

Research Article

D-STAC: Dashboard System for Student Association

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Abstract: Systematic management of student association and activity through a centralized platform eases the process of obtaining the information. At present, there are several platforms in student association management such as the Student Affairs Division website, online form, social media, and email. Due to tons of information on student associations, a restructuring and dashboard system is required to save a lot of time, avoid repetitive tasks, and increase user engagement. A preliminary study has been carried out among the university students and an interview with the admin staff. Therefore, Dashboard System for Student Association (D-STAC) is a web-based system is proposed with a dashboard feature to visualize the management of the student activities. It visualizes in interactive form such as total student association, activity, Graduan Integrasi Ilmu Naqli dan Aqli (GIINA) criteria in Universiti Sains Islam Malaysia, registered user, total submitted paperwork and report for the admin. The dashboard also displays data visualization in a chart and graph such as total activity in recent years and organized activity in a current year based on months. D-STAC can be accessed by the public for a general feature, while registered users of this system and admin staff have their own privileges to this system. Findings from the User Acceptance Testing show that 86% of respondents are satisfied while 14% of them are very satisfied with the system. D-STAC system received positive feedback as an alternative for student association management. In short, D-STAC aligns with Shift 1 in Malaysia Education Blueprint to develop the holistic graduates and GIINA model that employs by USIM organization. Besides, D-STAC supports the Sustainable Development Goals (SDGs) by reducing the use of paper and saving the tree which towards digitalization. D-STAC can be commercialized for any university organization specifically in the student affairs division to promote sustainable living.

Keywords: Student Association; Dashboard; Systematic Management; Data Visualization; Sustainable



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1. INTRODUCTION

Students can actively involve in their educational experience by participating in campus groups and organizations (Haines, K., 2019). The process of college students' growth, living, and development in the future will be strongly influenced by their level of socialization (Iancu et al., 2016). This helps students to establish connections, widen networking, and enhance their soft skills beyond the class. Since there are a lot of student associations in the university, students, especially new students, are unaware of how many student associations are available that are registered under Student Affairs Division if they are interested to join, what activities that have been done by each of the student associations and which of the student association is the most active in the university. In fact, they need to refer to many sources and platforms in order to obtain their information and activities. According to

the online preliminary survey that have been conducted in April 2022 among USIM students, there are various platforms that have been used to obtain student association information where the highest is 40.3% through social media. Hence, to obtain quick information, a dashboard system may be helpful as it provides real-time data visualization for student engagement since the data can be presented in a simplest and attractive form. Dashboards are more than just a set of graphs and indicators; they come in different forms and interfaces (Bradea Ioana-Alexandra et al., 2014). Dashboard aids in the visualization of information and provide visual, functional, and interactive analytical elements to manage chunks of information effectively (Nadj et al., 2020). This research paper outlines the problems of the student association management through the literature study, online preliminary survey and interview as follows:

i. No centralized platform for managing student association information and activities.

At present, there is no centralized platform for a web-based system of student association management that is capable to gather all the student association information and activities. For example, in the case of obtaining student association information such as email, student needs to find the contact number of the President or anyone in the organization and contact them through their social media. However, it is inappropriate to contact via social media and the majority of student's handphone is limited space and need to clean up the memory in WhatsApp due to many announcements, notices, etc. According to the interview that have been conducted with the USIM Student Affairs Division staff, most of the students will contact them personally to obtain the student association information and even worst they are contacting them after office hour. The study also shows that there are various platforms that have been used by students to obtain student association information where the highest is 40.3% through social media, whereas contacting the committee itself is 30.1%, browsing Student Affairs Division social media and its website is 11.7% and 11.2% respectively. Meanwhile, only 1.5% of respondents obtain information by contacting Student Affairs Division staff and there are also other ways such as through orientation day, and their friends.

ii. No dashboard implementation to obtain a quick information.

The preliminary findings also show 64% of the students do not know the total number of student associations that are registered under the Student Affairs Division in USIM. In this case, there is no implementation of a dashboard system that provides a quick summary of the student association information such as the total number of student associations registered under the Student Affairs Division. The literature study also shows that Student Affairs Division websites in USIM and UPM do not provide sufficient information, and this make students to refer to other platforms as well. Thus, implementing a dashboard will provide an interactive data visualization that displays a graphical representation of student association information. As a result, this saves a lot of time by eliminating the need to browse through multiple menus and directories to obtain the information needed and can increase user engagement.

iii. Manually gathering information led to repetitive tasks and consume a lot of time.

Since there are various platforms that have been used to obtain student association information, it is hard to manually gathering the information and this consumes a lot of time and led to repetitive task if the information is not properly documented. Even worst, some inactive student associations are difficult to trace their information and it takes some time for them to respond. Besides, certain student associations have several social media accounts with different usernames, and this will be more difficult to gather them manually.

Therefore, the main purpose of D-STAC (Dashboard System for Student Association) is to centralize the management of student association information and activities in a web-based system by providing data visualization through the dashboard. This dashboard system assists the staff and students in managing the student association information and activities which will be easier and more useful for both parties which can be commercialized for any university organization specifically in the student affairs division to promote sustainable living and towards digitalization. It aligns with Shift 1 in Malaysia Education Blueprint to develop the holistic graduates and *Graduan Integrasi Ilmu Naqli dan Aqli* (GIINA) model that employs by USIM organization with the principles of human resource development in the Quran and Sunnah which always emphasize the holistic aspect.

2. METHOD & MATERIAL

There are two attributes to consider in the software development life cycle which are to emphasize the process and the quality of software and the process itself (Sharma et al., 2012). Agile methodology is iterative and repetitive, and it involves the users during all phases of development. It can be changed throughout the project development process according to the market changes and needs (Kellen Christina Peitl & de, 2017). Hence, the Agile methodology model is chosen because it provides flexibility since the changes can be made at any phase. The ability of this methodology to quickly release the first product version can enhance the project quality as it can be improved according to the current needs and requirements. There are only five phases involved which are requirement, system design, development, testing, and deployment as shown in Figure 1.



Figure 1. Agile Model.

The Agile methodology does not require detailed requirements at the beginning, but it will evolve over time and with stakeholders (Senay Demirel & Das, 2018). Since it has the ability to adapt to changes, it is not documented all at once. In this research, the problem statements have been identified and analyzed. The problem statement is derived from journals, articles, the Internet, and also through the conducted online preliminary survey. The observation is made on the existing website systems related to student associations from various universities. Objectives are gathered by analyzing the possible solutions from the problem statements and the scopes are determined after the objectives are satisfied. To obtain the requirement, an online preliminary survey has been conducted on the management of student associations in USIM. Meanwhile, the interview has been conducted to obtain the requirements from the point of view of staff who are managing the student association information and activity. The milestone is prepared to keep track of the project's activity progress in terms of scheduling, deadlines, and managing the time allocated with its deliverable and Gantt Chart for better planning and scheduling which ease project visualization.

For the system design, the use case diagram has been prepared to identify how D-STAC looks and should behave. The Entity Relationship Diagram (ERD) consists of six entities stored in the databases named users, associations, programs, reports, elements and poster. The flowchart presents the process of the D-STAC system that presents three different users which are students who are registered to the system, admin (Student Affairs Division staff), and public (unregistered users). Hence, the diagrams prepared can specify the specified requirements as shown in Figure 2 until 6.

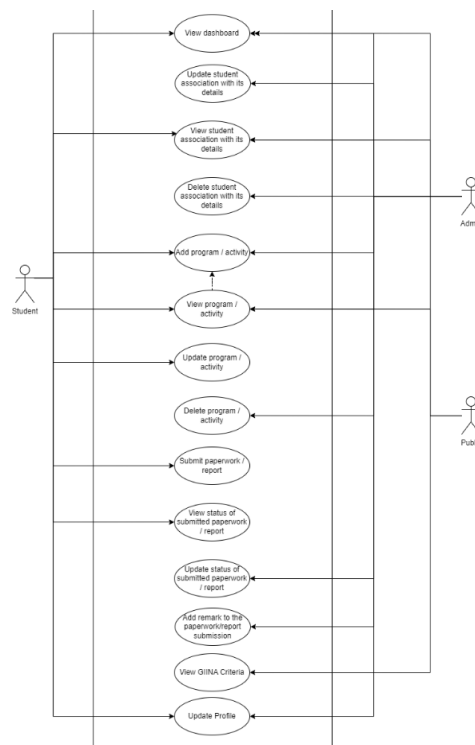


Figure 2. Use case of D-STAC.

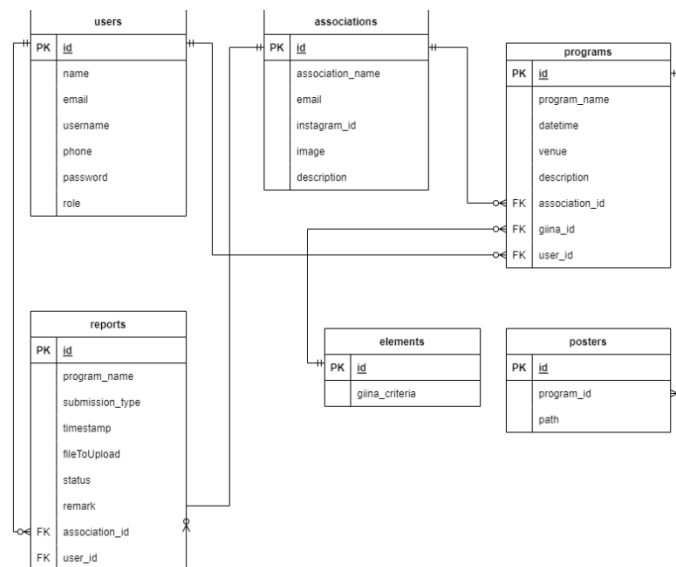


Figure 3. ERD of D-STAC.

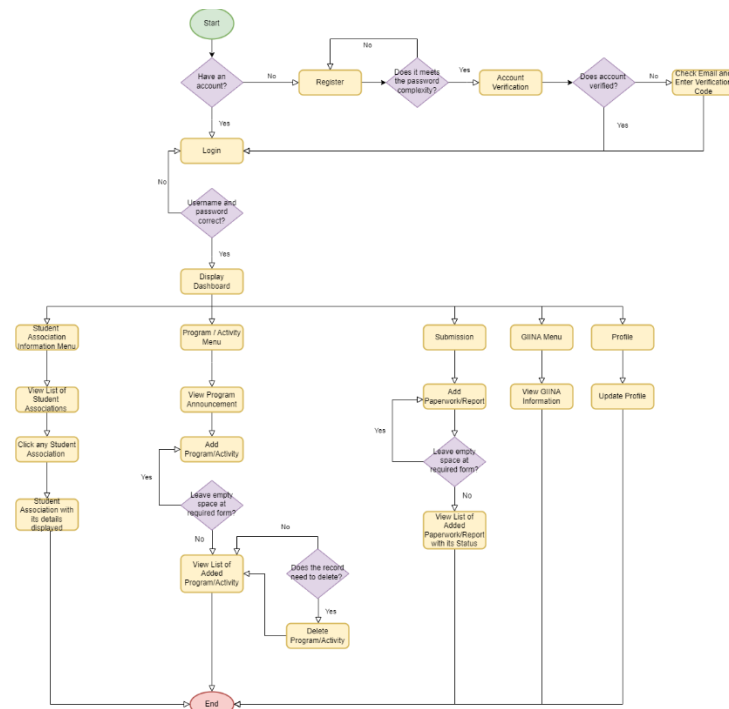


Figure 4. Flowchart for registered student.

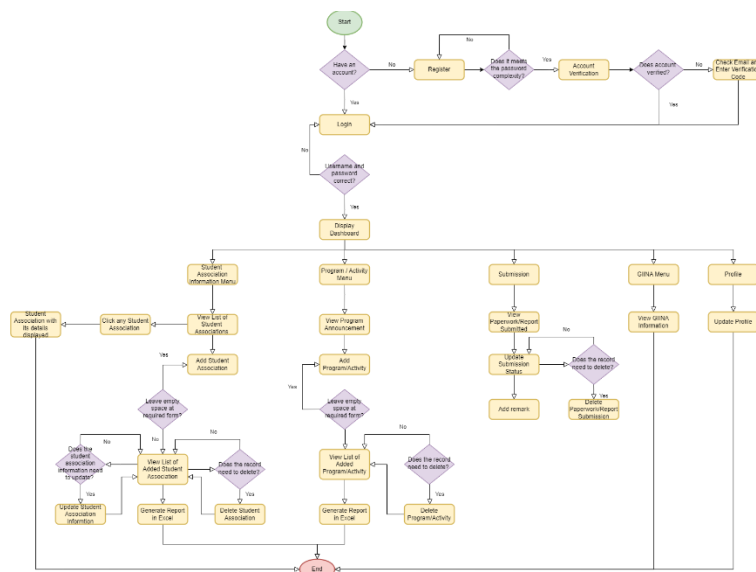


Figure 5. Flowchart for admin (Student Affairs Division staff).

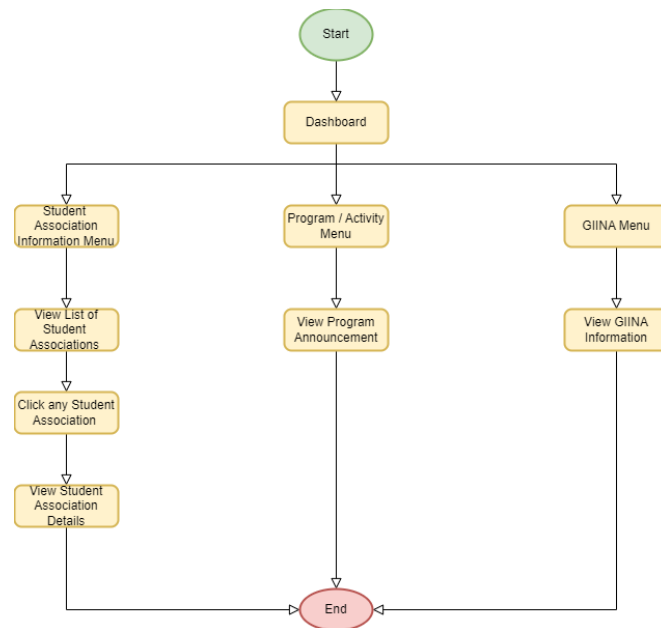


Figure 6. Flowchart for public user.

For the development, the first iteration of the developed system is based on the requirements defined with the goal of having a working and usable system at the end of the sprint. It can deliver the initial version earlier; however, it will undergo several revisions since Agile methodology is responsive to changes. The tools and programming languages are identified such as HTML, CSS, JavaScript, PHP, Bootstrap and MySQL database. The security features also have been implemented for D-STAC which are password hashing using Bcrypt algorithm, two-factor authentication (2FA), and password complexity.

Testing is an important part of accomplishing and evaluating the quality of a software product (Nirali Honest, 2019). In this process, the bugs and the vulnerabilities are discovered, patched, and refined using a black box testing approach. The functional testing is conducted which are test case, user acceptance testing (UAT), while non-functional testing is performed using penetration testing and usability testing. After the system undergoes testing and it performs as expected, the system is deployed and ready to use. The system performs web hosting so that everyone can use the system.

3. FINDINGS

3.1 Findings from online preliminary survey

An online preliminary survey conducted on the management of student associations in USIM was conducted using Microsoft Form from 11 April 2022 until 13 April 2022 that consists of 109 students from a different year of study and faculty. The findings show that 64% of respondents (70 students) do not know the total number of student associations that are registered under the Student Affairs Division as shown in Figure 7. This shows that students are not aware of the student associations available at USIM. Moreover, some students do not know where to find that information.

When it comes to obtaining the student associations' information, there are various platforms had been used by the students and the result shows in Figure 8. The highest percentage of getting student association information is through student association social media which is 40.3%. Besides, contacting the committee itself is 30.1%, while through Student Affairs Division social media and its website is 11.7% and 11.2% respectively. Meanwhile, only 1.5% of respondents obtain information by contacting PHEP staff and there are also other ways such as through orientation day, and their friends.

The result indicates that there are various platforms used and this method consumes a lot of time since they need to manually gather different information from different platforms.

Therefore, 106 respondents representing 97.2% prefer to have a centralized platform for managing student association information and activities as shown in Figure 9. Besides, Figure 10 shows 104 respondents with a percentage of 95.4% said that the dashboard system helps them to obtain information quickly. Thus, 79% of respondents agree about the idea of developing a web-based system with a dashboard for student association management as shown in Figure 11. Hence, the D-STAC system is a solution to manage student association information and activity to be more systematic and well-organized.

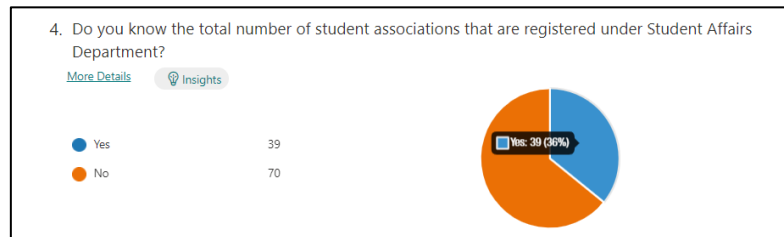


Figure 7. The percentage of students know the total number of student associations registered under Student Affairs Division in USIM.

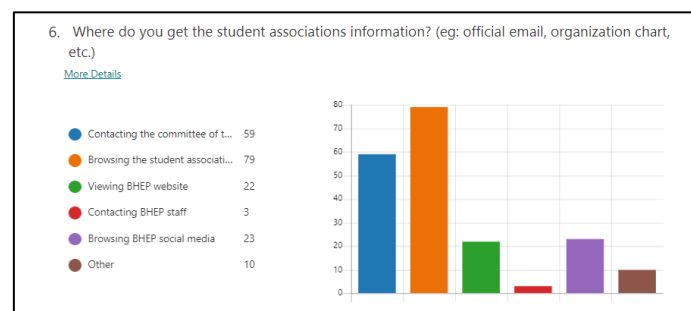


Figure 8. The platforms used to get student associations information.

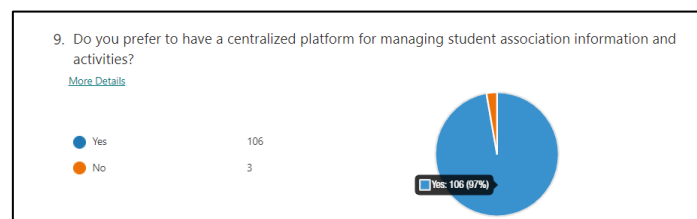


Figure 9. The percentage of students prefer to have a centralized platform for student association management.

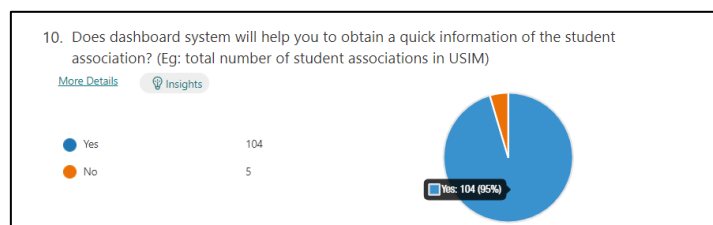


Figure 10. The percentage of students agree with the function of the dashboard that helps to obtain quick information.

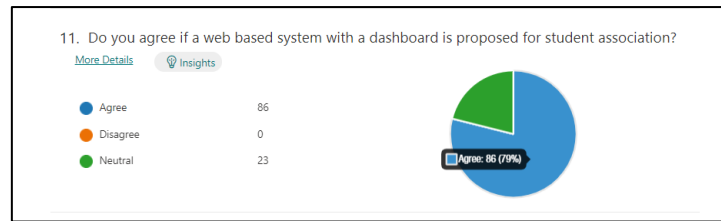


Figure 11. The percentage of students agree with the idea to develop a web-based system with a dashboard.

3.2 Security features implementation

Web security is important to keep unauthorized users from accessing credentials/sensitive information. Poor password management practises, on the other hand, are exploited by hackers who can disclose the users' credentials (Hatzivasilis, 2017). Maintaining security over sensitive information has become the most significant challenge (Chakravarthy Dummanaboyina, 2020). Thus, there is a need to implement up-to-date security methods to protect the credentials and this can be done using MD5, SHA-1, and Bcrypt hashing algorithms to encrypt the password (Katrandzhiev et al., 2019). The hashing algorithm between MD5, SHA-1 and Bcrypt also have been studied and compared as shown in Table 1.

Table 1. Comparison between MD5, SHA-1 and Bcrypt hashing algorithm.

Comparison Key	MD5	SHA-1	Bcrypt
Definition	Message Digest Algorithm (MD5) is a cryptographic hash algorithm that generates a 128-bit string value from an arbitrary length string.	Secure Hash Algorithm 1 (SHA-1) is a cryptographic hash function that takes an input and processes a 160-bit hash value.	Bcrypt algorithm is based on Blowfish block cipher that is used 128-bit salt and encrypts 192-bit hash value.
Speed of breach	High	Medium	Low
Ability to make the algorithm more complicated	No	No	Yes
Ability of outputs different for the same inputs	No	No	Yes
Recommended	No	No	Yes
Example of encrypted word (Test12)	c4a1a08c18d19f29b1312397f9378f16	299cd8b2492296844ba5b696459f0b2e63036362	\$2a\$12\$S3AzRFV2LDnACR3743r7c.KJb8c0HPsPpCoftcwoTxCZEwgVkJdXm

3.3 System User Interface (UI)

This paper highlights the dashboard interface of D-STAC that will display information about the total student associations, program/activities, GIINA criteria, and registered users. Meanwhile, the dashboard interface for the admin has additional information such as total submitted paperwork and report. The dashboard also displays various forms that promote variation for users' engagement as shown in Figure 12. If the users click the view button, they can view the information of that student association. The findings from the User Acceptance Testing (UAT) conducted through online preliminary survey shows that 100% of respondents agree the implementation of dashboard in D-STAC helps to obtain the information quickly, present the information in attractive form that can increase user engagement and it is informative and user-friendly. D-STAC system also consists of other functions which are activity announcement, GIINA information and submission of paperwork and report that ease the management of student association in university.

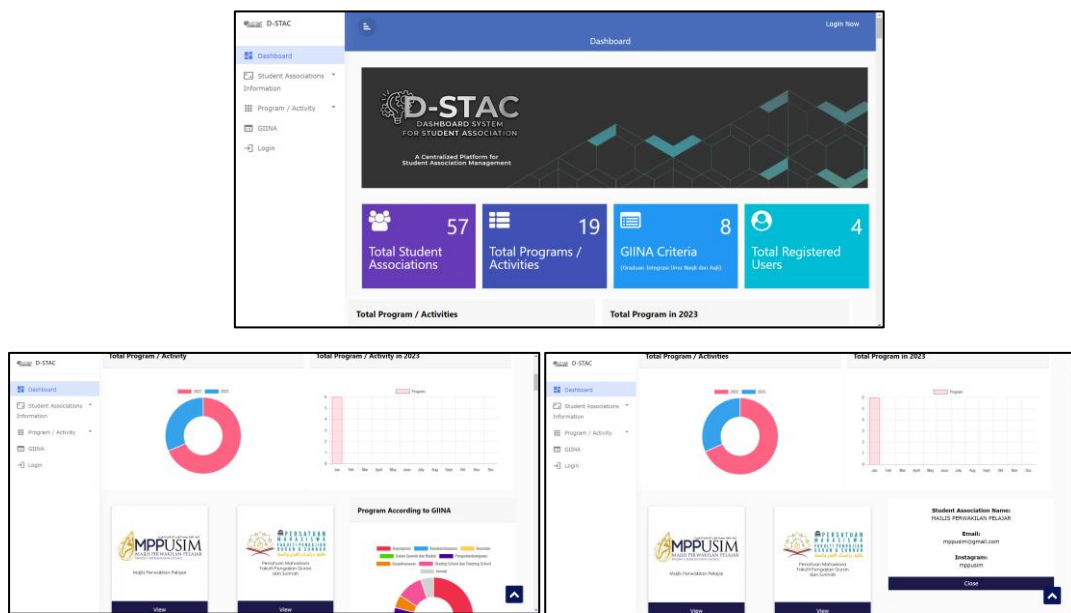


Figure 12. Dashboard interface.

3.4 Findings from System Testing

3.4.1 User Acceptance Testing (UAT)

User Acceptance Testing has been performed by the end user before it is released to the public via an online preliminary survey to determine if the system meets the requirements or not. It aims to validate whether the system is ready to use, and it meets the user's expectations. This survey has been conducted among 32 USIM students and three USIM staff admin representing the role of registered users and the public, and staff from the Student Affairs field as shown in Figure 12. Based on the findings, 86% of the respondents are satisfied while 14% of them are very satisfied with the D-STAC system as it is successfully achieved its requirements.

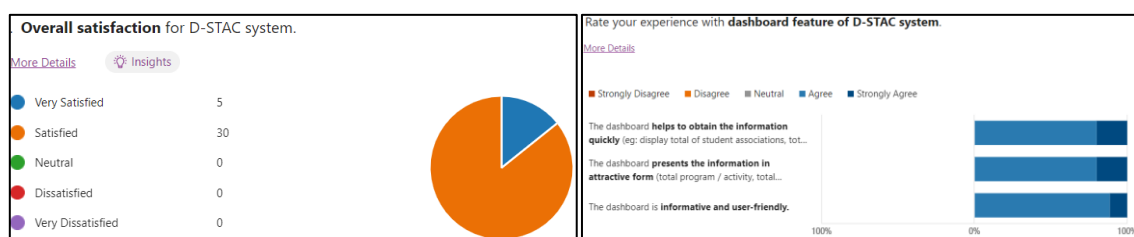


Figure 12. UAT results.

3.4.2 Penetration Testing

Web apps have been used widely in education, e-commerce, etc., yet many of them are deployed with critical vulnerabilities that can be exploited. Hence, web vulnerability scanners have been widely utilized to test the security of web applications (Balume Mburano & Si, 2018). D-STAC system undergoes penetration testing using OWASP ZAP. It is an open-source security scanner specifically for the web to automatically find security vulnerabilities in web applications. Figure 13 shows the penetration testing result. Based on the result, the D-STAC system only has one issue for medium vulnerability severity represents a missing anti-clickjacking header. This can be concluded that it is less severe.

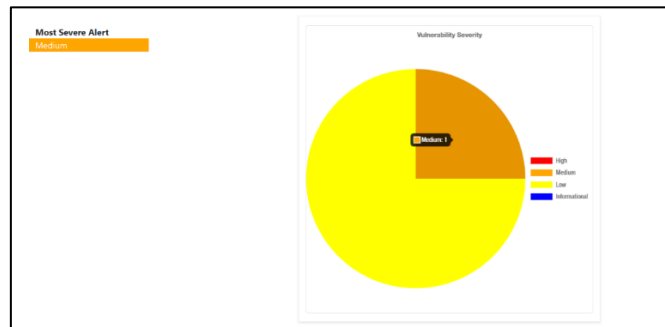


Figure 13. Penetration testing result.

4. DISCUSSION

The aim of study was to investigate the student association management in university. The findings indicate that students do not know student associations that are available under Student Affairs Division. Besides, there are various platforms that have been used to obtain student association information and activity. The process of manually gathering the information consumes a lot of time and led to repetitive task if the information is not properly documented. D-STAC system that act as one-stop platform helps to centralize student association information and activity with a dashboard as a unique feature to ease the management of student association and enhance user engagement.

D-STAC system provides student association information, activity announcement, submission of paperwork and report and GIINA criteria features. This system can be enhanced with the additional scopes for the future work which are:

- i) Add filtering features for the program announcement.
 - Providing the user to filter the program based on year, month, and also by student associations.
- ii) User is able to set the program/activity to announce within a specific time.
- iii) Add more graphs or charts that are clickable to improve the dashboard.
- iv) Provide a notification through the registered email to notify the users.
 - Program/activity organized by student associations.
 - Notification alerts send to the user once the status of the submitted paperwork/report is updated.
- v) Admin is able to upload to the student the corrected version of the submitted paperwork/report.

In a conclusion, D-STAC system gives significant impact to the students and staff in university to easily manage the student association information and activity and encourages the university

towards digitalization. D-STAC can be commercialized and improves user experience in student association management and support Shift 1 in Malaysia Education Blueprint. This web-based system can be used by all universities to manage student association information and activity effectively.

5. CONCLUSION

The dashboard helps to ease the management of student associations in university by providing the information in a simplest and attractive form which can increase user engagement. The user is enabled to obtain the information quickly such as total student associations, total program/activity, and others. The main findings from the User Acceptance Testing show that majority of respondents which are 86% are satisfied while 14% of them are very satisfied with the system. This proposed system also received positive feedback as an alternative for student association management. Moreover, D-STAC aligns with Shift 1 in Malaysia Education Blueprint to develop the holistic graduates and GIINA model that employs by the Universiti Sains Islam Malaysia (USIM) organization. D-STAC also supports the Sustainable Development Goals (SDGs) by reducing the use of paper and saving the tree by utilising the cloud storage. D-STAC can be commercialized for any university organization specifically in the student affairs division to promote sustainable communities. Therefore, D-STAC system that acts as a one-stop platform that is centralized student association information and activity, will improve the process of obtaining the information, avoid repetitive tasks and saves a lot of time. In summary, D-STAC helps student and Student Affairs Division staff on the systematic student association management and encourages the university towards digitalization.

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