Data Visualization on Zakat Distribution Among UiTM Students in UiTM Selangor

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ARTICLE INFO	ABSTRACT
	Zakat, one of Islam's five pillars, plays a significant role in alleviating financial hardship, especially among Universiti Teknologi MARA (UiTM) students, many of whom come from low-income families. However, the current Zakat distribution faces challenges such as limited transparency and low awareness, hindering stakeholders' ability to make informed, data-driven decisions. This research addresses the issue by developing a Zakat distribution data visualization dashboard using Jupyter Notebook, MySQL, and Power BI. The system provides interactive visualization tools that highlight patterns, trends, and disparities in Zakat allocation, thereby enabling administrators, researchers, and the public to better understand its impact. By leveraging advanced analytics, the dashboard offers a user-friendly interface to explore complex data, enabling a deeper understanding of zakat distribution flows. The project utilizes the OSEMN framework and Agile methodology to ensure systematic data handling, analysis, and visualization. This initiative empowers zakat distribution with valuable insights, facilitating informed decision-making and resource allocation. To further optimize the dashboard, we suggest expanding its scope to include data from all UiTM campuses, enabling a comprehensive analysis of zakat distribution patterns in UiTM.

1. Introduction

Zakat is one of the five pillars of Islam. Its essence is to distribute a specified quantity of money, belonging to a particular form of wealth, to designated beneficiaries once that income reaches the minimum amount which is *nisab* for the duration of a lunar year [1]. Therefore, it is required of every Muslim who is able to pay *nisab. Nisab* is defined as the amount needed to meet a person's or family's basic necessities for a year [2]. Any or all of the following are considered basic needs such as food, clothes, shelter, healthcare, and transportation for oneself and one's dependents. Dependents include parents in need, spouses, and kids who can't support themselves. *Nisab* is seen as being comparable to a poverty line set by the government in many contemporary nations [1]. Zakat is part of the general understanding of *sadaqah*, which can be divided into two different concepts namely *sadaqah wājibah*, sometimes called mandatory alms, and *sadaqah mustahabah*, which is

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recommended alms or voluntary charity [3]. Institutions such as state religious groups and educational institutions manage the administration of zakat money in Malaysia.

As stated by Ayub *et al.,* [4], zakat distribution is one method used at UiTM to assist students who are struggling financially. Therefore, the UiTM zakat distributes to needy students each semester in an effort to ease their financial burden and enhance their academic performance. In any event, lack of awareness and understanding among the public and the beneficiaries about zakat distributions [5]. Besides that, the zakat distribution is a limited sight for stakeholders to make data driven decisions to optimize zakat distribution. According to the perception, it is not prepared to show zakat distribution among UiTM students since it requires a thorough comprehension of the information and an inventive framework.

This study aims to visualize the distribution of zakat among UiTM students. Generally, these visualizations will raise awareness among the beneficiaries and the public about zakat distributions. There are three (3) objectives for this study which are; first, to identify data and system requirements for data visualization of zakat distribution amongst UiTM students. The second objective is to design an interactive dashboard on data visualization of zakat distribution among UiTM students, and the third objective is to develop an interactive dashboard on visualizing zakat distribution among UiTM students. The scope for this study includes geographical context which University Teknologi MARA (UiTM) in Selangor only, technical context such as Jupyter Notebook, PowerBI and MySQL, task and temporal context which focus on the identifying patterns, trends, or inequalities in the distribution of zakat that came out in the bar chart, histogram and line chart, resource context which data source from UiTM ZAWAF organization and social context such as UiTM students, UiTM organization and researchers that are doing research.

The significant of this study can be seen to benefit the researchers on the visualization of zakat distribution amongst UiTM students in Selangor. It also highlights income disparities or other factors influencing zakat eligibility, helping researchers examine the fairness and equity of zakat distribution. This project can also give significance to the public. These can raise awareness among the beneficiaries and the public about the role and impact of zakat in supporting students' education. In the context of technologists, visualization helps convey information to decide on the ideal solution and allows them to act faster than if the data is presented as a report.

2. Literature Review
2.1 Introduction to Zakat

Zakat is an act of devotion [2]. Therefore, it is covered in Islamic law (fiqh) in the "Ibadat" chapter, which deals with acts of devotion [6]. It is also seen as a financial duty of Muslims to the sovereign State as it is the foundation of the Islamic physical and social welfare system [7]. As zakat is an obligatory payment that members of the Muslim community must make, its goal is to gather extra money from society's wealthier individuals and provide it to the underprivileged and needy [8]. Shikur & Maysyaroh [9] highlighted that the principles of zakat management are explained in Law No. 23. Described in the legislation, the Zakat Collection Unit is an entity founded by BAZNAS that aids in zakat collection. To regulate the principle of zakat management, Zakat Core Principle is applied. Zakat Core Principle aims to improve the quality of managing zakat which is compiled to take into account the specific conditions in each country. As stated by Punding *et al.,* [8], after the Prophet Muhammad passed away, Umar Al-Khattab, the second Caliph established zakat as an official institution. This tradition has endured to this day since it has been accepted worldwide. But in Malaysia, the State Islamic Religious Council (SIRC) has authority over matters relating to Islamic laws and customs which includes overseeing the administration and distributing zakat to the recipients.

2.1.1 Impact of Zakat Distributions

According to Suprayitno [10], zakat is a component that suggests changes in economics in many Muslim nations. Both at the macro and local levels of the economy, zakat has a wide definition. In the microeconomy, zakat can be crucial to distributing zakat to the receiver, but in the macroeconomy, it can be a tangible policy tool in a nation or the public sphere of Islam. Sumardi and Al-Azizah [11] highlighted that those significant financial implications of zakat include aggregate productivity, national saving, investment, and consumption. Based on research by Asiati and Nopriyansah [12], one common Islamic tool for influencing the well-being of a morally and socially upright community is zakat. By allocating resources from wealthy individuals to underprivileged communities, zakat maintains the social balance. Even for the Muslim community, which is the value owner of zakat, the size that is intended to be achieved was insufficient to motivate individuals to apply it. Al-Azizah *et al.,* [13] stated in their research, that humans are inherently greedy, and their need for much more financial riches is never satisfied. Also, zakat helps with students' education. According to the Academic Affairs' record, some students have not paid their tuition since their parents are extremely impoverished [4]. Students used their PTPTN loan to support their families with household expenses. According to their study's findings, majority of the students used their zakat funds to cover both education costs and daily expenses. Therefore, zakat funds benefit these students as the zakat money helps to fulfil the necessity of students' life.

It is challenging to monitor the money allocation when the zakat distribution procedure is not clear. Donors and recipients not getting the insights whether the money is getting to the right people. According to Tuan Mahmood et al., [14] research, an institution is considered inefficient regardless of how effective the system is if it is unable to satisfy the demands of the community, particularly those of the poor and needy. The effectiveness of zakat collection and distribution mainly depends on the good governance of zakat institutions to distribute aid to the right recipients according to specific aid, in the form of money. It will become quite challenging if the future growth of zakat institutions is unable to fulfill their responsibilities. Thus, will not accomplish the goals of *Maqasid Syariah*.

2.2 Big Data

Big data is defined as collection of data that cannot be captured, managed, and processed by conventional software tools within a specific time frame [15]. The characteristics of big data include volume, variety, velocity and veracity. The term of volume describes the scale of data, which has exponentially increased, posing a challenge to the capacity of existing storage devices [16]. The speed at which data is processed and evaluated is known as velocity, and it is essential for obtaining real-time insights from sources such as social media. Veracity is a big data feature that is associated with consistency, accuracy, quality, and trustworthiness.

2.3 Data Visualization

To effectively visualize zakat distribution amongst UiTM students, various data visualization tools can be employed. Tools such as Jupyter Notebook, Tableau and MySQL are selected for this study. The zakat distribution amongst UiTM students may be efficiently visualized using a variety of techniques, each of which offers a unique viewpoint and set of insights. Bar and column charts provide a simple means of comparing the year or categories, such as beneficiaries and donors. Dashboards provide a thorough and dynamic overview of the data, allowing users to drill down into

specific details and track trends in real-time. They accomplish this by combining several visualizations into a single interface.

2.4 Existing System

There are six (6) existing systems related to zakat namely Majlis Ugama Islam Sabah (MUIS), Majlis Agama Islam & Adat Istiadat Melayu Kelantan (MyMAIK), Baznaz Maros, Majlis Agama Islam & Adat Melayu Terengganu (MAIDAM), Majlis Agama Islam Wilayah Persekutuan (MAIWP) and Majlis Agama Islam Selangor (MAIS).

2.4.1 Comparison of Existing System

A comparison table for the existing system such as MUIS, MyMAIK, Baznaz Maros, MAIDAM, MAIWP, MAIS across the specified features as shown in Table 1.

Referring to the table shown, 4 systems such as MyMAIK, Baznaz Maros, MAIDAM and MAIS surpass in presenting data clearly, while MUIS and MAIWP lack this feature, which could mean their data visualization might be less effective or harder to interpret. In the interactivity feature, only MyMAIK and MAIS allow users to interact with the data, such as through clickable charts or dynamic updates. The absence of this feature in other systems makes them less engaging or user-friendly. Baznaz Maros, MAIDAM, and MAIS support various chart types, which improves data flexibility and presentation. MUIS, MyMAIK, and MAIWP lack this feature, limiting how they display data visually. Furthermore, data filtering features available only in MyMAIK, enables users to sort or narrow down data based on criteria, making it easier to find specific insights. Other systems do not provide this functionality. MAIDAM, MAIWP, and MAIS incorporate storytelling elements, likely through narratives or annotated visuals that explain data trends. Next for clear and purposeful color choices most systems effectively use colors to convey meaning or emphasize data, only MAIDAM does not, which could lead to less visually appealing or clear presentations. However, all systems perform well in labeling data visuals and on device responsiveness. Only MyMAIK systems offer customization while the other systems do not, which means users cannot modify the interface or visuals to suit their specific needs or preferences.

Table 1
Comparison existing system

FEATURES	MUIS	MyMAIK	Baznaz Maros	MAIDAM	MAIWP	MAIS
Data Representation Clarity	x	✓	✓	✓	x	✓
Interactivity	✓	✓	x	x	x	✓
Multiple Chart Types	x	x	✓	✓	x	
Data Filtering	x	✓	x	x	x	✓
Storytelling	x	✓	✓	✓	✓	✓
Clear and purposeful color choices	✓	✓	✓	x	✓	✓
Clear and Informative labels	✓	✓	✓	✓	✓	✓
Device Responsive	✓	✓	✓	✓	✓	✓
Customization Options	x	✓	x	x	x	x

3. Methodology

3.1 Waterfall Model and OSEMN Model

The software development process is divided into phases according to the waterfall methodology. The first stage's result serves as support for the subsequent stage in the subsequent procedure. Requirement analysis, design, implementation, testing, deployment, and maintenance are the stages of the waterfall model.

There are five steps of OSEMN model such a useful tool for data scientists. The first step is obtaining data. Once the data is obtained, it is important to take a look at what has been acquired and become familiar with the dataset. Scrubbing data is one of the most time-consuming aspects of a data. Next is to explore data. The data scientist will use explore to carry out exploratory data analysis, or more simply put, create visuals to help them better comprehend the data before modelling. The last step is to interpret the result.

3.2 Methodology Table

The goal of usability testing is to assess how users interact with the technology. To evaluate the dashboard's usability, effectiveness, and general user satisfaction, a group of end users engages in System Usability Testing (SUS). Surveys, interviews, and user interaction observation are used to collect feedback. To find any usability problems, such imprecise navigation, incorrect visualizations, or performance delays, this input is essential. The system is improved to improve its usability and provide a seamless user experience based on these inputs.

Table 2
Methodology table

Project Objective	Phase	Activities	Tools/Technique	Deliverable
Objective 1- To identify data and system requirements for data visualization of zakat distribution amongst UiTM students.	Requirement Analysis	Identify problems	Techniques: Literature review	• Problem Statement
			Tools: Google scholar, Science direct, Research gate.	
		Ideate solution	Technique: Literature review	• Project objectives • Project Scope • List of hardware and software
		Data extraction	Technique: Web Scraping, obtain data, scrub data	• Raw datasets
			Tools: Microsoft Excel, jupyter notebook, MySQL	
Objective 2- To design an interactive dashboard on data visualization of zakat distribution	System Design	Data transformation	Technique: Explore data, Model data	• Formatted data sets for system development
			Tools: Jupyter Notebook	
		Data pipeline: Design dashboard interface	Technique: Storyboard	• Visualization UI layout and context of illustration
			Tools: Hand sketch, canva	

		Outline system features	Technique: Requirement Analysis	• List of functional and non-functional requirement
Objective 3 – To develop an interactive dashboard on visualizing zakat distribution amongst UiTM students.	Implementa-tion	Data load	Data interpretation Tools: MySQL	• Data Store • Database Model
		Develop data visualization	Technique: Process And visualize. Tools: Tableau, Jupyter Notebook	• Dashboard system • Data visualization
	System Testing	System testing Usability Test	Integration checking System Usability Testing (SUS)	• User Feedback

4. Results

4.1 Identify Data and System Requirement

The suitable dataset has been identified and has been collected through Bahagian Zakat, Sedekah dan Wakaf (ZAWAF) UiTM.

4.1.1 System Requirement

The functional requirements able the users to view the data and interact with the system, while non-functional requirement include the platform compatibility, performance and usability of the data visualization on zakat distribution among UiTM students.

The hardware and software use to create Data Visualization on Zakat Distribution among UiTM Students include the personal laptop, operating system of Window 11, Microsoft Power BI, Anaconda Jupyter Notebook and Microsoft Excel 2019

4.1.2 Data Requirements

The data requirement used are semi-structured with 7906 rows of data which sourced from Division of Zakat, Sedekah and Waqf (ZAWAF) UiTM. Whereas data type involve are string, float, Boolean and integer.

4.2 Storyboard Concept

The scenario starts with a researcher that wants to make a researcher on UiTM Zakat distribution. With the help of the system, the users can find solutions to the issues they face and make more informed decisions about the distributions.
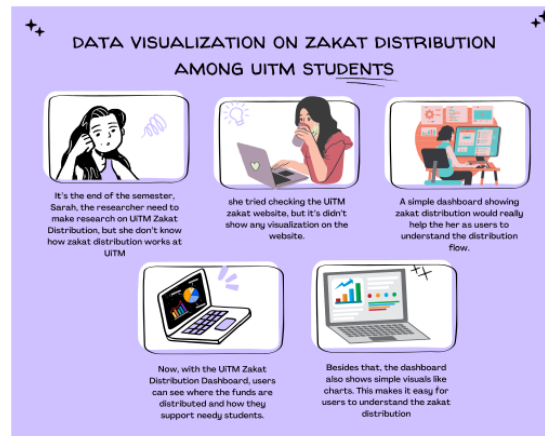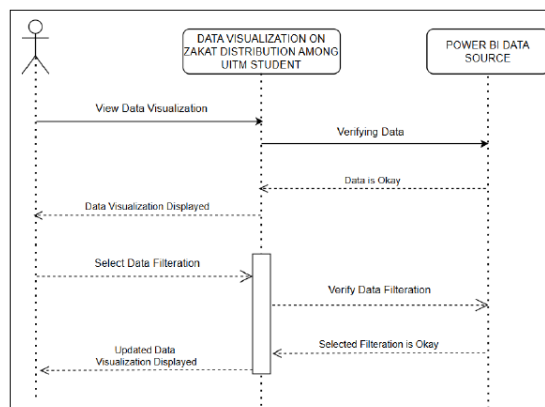
Fig. 1. Storyboard of data visualization

4.3 Flowchart and Use Case Diagram

The flowchart sets out a path for the user from beginning to end so they can understand the dashboard and also learn from the dashboard. The system has four pages which is Home, Overview, Zakat Distribution and Beneficiaries page.

The use case diagram has been made to describe the element of interaction into graphical illustration. This paper only shows part of the use case description. More detailed descriptions on use case diagrams can be obtained from researcher's full report.

4.4 System Integration

Figure 2 shows the sequence diagram for the Data Visualization on Zakat Distribution Among UiTM Students system interaction between users, the dashboard, and the Power BI data source.

Fig. 2. Sequence Diagram of Data Visualization

4.5 User Interface Design

The user interface is created to helps in giving an early overview of the dashboard design.

Fig. 3. Home Page

4.6 ETL Process

The ETL Process which are extract, transform and load were the pipeline for the visualization was designed to automate the process of collecting, processing, and storing data.

The datasets that were received from ZAWAF UiTM were in pdf type. The datasets consist of 9 different datasets from the main campus, Shah Alam, Puncak Alam and Puncak Perdana. From each campus, it contains 3 different datasets from the year 2021 to 2023.

The dataset has been converted into excel file from Shah Alam, Puncak Alam and Puncak Perdana Campus. The code snippet processes lines of data was run to ensure each line has a consistent number of fields, filling in missing fields with empty strings, and then writes the cleaned data to a new CSV file.

Figure 4 shows how to import both Excel data to Jupyter Notebook and display various information about the data. This includes details such as the data type, columns, the number of rows, and the total count of non-null values. More detailed explanation on data cleaning process can be obtained from researcher's full report.

```
In [1]:  import pandas as pd
         import numpy as np
         import random as rnd

         #visualization
         import seaborn as sns
         import matplotlib.pyplot as plt
         %matplotlib inline

         #machine Learning||
         from sklearn.linear_model import LogisticRegression
         from sklearn.svm import SVC, LinearSVC
         from sklearn.ensemble import RandomForestClassifier
         from sklearn.neighbors import KNeighborsClassifier
         from sklearn.naive_bayes import GaussianNB
         from sklearn.linear_model import Perceptron
         from sklearn.linear_model import SGDClassifier
         from sklearn.tree import DecisionTreeClassifier
```

Fig. 4. Import libraries and the path of the file

4.7 Developing Data visualization on Zakat Distribution Among UiTM Students

Figure 5 shows a dashboard created to present the overview of how Zakat has been distributed to students from a given entity. This dashboard presents its goal of compiling and intuitively presenting data to support decision-making. Some key metrics highlighted are 6,084 students altogether, and a total amount of zakat distributed to the tune of 5 million. In the student composition, there are 2,837 female students and 3,247 male students. The breakdown of the sum of zakat distributed for three campuses which is Shah Alam, Puncak Alam, and Puncak Perdana in eligible groups using Asnaf categories are as follows: Fakir, Fisabilillah, and Miskin. The graph indicates the highest amount received by Shah Alam campus and followed by Puncak Alam and

Puncak Perdana has the lowest, asserting that the provided platform can ensure actionable insights on zakat distribution.
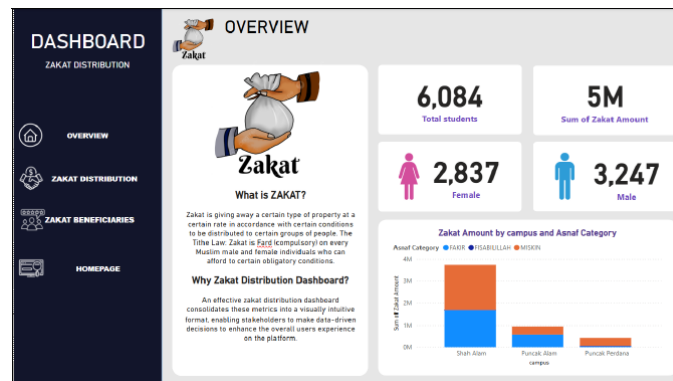

Fig. 5. Overview Dashboard Page

The image describes in detail the distribution dashboard for Zakat by Asnaf Category, campus, and year. At the top of this dashboard is an indication of the number of students: 4,408 for Shah Alam Campus, 1,137 for Puncak Alam Campus, and 539 for Puncak Perdana Campus.

The figure shows on the left-hand side a bar chart of average zakat amounts distributed to different Asnafs such as Fisabilillah, Miskin, and Fakir, among which Fisabilillah received the highest average amount for 2.5K, as followed by Miskin 1.1K and Fakir as the lowest average 0.7K.

The figure also shows that the pie chart demonstrates the distribution of the zakat according to the campus. The largest distribution goes to Shah Alam (72.45%), followed by Puncak Alam (18%) and Puncak Perdana (8.86%).
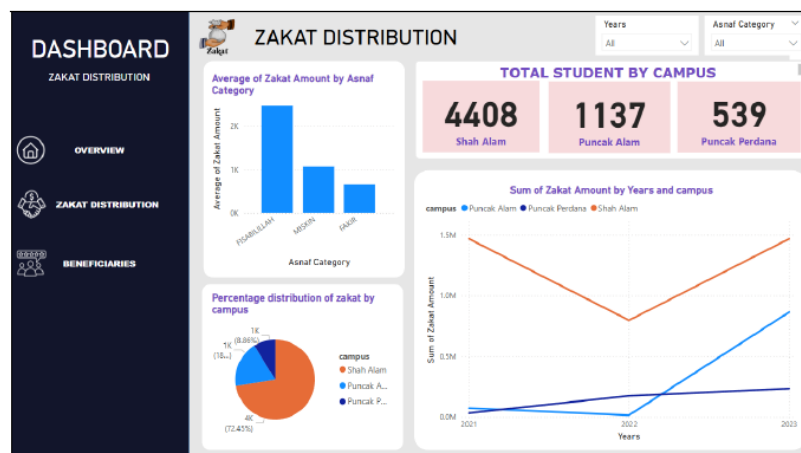

Fig. 6. Zakat Distribution page

The figure above illustrates an information line chart that depicts zakat distribution from year to year among the three campuses. Data indicates that zakat distribution over years is on the rise for Shah Alam and Puncak Alam. In contrast, Puncak Perdana remains relatively stable, receiving considerably less zakat distribution. In 2021, Shah Alam received the highest zakat amount at 1.47M, while in 2022, the zakat amount dropped significantly to 0.80M. By 2023, it rebounded back to 1.47M, returning to the year 2021 level. Puncak Alam received 0.05M zakat amount in 2021, for 2022 there were slight increase to 0.17M. By 2023, the zakat amount surged significantly to 0.86M. In 2021, the zakat amount for Puncak Perdana was 0.07M, slightly higher than Puncak Alam. By 2022,

there was a small increase to 0.01M, while in 2023, the zakat amount reached 0.23M, showing a gradual upward trend.
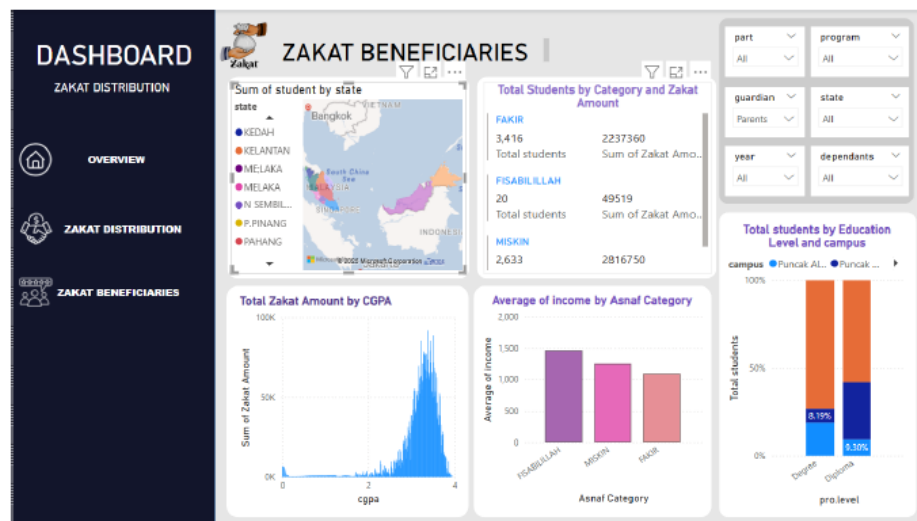

Fig. 7. Zakat Beneficiaries Dashboard Page

Figure 7 is the Zakat Beneficiaries Page is to provide a comprehensive analysis of beneficiaries' demographics. This visualization helps users understand with insights into the distribution among the zakat beneficiaries by location, academic performance, income, and education levels.

The stacked bar chart below displays the total students based on program level and campus. Shah Alam dominates the distribution across both educational levels, followed by Puncak Alam and Puncak Perdana. The majority of degree students are from Shah Alam, covering more than 50% of the total. The Puncak Perdana campus contributes the least to the degree student population at 8.19%. A significant portion of diploma is also Shah Alam, forming more than half of the total at 58.14%. Puncak Perdana has a more noticeable share compared to its degree students at 32.56%. Puncak Alam has smaller a smaller but consistent representation in both categories' degree and diploma respectively at 18.79% and 9.30%.

The shown figure also demonstrates the line graph shows the mean income of recipients primarily grouped into Asnaf groups (Fisabilillah, Miskin, and Fakir), where Fisabilillah received the highest income slightly above 1500. As for Miskin, the income is slightly above 1000 and Fakir slightly above 500, the lowest income.

The graph above shows the total of zakat amounts by students' CGPA (Cumulative Grade Point Average). The amount of zakat distributed is relatively low for students with a CGPA below 2.0. The total zakat amount distributed starts increasing significantly from a CGPA of around 2.5. The highest concentration of zakat funds is received by students with a CGPA closer to 3.5 and above.

This summary table presents data on the total number of students in each Asnaf category and the total zakat amount distributed to them. The largest number of students at 3416 belong to this Fakir category, with total zakat receiving 2 237 360. The Fisabilillah category has the smallest number of students at 20 and total zakat received 49519. While Miskin has fewer students than Fakir,at 2633 it receives the highest total zakat distribution which is 2 816 750.

4.8 System Testing

System testing is required to collect user feedback following their interactions with the system. Google Forms is being used to administer an online survey. Based on their thoughts and experiences

with the Data Visualization on Zakat Distribution Among UiTM Students system, survey respondents will assign a score. Participants in the survey must score the statements on a scale of 1 to 5 to indicate how much they agree or disagree with the System Usability Testing (SUS) questions. Five means strongly agree, and one means strongly disagree. Ten responses in all have been received.

A score of more than 80.1 could indicate that the system is rated as excellent. A value of 68 to 80 is optimal for the system. With a score of 67–67.9, it is deemed acceptable and falls within the table's average. A subpar system is indicated by a score of 51 to 66.

The respondents' SUS scores for the Data Visualization on Zakat Distribution Among UiTM Students system were given an overall score of 87.25, meaning that all users found it to be user-friendly and that the system is regarded as excellent. Since the duration of the research is only five months to complete, therefore in the future the researchers suggested more detailed and comprehensive testing should be done in order to get better findings for the research.

5. Conclusions

The study has successfully achieved the three objectives of the research and delivered a functional and dependable system. The research has achieved the first objective, which is identifying data and system requirements for data visualization of zakat distribution amongst UiTM students. The research has also achieved the second and third objectives, which are designing and developing an interactive dashboard on data visualization of zakat distribution among UiTM students. However, there are several limitations that can be highlighted which are the design of Data Visualization on Zakat Distribution Among UiTM Students system can only be accurately displayed in Power BI desktop mode due to its limitations. If not, the system would become not practical, and the user interface would glitch, and the limitation of the dataset, which only contains data from the years 2021 to 2023, making it difficult to assess how patterns have evolved over time. Future works recommended to upgrade to a full Power BI account allows the system to take advantage of more sophisticated features like greater data handling, better performance and visualizations which eventually improve the dashboard's overall usability and functionality, and also expanding the project's scope to include all UiTM Campus.

In conclusion, the development process involved gathering data from three years, covering the years 2021 to 2023. The final dashboards offer significant value to researchers and the general public interested in Zakat Distribution among UiTM Students. The Data Visualization on Zakat Distribution Among UiTM Students system serves as an essential tool to increase the knowledge among the users. By utilizing the dashboard's features, users can analyze various aspects such as Asnaf Category, Zakat Amount that is distributed and Total Students based on different campus in UiTM Selangor.

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