The Impact of BABA: Mean Absolute Deviation (MAD) Tool: Beyond Spreadsheet Simple Statistics

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ABSTRACT

This study evaluates the effectiveness and user experience of the Business Analytic Basic Aid (BABA) Mean Absolute Deviation (MAD) tool compared to manual MAD calculations using Excel among students. Initially, students were taught to perform MAD calculations manually with Excel, followed by an introduction to the BABA automated MAD tool. A survey was conducted to assess various aspects of usability, complexity, and overall experience with both methods. Survey results indicated a general preference for the BABA automated MAD tool, with high ratings for ease of use (mean: 3.96) and quick learning (mean: 4.06). However, the tool was perceived as somewhat complex (mean: 2.88), and students expressed a need for technical support (mean: 3.36). Despite these challenges, confidence in using the tool was high (mean: 3.78), and students appreciated its well-integrated functions (mean: 3.88). The findings suggest that while the BABA automated MAD tool provides significant advantages over manual calculations, further refinements and user support are needed to address its complexities. The study highlights the potential for improved learning outcomes and efficiency in statistical analysis through the adoption of automated tools in educational settings, offering valuable insights for educators and tool developers.

INTRODUCTION

In recent years, the rapid advancement of technology has ushered in a new era of data analysis tools that have fundamentally transformed the way researchers and professionals approach data-driven decision-making. The MAD has contributed to the expansion of statistical analysis capabilities within the familiar Excel environment, empowering users to move beyond the limitations of spreadsheet-based descriptive statistics and venture into more sophisticated data exploration and modeling techniques (Halpern et al., 2018). A particularly notable feature of the MAD tool is its ability to facilitate the calculation of the mean absolute deviation (MAD), a robust measure of statistical dispersion that offers several advantages over the more commonly used standard deviation(Halpern et al., 2018).On other hand spreadsheet is an application that allows user to use and perform any statistical analysis, from simple calculations to more complex data manipulation and modelling(Halpern et al., 2018;Ruben, 2016) depending on user skills, abilities and knowledge of the user. This paper aims to investigate the potential impact of the MAD tool in enhancing statistical analysis, particularly in its ability to complement and expand upon the traditional spreadsheet-based approaches to data analysis.

While spreadsheet software has become ubiquitous in data analysis, offering a user-friendly platform for basic computations and data manipulation, the Mean Absolute Deviation (MAD) tool has emerged as a powerful extension of these capabilities, enabling researchers and professionals to delve deeper into their data, uncover hidden insights, and develop more robust and accurate predictive models, all within the familiar and widely-adopted Excel environment (Halpern et al., 2018) (Couraud, 2009).

LITERATURE REVIEW

As user research increasingly focuses on quantifying user experience, the need for reliable statistical methods becomes crucial. Designers of user interfaces and applications must often show how their design choices impact usability by comparing metrics before and after changes. The System Usability Scale (SUS) is a widely used tool for measuring overall usability (Sauro & Lewis, 2012). However, because SUS relies on user-reported scores, it can be influenced by bias and may not detect subtle changes (Adebiyi et al., 2017).

To address these issues, incorporating the Mean Absolute Deviation (MAD) can be beneficial. MAD measures the average deviation of data points from the mean, providing a clearer picture of variability than traditional methods like standard deviation (Howe & Simkin, 2006). By using MAD alongside SUS, researchers can gain a deeper understanding of how user feedback varies and how consistent the responses are (Sauro & Lewis, 2012).

Combining SUS with MAD offers a more complete view of user experience. SUS provides an overall measure of satisfaction, while MAD reveals how consistent users' perceptions are. This combined approach helps researchers understand not just how users feel on average, but also how much their opinions differ (Awaji & Solaiman, 2022).

Assessing user experience effectively is vital for ensuring that a product meets users' needs and expectations (Davis, 1989). Using SUS to gauge perceived usability and MAD to evaluate the consistency of responses helps confirm whether the system meets user requirements and where improvements are needed (Adebiyi et al., 2017; Brooke, 2013).

However, it is important to note that spreadsheets used for these calculations can be prone to errors, potentially leading to inaccurate results (Krishna et al., 2002). Therefore, it is crucial to implement strong validation processes to ensure the accuracy of spreadsheet-based analyses.

METHOD

The examination of the impact of the MAD tool has been conducted through a through Jan 2024 to April 2024 to three different groups of students that enrolled and completed their study in Business Analytic Subject. The feedback was collected at the end of the duration of study. This study adopted the questionnaire by SUS Brooke (2013)

The data collection process for this study aimed to compare user feedback on the use of Mean Absolute Deviation (MAD) tools versus manual calculations using Excel. This involved several key steps:

First, users were taught to calculate MAD manually using Excel. They were given a dataset and shown how to use Excel functions and formulas to perform the calculations. This hands-on exercise ensured that users understood the manual process.

Next, an instructional session introduced users to the automated MAD tool. They learned how to input data, use various functions, and interpret the results. This session aimed to make users comfortable with the tool.

To provide practical experience, users were given datasets to use with the MAD tool. They performed calculations using the tool and compared this experience to the manual method.

After these sessions, a questionnaire was distributed to gather detailed feedback on their experiences with both methods. The survey included questions about ease of use, complexity, need for technical support, and overall satisfaction. Responses were collected using both rating scales and open-ended questions.

The feedback was then analyzed. Quantitative data were summarized with mean scores and trends, while qualitative responses were reviewed for common themes and specific comments. This analysis helped to understand user perceptions and experiences.

Finally, the findings were documented in a report. The report summarized the key insights, highlighting the advantages and challenges of the MAD tool. It included statistical summaries, charts, and excerpts from the feedback. Recommendations for educators and tool developers were also provided based on the results.

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In summary, the data collection process involved teaching manual MAD calculations, introducing the automated tool, providing practical experience, collecting feedback through a survey, analyzing the feedback, and reporting the findings. This thorough approach ensured a comprehensive evaluation of the MAD tool's effectiveness and usability.

RESULT

The output from the feedback as follows;

The results are dominant by female of 78.4% as figure 4.1

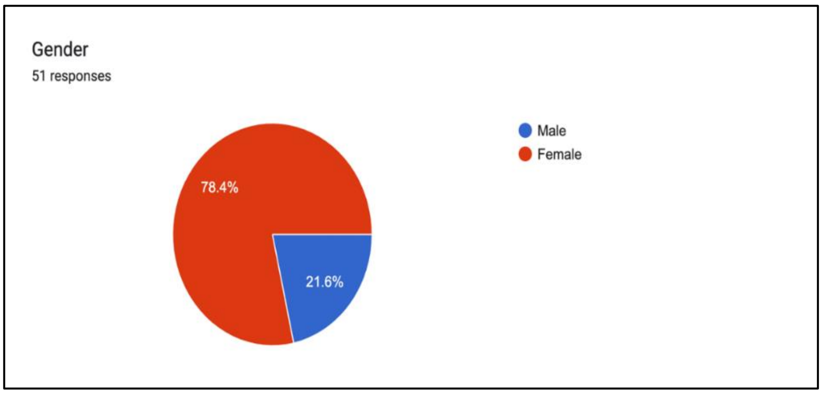

Figure 4.1: Gender

By referring table 4.1 below, the elaboration of statement "I think that I would like to use this system frequently" received a high mean score of 4.06, with a standard deviation of 0.83, suggesting that most users are inclined to use the system often. The responses were generally consistent, with ratings ranging from 2 to 5. In contrast, when asked if they found the system unnecessarily complex, the mean score was 2.88, indicating that while some complexity was perceived, it was not overwhelming. However, the standard deviation of 1.09 points to a broader range of opinions, as some users rated the system as very complex, with ratings spanning from 1 to 5.

The system was largely regarded as easy to use, reflected by a mean score of 3.96 and a relatively low standard deviation of 0.80, signifying agreement among respondents. Ratings for ease of use ranged from 2 to 5, highlighting that while most users found the system user-friendly, a small number of users encountered difficulties. The need for technical support showed more variability, with a mean score of 3.36 and a standard deviation of 1.05. This indicates that while some users felt confident using the system independently (with ratings as low as 1), others felt they would require significant support (up to a maximum rating of 5).

When evaluating the integration of various system functions, respondents gave a mean score of 3.88, coupled with a standard deviation of 0.79, suggesting that most users found the system's features well integrated. Ratings for this question were mostly positive, ranging from 2 to 5. However, when asked about system inconsistency, the mean score was lower at 2.82, and the standard deviation was 1.03, indicating that some users experienced inconsistency issues, with ratings varying widely from 1 to 5.

In terms of learning to use the system quickly, the mean score was again 4.06 with a low standard deviation of 0.80, suggesting that most users agreed the system could be learned quickly, with ratings clustered between 3 and 5. Conversely, the system was considered somewhat cumbersome by some users, reflected in a mean score of 2.78 and a standard deviation of 1.06, showing a spread of responses from 1 to 5. Confidence in using the system was moderately high, with a mean score of 3.78 and a standard deviation of 0.92, indicating that while most users felt confident, there was some variation in confidence levels. Lastly, the need to learn a lot before effectively using the system had a mean score of 3.60 and a standard deviation of 0.87, suggesting that while some users felt well-prepared (with scores as low as 1), others felt the need for extensive learning (with scores up to 5).

The histograms for each of the question are label Figures 4.2 until 4.11 showing the feedback from the study.

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Table 4.1: Descriptive Statistic of Question

Question	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
I think that I would like to use this system frequently	4.06	0.83	2	5
I found the system unnecessarily complex	2.88	1.09	1	5
I thought the system was easy to use	3.96	0.8	2	5
I think that I would need the support of a technical person to be able to use this system	3.36	1.05	1	5
I found the various functions in this system were well integrated	3.88	0.79	2	5
I thought there was too much inconsistency in this system	2.82	1.03	1	5
I would imagine that most people would learn to use this system very quickly	4.06	0.8	3	5
I found the system very cumbersome to use	2.78	1.06	1	5
I felt very confident using the system	3.78	0.92	2	5
I needed to learn a lot of things before I could get going with this system	3.6	0.87	1	5

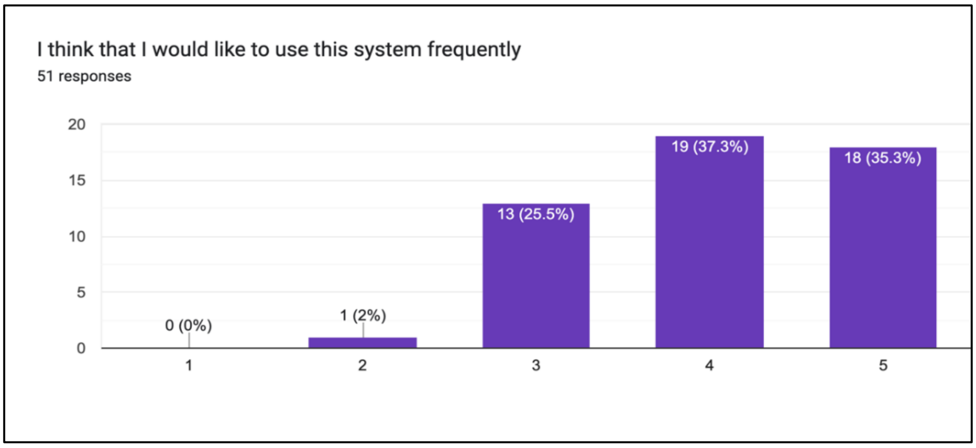

Figure 4.2: Frequent of Use

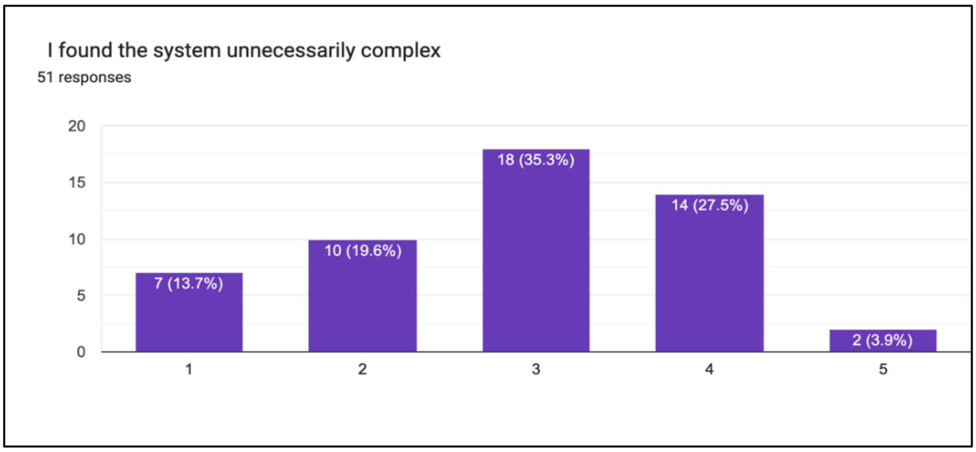

Figure 4.3: Unnecessarily Complex

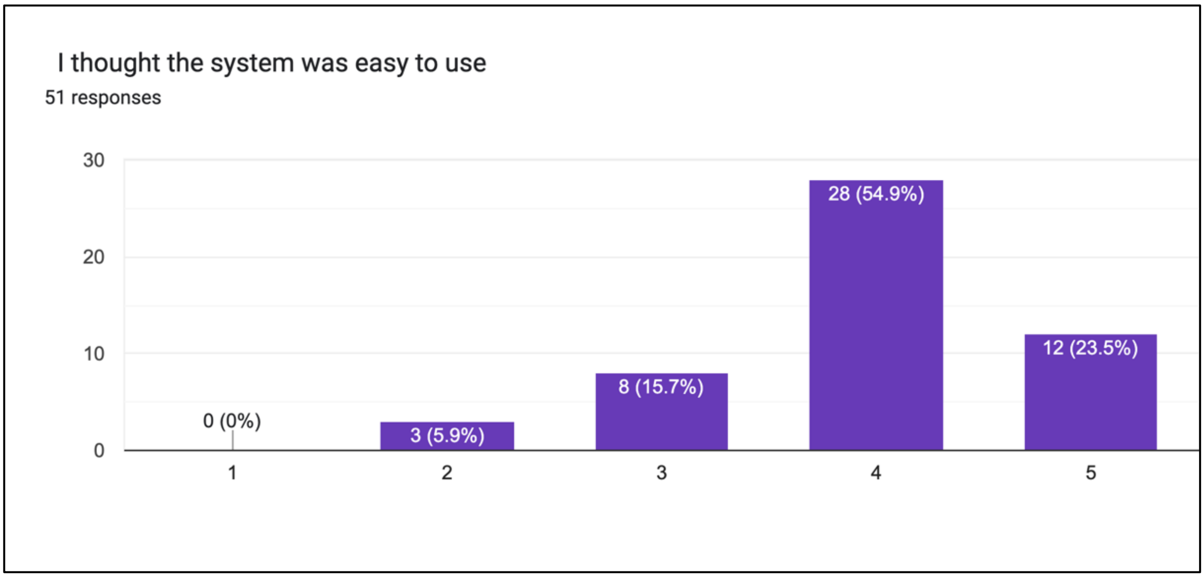

Figure 4.4: Ease of Use

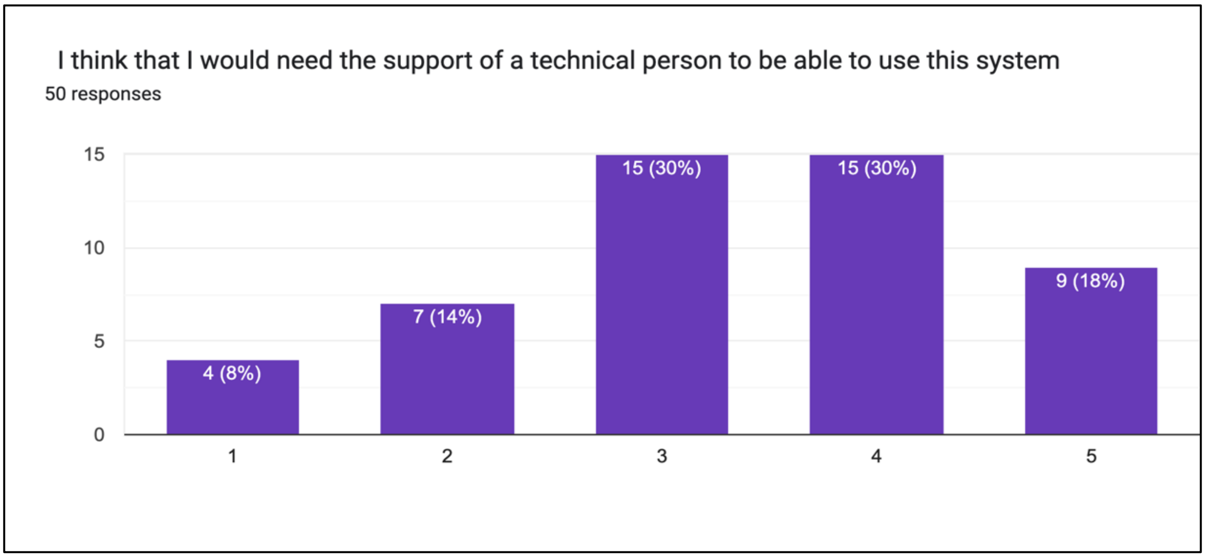

Figure 4.5: Need of Technical Support

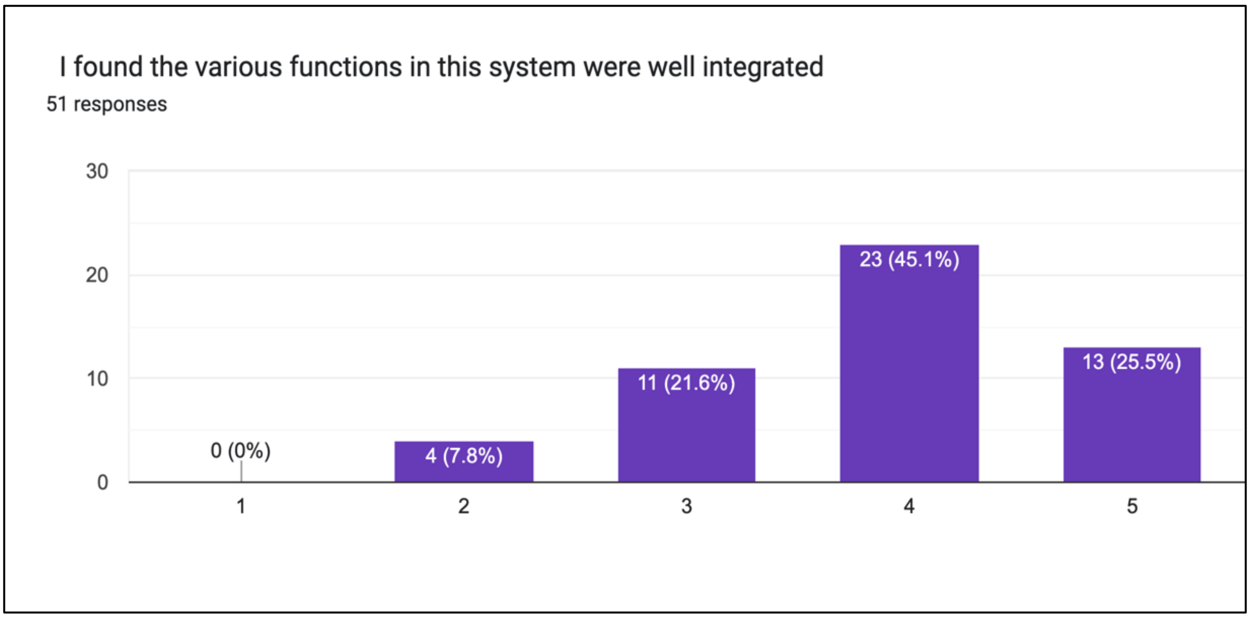

Figure 4.6: Well Integrated

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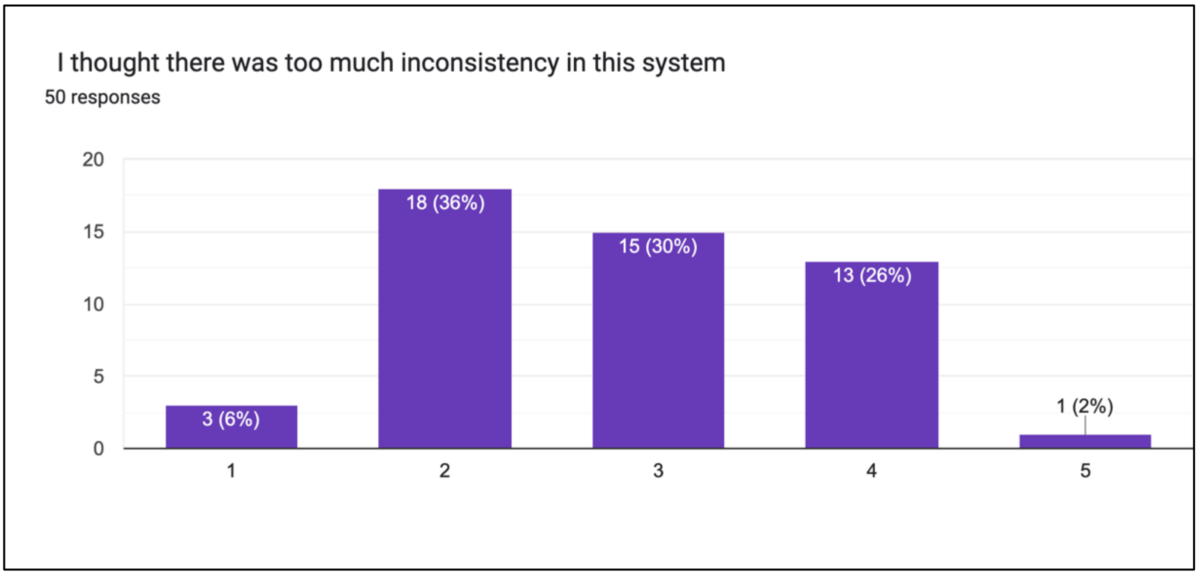

Figure 4.7: Inconsistency

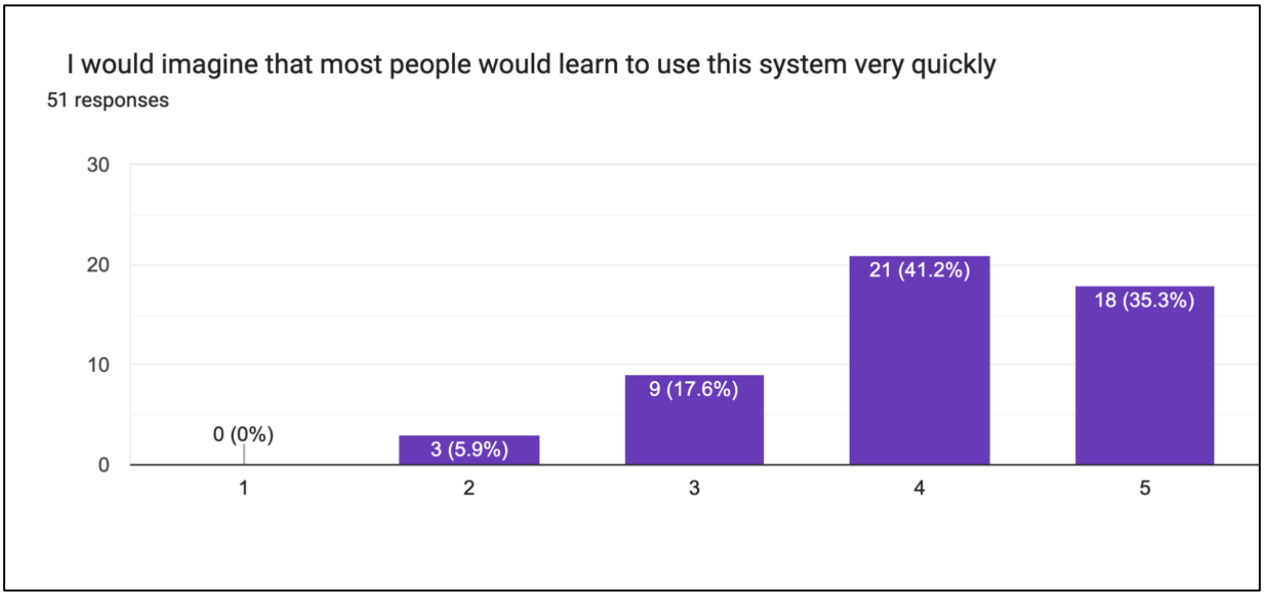

Figure 4.8: Learn Quickly

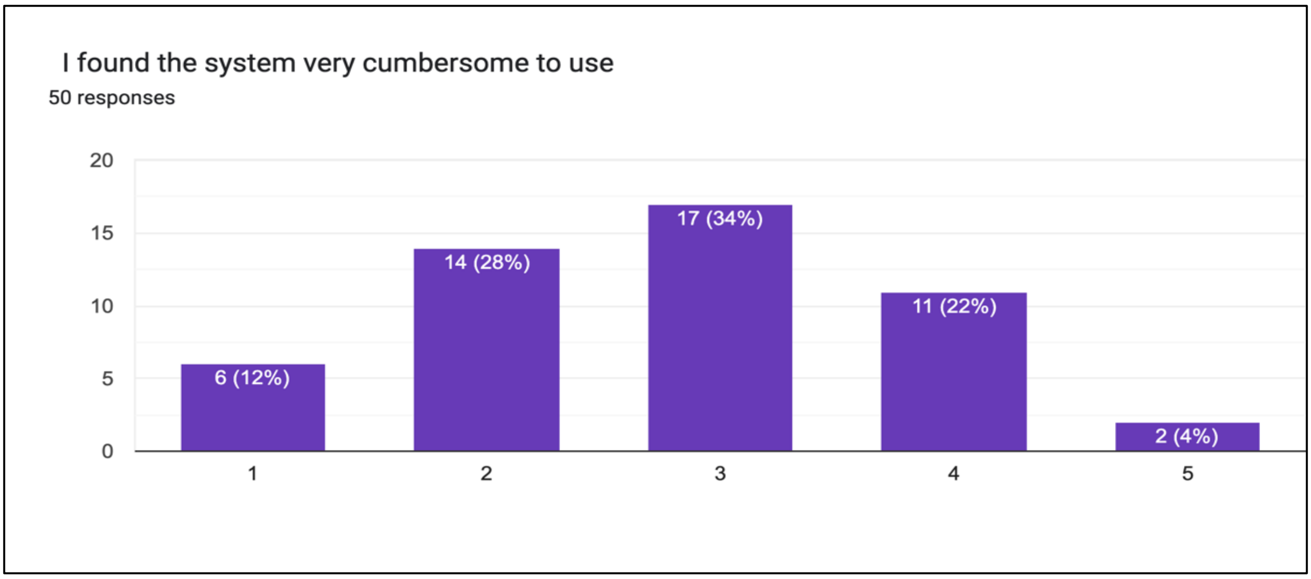

Figure 4.9: Cumbersome

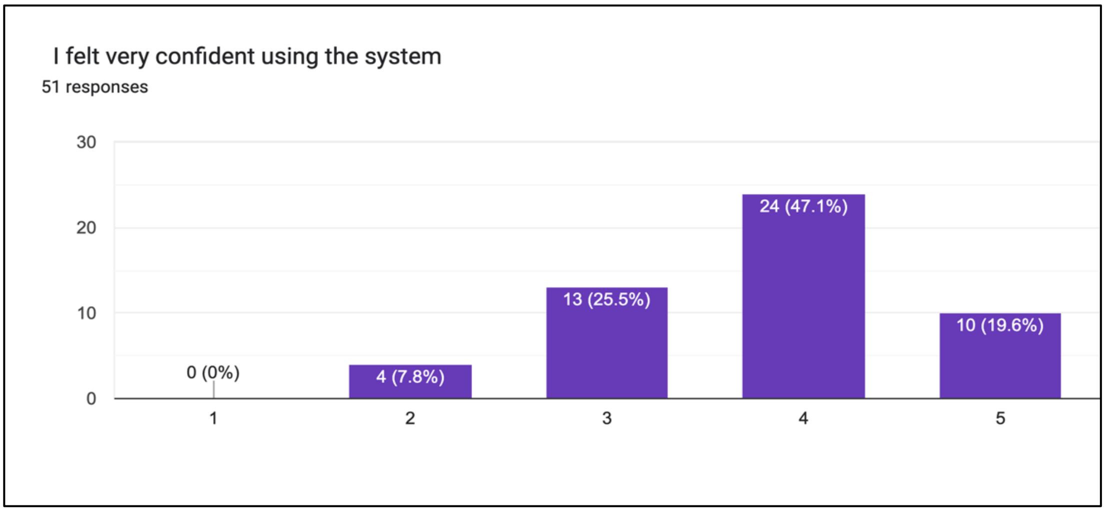

Figure 4.10: Confident

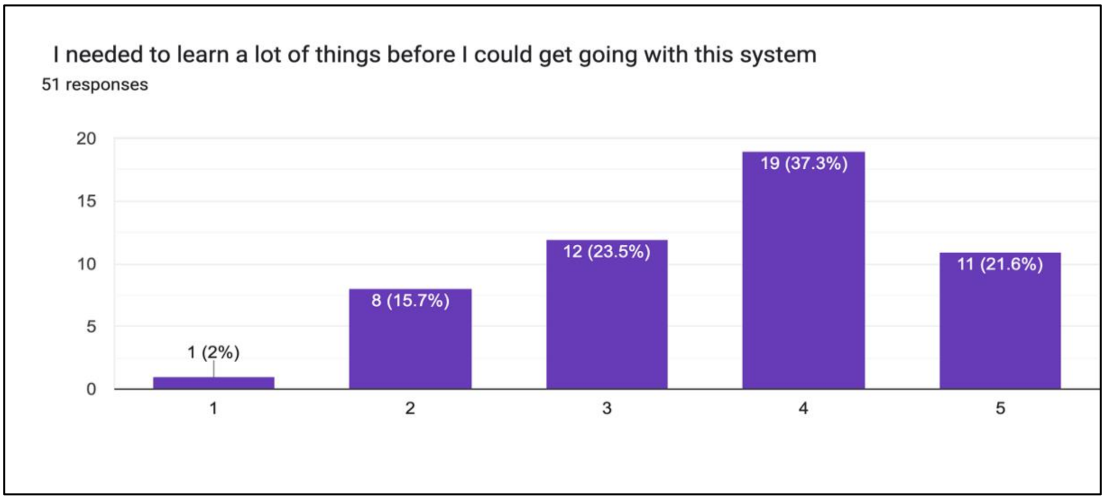

Figure 4.11: Need to Learn

CONCLUSION AND RECOMMENDATIONS

The analysis of user feedback on the newly developed system demonstrates a strong positive reception among users. Most notably, the system is highly regarded for its ease of use, as reflected in a mean score of 3.96 and a low standard deviation of 0.80, indicating that users consistently found the system intuitive and accessible. Additionally, the system's integration of various functions was positively rated, with a mean score of 3.88, suggesting that users appreciated how seamlessly the different features worked together.

Users also showed a strong willingness to engage with the system regularly, with the statement "I think that I would like to use this system frequently" receiving a high mean score of 4.06 and a standard deviation of 0.83, indicating a consistent preference for frequent use. Furthermore, users generally felt confident in using the system, as evidenced by a mean score of 3.78, which underscores the system's success in fostering user assurance and comfort.

As for the recommendations

1. **Enhance User Support and Training**: Given the mixed responses about the need for technical support and the system's complexity, it is recommended to provide more robust user support. This could include detailed tutorials, help documentation, and possibly live support options to assist users who may struggle with the system.
2. **Optimize System Usability**: To address concerns about system complexity and cumbersomeness, a

review of the interface design is recommended. Streamlining workflows and simplifying the user interface could make the system more intuitive, reducing the perceived complexity and enhancing the user experience.

3. **Improve Consistency Across Functions**: Some users noted inconsistencies within the system, which could lead to frustration and errors. It would be beneficial to conduct a thorough usability audit to identify and resolve these inconsistencies, ensuring a more seamless and reliable user experience.
4. **Encourage Regular Use Through Positive Reinforcement**: Given that users expressed a willingness to use the system frequently, reinforcing this behavior through reminders, tips for maximizing efficiency, and regular updates could help maintain and even increase user engagement.
5. **Targeted User Feedback for Continuous Improvement**: Implementing a system for ongoing user feedback can help identify specific pain points and areas for improvement. Regular updates based on user input will not only improve the system but also show users that their feedback is valued, fostering greater user satisfaction.

Overall, these positive ratings highlight the system's effectiveness in meeting its primary goal of simplifying the Mean Absolute Deviation (MAD) calculation process for users. The consistent and high scores across multiple usability aspects suggest that the system is well-received and has the potential to be a valuable tool for educational purposes

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