on the other hand it can be taken, which requires as a Stakeholder, to actively seek information in the form of a dedicated opening link and look for information symbolized as taken.
5. Up-to-Date Determines how often data is updated. One alternative is to update data regularly, for example every night with the advantages of synchronized data but with disadvantages that are not Up-to-Date.
6. Navigate Determine what goals must be met by the Dashboard. One alternative is to use the Dashboard to spread information widely. Another option is to design a Dashboard for certain types of mind decisions, for example release readiness.
7. Data flow Defines how much data processing is done in the Dashboard. One alternative is to visualize raw data which means to add interpretation by applying model analysis and thereby visualizing indicators.

2.4.1. Dashboard Types: Here are Dashboard types:

1. Reporting Dashboard: This is a partnership between the Strategic Dashboard and Analytical Dashboard that has business information that is usually in a visual format and focuses on metrics and risks, report users are more likely to read it regularly and initiate actions or ask questions according to Fig 2 [3]. This causes Dashboard Reporting to be very fitting in implementing Church Data because there are several Department data and Churches have targets that must be met

ting Dashboard

2. Operational Dashboard: Measuring the effectiveness of short-term and Dashboard used by operational employees who are used to control the company as shown in Fig 3.

Fig. 3. Operational Dashboard

3. Analytical Dashboard: This dashboard is used to monitor the performance of several departments or data in the company as shown in Fig 4.

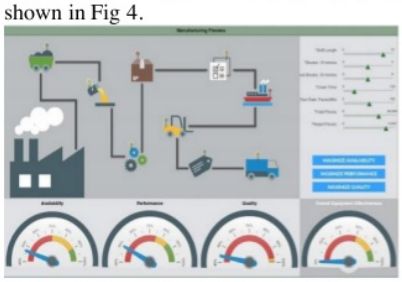

Fig. 4. Analytical Dashboards

4. Strategic Dashboard: This dashboard is used by high-ranking officials in a large company to see whether the company is running in accordance with the targets set as shown in Fig 5

Fig. 5. Strategic Dashboards

2.5. *User Interface for Mobile Dashboard*

The User Interface Dashboard based on Mobile is very different from the Desktop based. For example, your Desktop application might be designed to display reports freely because it has a large enough screen, while the Mobile application has a fairly limited screen.

The functionality, look, and feel for mobile and desktop applications must be different. For example, a Desktop-based Dashboard will have multiple tabs for various types of information displayed, while a Mobile-based Dashboard will have a chart that contains a summary showing the data obtained.

When designing a Mobile-based Dashboard, there are a number of considerations as follows:

1. Dashboard visualization should look attractive regardless of the Mobile device (for example Screen size and function). Even input must be friendly to every mobile so users can access, interact with, and modify visualization easily on small screens or large screens.
2. Mobile devices are constantly changing in terms of devices, operating systems, and support for various types of content.
3. Developing Mobile applications that comply with web standards such as XML and HTML5 and working on various platforms users can make or break Dashboard designs.

2.6. *Mobile Reporting*

Mobile Reporting is an increasing trend in organizations considering the modernization and accessibility of information. The main challenge in reporting data on mobile devices is various platforms such as iOS, Android, Windows, etc. And various devices such as tablets and mobile phones of various sizes. When it comes to Mobile Reporting on cellular, another challenge is using the right visualization that can be used on a limited screen size from a mobile device. The design of data visualization remains a priority for cellular reporting because it sees and analyzes a lot of very large transactional data because on a mobile screen it is very uncomfortable to see.

2.7. *User Interface for Mobile Dashboard*

User Centered Design is a broad term to describe the design process that affects the end user how the design is formed [2]. The concept in the User Centered Design process is that users are involved one way or another. For example, some types of UCD consultations users about their needs and involve them at certain times during the typical design process during requirements collection and usability testing [2].

According to Rauterberg [10], there are 3 principles needed in designing using User Center Design such as:

1. Knowing the User, the way to find out the user's needs is to understand what the user intends to intend. The user-centered approach assumes that although people vary greatly, they all have special needs that must be met.
2. Involve Users Early and Continuously, users must be involved as early as possible in the design process. Users contribute to the initial effort to gather information by means

of observation, questionnaires, focus groups and interviews, or through a more detailed task analysis. The designer will build models from the user's domain and set priorities for tasks and relationships. Users may not be good at understanding requirements, describing or predicting their own behavior, therefore, field observations of user behavior are often the most effective.

3. Fast and Frequent Iterations Towards Measurable Usability Targets, the key to engaging users is to take an iterative approach. Each iteration is an opportunity to bring real users and evaluate various aspects of the product that continues to grow.

In a journal entitled User Centered Design written by Nomadic Media company, there are 5 steps that must be taken in implementing User Centered Design [8] such as:

1. Determine the user's needs and the context of application use, meet the same user / task objectives, to identify the design of good features that can be incorporated into a new system or the possibility of a bad design that should be avoided. Some ways to find out users are Interview, Observation, Literature Study, Brainstorming or sorting cards that contain features or design examples.

2. Visualize design ideas, illustrate the design solutions obtained from the initial phase of design allowing designers to communicate more effectively with users and reduce the need and cost of rework later. Potential design solutions must be based on collected initial user requirements. Generic human factors and ergonomic design guidelines and standards must also be used. Some methods are Match-stick Man Visualization technique (MMV), Use cases, Storyboarding, Multimedia based visualization, and Sketches

3. Perform user evaluations of design ideas, after the context-usage information has been collected, the design team can develop one or more ideas (or system concepts) for a new system. It would be better if you develop and compare several concepts. The most feasible concept is then brought forward as part of the user requirements specification. Some of the methods used are Focus Groups, Group Discussions, Brainstroming and Interviews

4. Create a concept and prototype is a representation of all or part of the product or system which, although limited in several ways, can be used for evaluation. In a user-centered design approach, prototypes are not only demonstrations to show users a preview of the design, but they are developed to collect user feedback which is then used to drive the design process. A Prototype can be as simple as a pencil and paper sketch or as complex as a computer-based simulation.

5. Evaluation of concepts and prototypes, a solution of a design is an important step of user-centered design and must be done at all stages in the User Centered Design cycle. Therefore, evaluation of design solutions must begin early in the development life cycle to iteratively improve design. An evaluation must also be carried out to validate the user and the organization's objectives have been met, that is when deciding when the system is 'good for users'. Some ways for evaluation are Heuristic Evaluation, Cognitive Walkthrough, Laboratory usability testing and Field Trials.

3. Research Method

This research uses restful web service and user centered design to create and test designs that are designed on this system.

3.1. Web Service

The Web Service function that will be created will be called when called by android. On the server side, it will use Laravel Web Service. On the Android side, it will use the Retrofit library as a Web Service call. All functions used in this system only use the Get function. The functions that will be implemented are 4 main functions as follows:

1. Reporting Function: The function will display data such as the current amount, the previous amount, the difference amount and the percentage difference in form. This reporting is static which has been determined from the start. This function is used to display the main menu such as in Presence, Organization and Growth. On the Attendance menu there is reporting on the attendance of the Fellowship and Conventions and Activities. The Organization menu displays Pastors, Elders and Service Agencies (Commissions and Activity Managers). The Growth menu displays Investigators, Churches, Baptists, Attestations, Areas and Church Details (Occupational and Ethnic Education).

2. Dynamic Reporting Function: The function will display dynamic data according to what is in the data warehouse that displays data such as the current amount, the previous amount, the amount of the difference and the amount of the difference in percent form. The results displayed will be dynamic depending on the data contained in the data warehouse. This function is used to display the Reporting List of devotions on the reporting menu of the Fellowship and Devotional List and to display a list of activities on the Activity Reporting menu on the Attendance menu.

3. Year based Chart: The function will display a dynamic chart in accordance with the year in the data warehouse that displays data such as the specifics of detail that will be on every user clicking on a reporting

4. Date based Chart: The function will display a dynamic chart in accordance with the date in the respective table in each table contained in the warehouse that displays data in the form of gender, membership and assembly. In this function it will send the date parameter to the data warehouse. This function is used in Fellowship and Assembly and Activities.

3.2. Interface Design

The User Centered Design process is based on ISO 13407: 1999 as shown in Fig 6

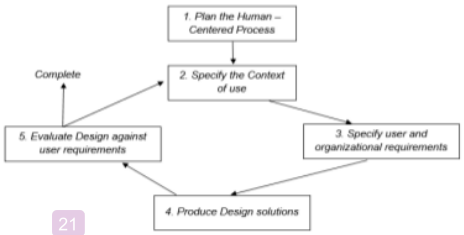

Fig. 6. User Centered Design Process Based on ISO 13407: 199

Following is an explanation of the stages of the User-Centered Design method based on ISO 13407: 1999 in Fig 3.24:

1. Plan the Human - Centered Process
   At this stage, planning is carried out for meetings with users.
2. Specify the Context of use
   Design a system that can understand and determine the user's context. To form a new system, it is very important if information about the context is obtained through interviews or meetings. This study determines the user of this application is the Church Secretariat that processes the data and the data is reported to the Pastor, Church Assembly and Regional Synod.

3. Specify user and organizational requirements
   At this stage, determining the needs of users and the organization. The design process contains specific main activities, such as system function requirements. In this study, data collection was taken by questionnaire targeting the Church Secretariat. This study uses a closed and open question method questionnaire. Closed question is a method of questions for which answers have been provided by researchers while Open question is a method for questions users give answers according to their opinions freely.

4. Produce Design solutions
   At this stage a conclusion and solution can be drawn from the design produced. Drawing conclusions and solutions with the ranking scale method and produce what is desired by the user. After getting a conclusion and a solution, it will design an interface display in accordance with the questionnaire that has been done.

5. Evaluate Design against user requirements
   At this stage is the evaluation / testing phase of the design of the interface that has been designed. The purpose of evaluating / testing is to determine whether the application is designed in accordance with the needs and desires of the user and get user feedback. In testing, will be measured by the level of user success in completing a task.

In the role of interface design, the first step taken was to collect information carried out using the interview method in which the respondents consisted of 4 respondents, 2 respondents came from GKI Ngupasan Yogyakarta while 2 respondents came from GKI Wongsodirjan Yogyakarta. The following is a list of user needs obtained at the interview:

1. The application can be used comfortably by users who have minus eyes and emphasize color as one of the factors displaying reporting results.
2. Applications that can display congregational data that has been processed automatically.
3. The search feature will be used for large amounts of data based on interview results.

4. The application can display detailed information in a chart.
5. This application will make the chart viewed properly with portrait and landscape orientation.
6. This application uses a simple design that is understood by the user.

3.3. *First Interface Implementation:* In the implementation of this first interface, there are several icons used in this application for free and the icon can be downloaded via https://material.io/tools/icons and https://icons8.com. Each icon will represent data that will be displayed just like the pastor icon will display church organization data where the icon can be useful for the user so that it can be easily used by the user. The following list Table 1 contains a list of icons that will be used in this system.

Table 1
List of icons that will be used in this system.

No	*Icon*	As
1		Icon for Attendance Data on Worship / Fellowship and Activities
2		Organization Data menu icon
3		Community Growth menu icon
4		Settings menu icon
5		Icon to display search features based on image and name
6		Icon to display detailed information from a chart that is displayed
7		Icon used in reporting to indicate whether a data displayed in reporting has increased
8		Icon used in reporting to indicate whether a data displayed in reporting has decreased

This application consists of pages that display Reporting, Data in Chart form, Search page and detail information page. When the user opens the application, it will display the reporting and navigation contained below along with the icon that will facilitate the user in using the application and at the first display. In this application displays reporting in accordance with predetermined metrics in which the Attendance of the Church which according to respondents has the highest priority so that when opening the application, it will display the Reporting of Attendance Churches. The results of the implementation can be seen in Fig 7

Fig. 7. Initial appearance of the application

This application displays data in the form of charts. The Library Chart used in this application is the MPAndroid Chart developed by Phil Jay. The library can be seen at https://github.com/PhilJay/MPAndroidChart. All reporting shows the current temporary status that is displayed using the Year filter function that is displayed with Pie Chart so that the user can see the current condition in detail except for reporting the Details of the Jamaat Data, for example on reporting on the attendance of meetings and services can be seen in Fig 8 and for opening the Date filter chart function can be seen in Fig 9

Fig. 8. Year filter chart function displayed with Pie

Fig. 9. Button for Date filter Chart Function

This application supports Landscape and Potrait orientation because of the 3 respondents who chose Landscape, this application still supports Potrait. The portrait mode on the chart can be seen in Fig 10 and the Landscape mode on the chart can be seen in Fig. 11.

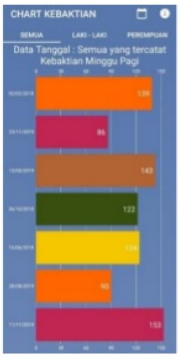

Fig. 10. Potrait mode on Chart

Fig. 11. Landscape mode on Chart

The application can display detailed information in a year chart filter function that can display data that cannot be displayed on a chart. This detailed information will only be on the date filter chart function for the attendance menu, because it needs to display a lot of data and is complex compared to the others. The chart will contain the Amount of Data displayed, the Amount of attendance based on gender and contains the information of a worship. Detailed information on functioning in portrait mode can be seen in Fig 12

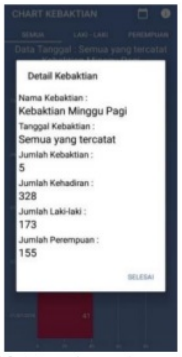

Fig. 12. Potrait mode on Detail

This application can display search features will be used for large amounts of data. Fields that can be filled in by the user are the name of Worship or Activity of a data and the date of implementation. The search feature can be seen in the portrait mode in Fig 13

Fig. 13. Potrait mode on Search Feature

3.4. *First Interface Evaluation:*

The first Interface Evaluation was carried out by 4 people who had followed the interview process to identify user needs. Each respondent will try and explore the application for 3 minutes and be accompanied. After trying and exploring the application the respondent is asked to complete the task that has been provided as follows:

1. Look at the worship / fellowship chart
2. Creating worship / fellowship filters January 1 - April 30
3. See detailed information from the worship / fellowship chart
4. Looking at the age of the church at the age of 35-39
5. See the Number of Commission Management
6. See the Number of Active Pastors
7. See the Number of Baptist Children

The results of discussion and observation of respondents during completing the seven tasks from the results of the evaluation of the first interface design can be seen in table 2

Table 2
First Evaluation Result

Respondent / Task	US-01	US-02	US-03	US-04
1	Succeed	Succeed	Succeed	Succeed
2	Succeed	Succeed	Succeed	Succeed, but confusion because there is no number of services displayed
3	Succeed	Succeed	Succeed	Succeed
4	Succeed	Succeed	Succeed	Succeed
5	Succeed	Succeed	Succeed	Succeed
6	Succeed	Succeed	Succeed	Succeed
7	Succeed	Succeed	Succeed	Succeed

There are suggestions from respondents at the time of the evaluation such as:

1. US-01: The existence of a meeting of men, women and children in a chart, show about the meeting of members, sympathizers and assemblies and the Management of activities and the Commission put together into a Service Agency
2. US-02: In detail the number of attendances is the average attendance
3. US-03: There are a number of churches in the region and add a logo to the reporting

3.5. *Second Interface Design:* The second interface design is based on the results of interviews and the first evaluation that has been done. This stage will explain the design implementation and evaluate the second interface design. There are several things that will be developed in this system, such as:

1. The male, female and child charts are displayed on a stacked chart
2. Replacing the contents of the menu with Gender, Membership and Assembly
3. Change the number of attendances to be average in the details of attendance of worship
4. Display the number of services / activities in detailed information
5. Increasing the number of churches based on the region.
6. The organizer of the activity and the Commission are united as a Service Agency
7. Adding some logos to reporting

3.6. *Implementation of the Second Interface:* In this second interface implementation, there are several icons used in this application for free and the icon can be downloaded via https://icons8.com. Each icon will represent the reporting data that will be displayed like the water icon will display the baptism reporting data which the respondent thinks the icon can be useful for the user to be easily seen by the user. The following list Table 3 contains a list of icons that will be added to reporting in this system.

Table 3
List of icons that will be used in this system.

No	*Icon*	As
1		Icon for Church Reporting
2		Icon for the Church Details menu
3		Icon for Baptist Reporting
4		Icon for the Region menu
5.		Icon for the Attestation menu
6		Icon for non Congregation Reporting
7		Icon for Pastor Reporting
8		Icon for Elder Reporting
9		Icon for Reporting Services Agency
10		Icon for Reporting List of Attendance and Service Attendance
11		Icon for Reporting List of Attendance Activities

There is an application design that has changed and added several features along with the evaluation results that have been done. Changes in the type of chart in the year chart filter function in the presence of fellowship and worship services and activities are considered important by respondents because to know the pattern of attendance based on gender, membership and assembly. The chart used is a Stacked Chart that can display a lot of data in a limited place. The results of the application design add to portrait orientation sympathizers can be seen in Fig 14.

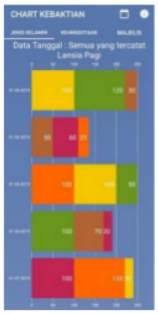

Fig. 14. Chart improvement results in Potrait mode

At the time of the first evaluation, respondents provided input on details of the service where respondents felt that they needed an average attendance more than the total number because the average could see a summary chart in quick and easy time. The result of the mode improvement and portrait mode in Fig 15.

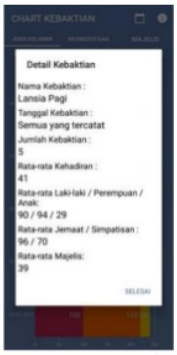

Fig. 15. Chart improvement results in Potrait mode

This application adds a menu that counts the number of congregations based on the area determined by the Church. In this case, the church area is very large, so an entry menu is placed on Growth with the name of the Church Region as shown in Fig 16 to display the contents of the area dynamically as shown in Fig 17.

Fig. 16. Entry menu for the Church Region

Fig. 17. Reporting Region

This application combines reporting, namely the Commission Management and Activity Management into one reporting into reporting Services Agency. Respondents stated that it would be easier to see the commission management and activity management as a reporting service agency. Reporting that has not changed can be seen in Fig 18 and Reporting in accordance with the advice of respondents in Fig 19

Fig. 18. Reporting the Number of Commission Management and Activity Management

Fig. 19. Reporting Number of Services Agency

This application also adds several reporting icons which become an input from respondents which users will find easier to use. The icon is placed to the left of the reporting title. Examples of the results of the implementation of the icon in reporting can be seen in Fig 20 and the results of the implementation of the icon on the menu can be seen in Fig 21.

Fig. 20. Example of Implementation of icons on reporting

Fig. 21. Example of Implementing icons on the menu

3.7. Evaluation of the Second Interface: The second Interface Evaluation was carried out by 4 people who had followed the interview process to identify user needs. Each respondent will try and explore the application for 3 minutes and be accompanied. After trying and exploring the application the respondent is asked to complete the task that has been provided as follows:

1. Look at the worship / fellowship chart
2. Creating a worship / fellowship filter 30 October 2018 - 28 February 2019
3. See the average attendance of children in detailed information from the worship / fellowship chart
4. See the Number of Administrators of women's activities
5. See the amount of attest entered male
6. See the number of Elders under 40 years
7. See the Number of Baptist Sidi women
8. See the number of member in the Sagan area
9. Seeing Elder Men

The results of discussions and observations of respondents during completing the seven tasks from the evaluation results of the second interface design can be seen in table 4

Table 4
Second Evaluation Results

Respondent / Task	US-01	US-02	US-03	US-04
1	Succeed	Succeed	Succeed	Succeed
2	Succeed	Succeed	Succeed	Succeed
3	Succeed	Succeed	Succeed	Succeed
4	Succeed	Succeed	Succeed	Succeed
5	Succeed	Succeed	Succeed	Succeed
6	Succeed	Succeed	Succeed	Succeed
7	Succeed	Succeed	Succeed	Succeed
8	Succeed	Succeed	Succeed	Succeed
9	Succeed	Succeed	Succeed	Succeed

There are suggestions from respondents at the time of the evaluation, such as:

1. US-01: Increases the age of the church in regional reporting and regional reporting can be filtered
2. US-03: On the chart, add a description of a male or female based on color, the writing navigation buttons are always displayed and replace the icons on the navigation
3. US-04: Deleting the words dashboard congregation details into church details

4. Result and Discussion

4.1. Web Service Implementation

The implementation of Web Service on the android system, on the server side, will use the Laravel Web Service. On the Android side, it will use the Retrofit library as a Web Service call. All functions used in this system only use the Get function. This system will send a URL to the server. The URL is in the form of Server IP, Church Code and the requested web service function. The church code is obtained from the session login.

Every time you make a request, you will have an "Authorization" header that will be used to store the generated token that will perform Basic Authentication every time you call the request. Basic Authentication will ask for a username and password that will use the email as the username and the token obtained by Auth0 will be used as the password. Following are the results of the implementation of 4 web service functions:

4.2. *Reporting :*

This system will display several reporting menus that have 3 namely Attendance, Organization and Growth. This report will display the number of present, previous and difference in increase or decrease. The function of sending requests in Fig 22 and Funsgi query in reporting in Fig 23.

```
private void getReportingKehadiran(){
Retrofit retrofit = new Retrofit.Builder()
            .baseUrl(getString(R.string.ip) + kode + "/")
            .addConverterFactory(GsonConverterFactory.create())
            .build();
String base = email + ":" + password;
String getToken = "Basic "+Base64.encodeToString(base.getBytes(),Base64.NO_WRAP);
JsonPlaceHolderApi jsonPlaceHolderApi = retrofit.create(JsonPlaceHolderApi.class);
Call<List<Kehadiran>> call = jsonPlaceHolderApi.getReportingKehadiran(getToken);
```

Fig. 22. Sending reporting requests

Fig. 23. Query function on reporting

In Fig 24 the left is the attendance reporting menu, in the middle picture 24 is the organization's reporting menu and in the right picture 24 is the growth reporting menu.

Fig. 24. Results implemented in the interface system on reporting

4.3. *Dynamic Reporting:*

This system will display several reports such as Worship and Activities according to the amount contained in the data warehouse that is different from the usual reporting which has been set statically. This report will display the number of present, previous

and difference in increase or decrease. The queries on Fig 25 function and the function of queries on reporting on Fig 26.

```
private void getFilterKebaktian(Date awal, Date akhir, String nama){

    putNama = nama;
    putAwal = new SimpleDateFormat("yyyy-MM-dd").format(awal);
    putAkhir = new SimpleDateFormat("yyyy-MM-dd").format(akhir);

    Retrofit retrofit = new Retrofit.Builder()
            .baseUrl(getString(R.string.ip)+kode+"/")
            .addConverterFactory(GsonConverterFactory.create())
            .build();

String base = email + ":" + password;
String getToken = "Basic "+Base64.encodeToString(base.getBytes(), Base64.NO_WRAP);

JsonPlaceHolderApi jsonPlaceHolderApi = retrofit.create(JsonPlaceHolderApi.class);
Call<List<Kehadiran>> call =
jsonPlaceHolderApi.getKebaktianGenderFilter(getToken,nama,putAwal,putAkhir);
```

Fig. 25. Sending Request on dynamic reporting

```
public function daftarkebaktian($kode)
{
  $daftar = DB::table('dim_kebaktian')
  ->selectRaw("nama_kebaktian,
      round(AVG(case when dim_waktu.year = date_part('year', CURRENT_DATE) then fact_kehadiran.jumlah_lemaat
        + fact_kehadiran.jumlah_majelis + fact_kehadiran.jumlah_simpatisan end)) as sekarang,
      round(AVG(case when dim_waktu.year = date_part('year', CURRENT_DATE)-1 then fact_kehadiran.jumlah_lemaat
      + fact_kehadiran.jumlah_majelis + fact_kehadiran.jumlah_simpatisan end)) as dulu")
  ->join('fact_kehadiran', 'fact_kehadiran.dim_kebaktian_id', '=', 'dim_kebaktian.dim_id')
  ->join('dim_waktu', 'fact_kehadiran.dim_waktu_id','=','dim_waktu.dim_id')
  ->join('dim_bideng', 'dim_kebaktian.dim_bideng_id','=','dim_bideng.dim_id')
  ->join('dim_gereja', 'dim_bideng.dim_gereja_id','=','dim_gereja.dim_id')
  ->where('dim_gereja.kode_gereja', '=', $kode)
  ->whereRaw('dim_kebaktian.date_to = (select MAX(date_to) from dim_kebaktian)')
  ->groupBy("nama_kebaktian");

  $daftarkebaktian = DB::table('dim_kebaktian')
    ->selectRaw("nama_kebaktian,
      round(AVG(case when dim_waktu.year = date_part('year', CURRENT_DATE) then fact_kehadiran.jumlah_lemaat
        + fact_kehadiran.jumlah_majelis + fact_kehadiran.jumlah_simpatisan end)) as sekarang,
      round(AVG(case when dim_waktu.year = date_part('year', CURRENT_DATE)-1 then fact_kehadiran.jumlah_lemaat
      + fact_kehadiran.jumlah_majelis + fact_kehadiran.jumlah_simpatisan end)) as dulu")
    ->join('fact_kehadiran', 'fact_kehadiran.dim_kebaktian_id', '=', 'dim_kebaktian.dim_id')
    ->join('dim_waktu', 'fact_kehadiran.dim_waktu_id','=','dim_waktu.dim_id')
    ->join('dim_komisi', 'dim_komisi_id', '=', 'dim_komisi.dim_id')
    ->join('dim_bideng', 'dim_komisi.dim_bideng_id','=','dim_bideng.dim_id')
    ->join('dim_gereja', 'dim_bideng.dim_gereja_id','=','dim_gereja.dim_id')
    ->where('dim_gereja.kode_gereja', '=', $kode)
    ->whereRaw('dim_kebaktian.date_to = (select MAX(date_to) from dim_kebaktian)')
    ->groupBy("nama_kebaktian")
    ->union($daftar)
    ->get();

  return response()->json($daftarkebaktian);
}
```

Fig. 26. Query function on dynamic reporting

After sending a request and getting data, the following results are implemented in the system interface. In Fig 27 the left is the attendance reporting menu and in the picture 27 the right is the growth reporting menu.

Fig. 27. Results implemented on the interface system on dynamic reporting

4.4. *Year based Chart :*

This system can display charts using filters but this function is used when the user enters one of the reporting menus and will display the year filter chart in the form of a pie chart. This year's filter chart will display the amount of data adjusted for the year. The request sending function in Fig 28 and the Request function on reporting in Fig 29.

```
private void getPenatuaOverview(String tahun){
    Retrofit retrofit = new Retrofit.Builder()
            .baseUrl(getString(R.string.ip)+kode+"/")
            .addConverterFactory(GsonConverterFactory.create())
            .build();

String base = email + ":" + password;
String getToken = "Basic "+Base64.encodeToString(base.getBytes(), Base64.NO_WRAP);
JsonPlaceHolderApi jsonPlaceHolderApi = retrofit.create(JsonPlaceHolderApi.class);
Call<List<Penatua>> call = jsonPlaceHolderApi.getPenatua(getToken,tahun);
```

Fig. 28. Sending Request on the Year Filter Chart

Fig. 29. Query Function in the Year Filter Chart

In Fig 30, the left is the Elder and the Service Agency while the middle and right are the center and the right is the Activity Manager.

Fig. 30. Results implemented in the interface system on the year filter chart

4.5. *Date based Chart :*

This system can display charts by using a filter but this function is used when the user is on the year filter chart and presses the bottom button to display the graph on a date The functions of sending requests in Fig 31 and Fung queries on reporting in Fig 32.

```
private void getPendidikanOverview(String tahun){
    Retrofit retrofit = new Retrofit.Builder()
            .baseUrl(getString(R.string.ip)+kode+"/")
            .addConverterFactory(GsonConverterFactory.create())
            .build();

String base = email + ":" + password;
String getToken = "Basic "+Base64.encodeToString(base.getBytes(), Base64.NO_WRAP);
JsonPlaceHolderApi jsonPlaceHolderApi = retrofit.create(JsonPlaceHolderApi.class);
Call<List<Pendidikan>> call = jsonPlaceHolderApi.getPendidikan(getToken,tahun);
```

Fig. 31. Sending Request on the Date Filter Chart

Fig. 32. Query function on date filter charts

The results of the implementation on the interface can be seen in Fig 33, which is left is an investigator and the right is a church.

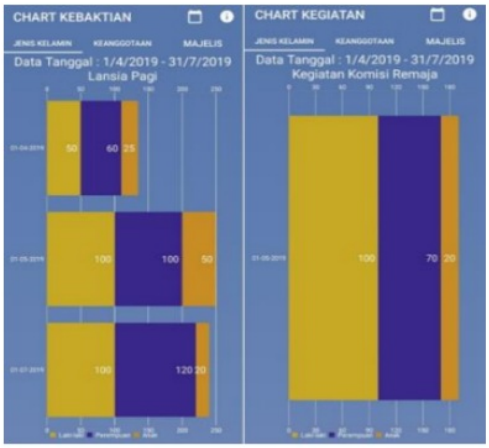

Fig. 33. Results implemented in the system interface on the date filter chart

4.6. *Final Interface Design*

The design of the final interface is based on the results of interviews and second evaluations that have been carried out. In the final interface design, there will be some that will be developed in this system, such as:

1. Always show text on the Navigation buttons
2. Change the icon on the navigation
3. Add a church age category to the region
4. Add information based on color on each chart
5. Erase the words dashboard of church details into church details

4.7. *Final Interface Implementation :*

In this final interface implementation, there are several icons used in this application for free and the icon can be downloaded via https://icons8.com. Each icon will represent each navigation on the menu and reporting area in this application. The following list Table 5 contains a list of icons that will be added to reporting in this system.

Table 5
List of icons that will be used in this system.

No	*Icon*	As
1		Icon for Navigation of Church Presence Data
2		Icon for Organizational Data Navigation
3		Icon to Navigate Church Growth Data

In Fig 34 is the result before the improvement and the results of navigation design improvements in accordance with the results of the interview and evaluation contained in Fig 35 which where the Attendance menu has an icon that resembles more clearly than before, the Organization menu also has an icon that has many people because it is identical to an organization, and the growth menu has a chart icon that always grows and develops.

Fig. 34. Navigate before repairing

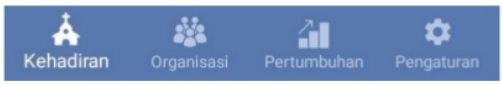

Fig. 35. Navigation after repairing

In the second evaluation, the church area received a suggestion to add the number of congregations based on age categories according to the reporting of each Indonesian Christian Church, namely Children (0-14 years), Youth (15-18), Youth (19-35), Adults (36-60) and Elderly / Elderly (> 61) and can display data that can be filtered annually can be seen in Fig 36

Fig. 36. The region displays the age category and filter data per year

On all charts there was a change, in which respondents claimed to feel confused, especially when respondents looked at the stacked chart to find out which male or female can be seen in Fig 37 in the left portrait. The chart design has changed by

entering a male or female mark according to the color shown in picture 37 in the right portrait.

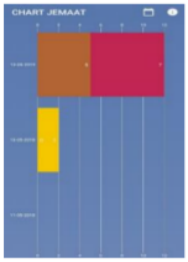

Fig. 37. Chart before and after experiencing changes to the portrait

There is a change of sentence in a reporting menu that is the Church Details Dashboard in Fig 38 where there are respondents who feel the word and the sentence is changed to Church Details in Fig 39.

Fig. 38. Reporting menu before changing

Fig. 39. Reporting menu after changing

4.8. *Final Interface Evaluation :* The second Interface Evaluation was carried out by 4 people who had followed the interview process to identify user needs. Evaluation at this stage will focus more on usability testing. In usability testing, it will be measured only by means of success rates such as Task on Time. There are 9 tasks that are used to evaluate as follows:

1. Create a search filter for worship services / fellowship services Sunday morning on September 1, 2018 to March 31, 2019. The predicted time is 1 minute 45 seconds.
2. See the average congregation and investigators in the detailed information contained in the worship / fellowship chart. The predicted time is 10 seconds.
3. See the Number of Activity Managers over 60 years. Predicted time for 20 seconds
4. Looking at the age of the male congregation at the age of 30-34. Predicted time for 20 seconds.
5. See the Number of Elder Women. Predicted time for 20 seconds. Predicted time for 20 seconds.
6. See the Number of Adult Male Baptists. Predicted time for 20 seconds.
7. See the number of elderly church members in the Sagan Region. Predicted time for 20 seconds.
8. See the number of male church members. Predicted time for 20 seconds.
9. See the number of attestation out of women. Predicted time for 20 seconds.

There is a summary of the results of the evaluation table based on the time of each respondent and the average of each task. The results of the evaluation based on time can be seen in table 6.

Table 6
The results of the evaluation are time-based (second)

Respondent ***Task***	**US-01**	**US-02**	**US-03**	**US-04**	**Average**
***Task* 1**	83	60	113	105	90
***Task* 2**	7	5	5	5	5,5
***Task* 3**	6	7	6	8	6,75
***Task* 4**	12	17	9	8	11,5
***Task* 5**	22	16	30	19	21,75
***Task* 6**	8	5	12	7	8
***Task* 7**	7	9	11	8	7
***Task* 8**	3	3	5	4	3,75
***Task* 9**	9	6	5	10	7,5

There is a summary table of evaluation results based on the type of success for each respondent and the average of each task. In the summary results table is represented by a number where 0 which means the respondent succeeded without help and the right time, 1 which means the respondent succeeded but passed the estimated time and 2 which means the respondent succeeded but with help. The results of the evaluation based on time can be seen in table 7.

Table 7
The results of the evaluation summary are based on the type of success

Respondent ***Task***	**US-01**	**US-02**	**US-03**	**US-04**
***Task* 1**	0	0	0	0
***Task* 2**	0	0	0	0
***Task* 3**	0	0	0	0
***Task* 4**	0	0	0	0
***Task* 5**	0	2	1	0
***Task* 6**	0	0	1	0
***Task* 7**	0	0	1	0
***Task* 8**	0	0	0	0

Task 9	0	0	0	0

5. Conclusion

Based on the system design carried out, there are several conclusions obtained as follows:

1. Based on the results of the implementation of a restful Web Service using congregational data on an android device capable of being implemented and running well for the mobile reporting dashboard.
2. Evaluation results that have been done show that the interface design process using the User Centered Design method can accept respondents' input which can improve the performance of respondents in using this system. In the evaluation that the respondent has failed only once where the respondent was assisted and three times the respondent succeeded but passed the specified time and after that, the respondent can run the system with the task and time specified

6. References

[1] Alper Sarikaya, M. C. (2018). What Do We Talk About When We Talk About Dashboards? IEEE Transactions on Visualization and Computer Graphics, [Online]. page 1–11. Available on: https://research.tableau.com/sites/default/files/DashboardsConspiracy_final.pdf

[2] Chadia Abras, D. M.-K. (2004). User-Centered Design. Encyclopedia of Human-Computer Interaction, [Online]. page 1–14. Available on: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.94.381&rep=rep1&type=pdff

[3] CPA Australia, "Dashboard reporting. A guide to improving management," first edition, CPA Australia Ltd, 2011, page 1–4.

[4] Fielding, R. T, "Architectural Styles and the Design of Network-based Software Architectures," dissertation Doctor of Philosophy, Majors Information and Computer Science, University of California, Oakland, United States, 2000.

[5] Ketan Anant More, M. C. (2015). Scientific Journal Impact Factor. Native Vs Hybrid Apps, [Online]. page 563 - 572. Available: https://ijcter.com/papers/volume-2/issue-6/native-apps-vs-hybrid-appsionic-titanium.pdf

[6] Makkonen, J., "Performance and usage comparison between REST and SOAP web services," dissertation Master's programme in Computer, Communication and Information Sciences, Majors Information and Computer Science, Aalto University, Helsinki, Finlandia, 2017.

[7] Nizamettin Gok, N. K., "Building Hybrid Android Apps with Java and JavaScript: Applying Native Device APIs, first edition, O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472, page 2-3.

[8] Nomadic Media. (November 2005). *User-Centred Design Guidelines for Methods and Tools*. (first edition) [Online]. Available: https://www.vtt.fi/inf/julkaisut/muut/2005/UCD_Guidelines.pdf

[9] Paul Adamczyk, P. H. (2011). REST and Web Services: In Theory and in Pratice. REST: From Research to Practice, [Online]. page 35–56. Available: https://www.researchgate.net/publication/265236489_REST_and_Web_Services_In_Theory_and_in_Practice

[10] Rauterberg, M. (1996). User Centered Design. USABILITY ENGINEERING METHODS AND TOOLS, [Online]. page 1–16. Available: https://www.researchgate.net/publication/220422205_Usability_Engineering_Methods_For_Software_Developers

[11] Staron, M. (February 2016). Dashboard development guide. How to build sustainable and useful dashboards to support software development. [Online]. Available: https://gupea.ub.gu.se/bitstream/2077/41120/1/gupea_2077_41120_1.pdf

[12] Thakare, A. R. (2018). International Research Journal of Engineering and Technology (IRJET). A Review On Performance Enhancement Of Web Services Using, [Online]. page 1177. Available: https://www.irjet.net/archives/V5/i3/IRJET-V5I3267.pdf

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