International Journal of
Advanced Science Computing and Engineering

Journal Homepage www.ijasce.org/index.php/ijasce

Multiple Events and Multiple Users Tabulation System with E-Certificate Generation

Benjamin L. Cornelio Jr. [a,*], Rowena S. Borcelo [a], Nordy D. Siason Jr. [b]

[a] College of Information and Communication Technology, Iloilo State University of Fisheries Science and Technology, Iloilo, Philippines
[b] Iloilo State University of Fisheries Science and Technology, Iloilo, Philippines

Corresponding author: [*]bj_cor18@hotmail.com

***Abstract*— This study was conducted to help the Cultural Office of the Iloilo State University of Science and Technology (ISUFST) Dingle Campus by developing a system to make contest tabulation faster and more accurate. The problem is that most of the events or contests still use a paper and pen or manual tabulation. This system is called the MEMU Tabulation System with e-certificate generation, it sends email confirmations to certify that judges were present and participated, ensuring fairness and transparency. The researchers used a developmental research method so the system could be improved in the future based on the needs of the Cultural Office. To make sure it met quality standards, the system was evaluated using the ISO 25010 framework, which checks important aspects like usability, reliability, and functionality. For the evaluation, the researchers asked for feedback from 10 IT experts and 40 users. These users were cultural event coordinators, faculty members, staff, and judges with experience in local pageants. Their opinions were gathered to see how well the system worked and how easy it was to use. The results were very positive. The system earned a score of 4.89, which is considered "Excellent." This means the MEMU Tabulation System is highly reliable, easy to use, and meets the expectations of its users. It shows that the system can help simplify and improve the way contest results are handled. Overall, the study demonstrates how the MEMU Tabulation System can benefit cultural events at ISUFST Dingle Campus by making the process more efficient, accurate, and fair for everyone involved.**

***Keywords*— Electronic certificates; multiple events; multiple user; tabulation system.**

Manuscript received 15 Oct. 2024; revised 8 Feb. 2025; accepted 12 Mar. 2025. Date of publication 30 Apr. 2025.

I. INTRODUCTION

In the modern era, managing data efficiently is vital for organizations and institutions. A core tool for achieving this is a tabulation system, which organizes and presents data in a structured and clear manner, enabling informed decision-making.

Cultural contests are a valuable aspect of education, encouraging intellectual development, collaboration, and creativity among participants. These events showcase skills, critical thinking, and talents across various disciplines. With rapid technological advancements, the landscape of academic contests has evolved significantly. Integrating technology into these events promotes efficiency, sustainability, and better communication while fostering innovation and teamwork.

Relying on manual tabulation for academic activities presents challenges such as time consumption, human error, and limited scalability. Manual methods require considerable effort to collect and calculate scores or attendance, making them prone to inaccuracies. Errors in data entry or calculations can undermine the event's fairness and credibility, which this study seeks to address.

Tabulation systems have become an essential tool in today's digital world, especially for events like pageants. For instance, Afable and Quiloña [1] designed and evaluated an automated tabulation system tailored for pageants in the local government of Can-avid, Eastern Samar, Philippines. Similarly, Agoylo Jr.'s Dynamic Event Tabulation System [2] brought innovation to event management at SLSU by introducing a web-based platform that simplifies and streamlines scorekeeping. This user-friendly system ensures accurate and efficient results, enhancing the overall experience. The only main difference is that this study integrates electronic certificates. Another specific study by Orioque Web-based Scoring System [3] focuses more on the pageant event and offers a tabulation system with faster and more accurate results; however, Multi-Event Tabulation System has a wider scope for events.

Today's systems can communicate with the server in multiple channels simultaneously for data entry and modification. This is possible in the majority of the systems observed in this study, regardless of the concurrent occurrence. Mission, R. S.'s study, Multi-channel support and ticketing interface for online support management system [4], and another study by Mission, R. S. Online Support Management System for University of Antique [5], multiple users can log in to different events, or contests is also supported by this.

According to Orioque, J.A.'s Contextualized Online Document Management System [6], creating reports by printing and utilizing paper can take up a lot of space. Similarly, by removing the need to produce large quantities of paper, a paperless system for report generation can streamline the process. It might be helpful in tabulation or scoring systems for many occurrences in addition to managing reports and document monitoring.

The Multi-Event Tabulation System can generate online digital certificates for all the judges. The issuance of online or digital certificates has been in demand, especially during the COVID-19 pandemic. Many people are connected online, and others are trying to gain knowledge by enrolling in short courses or seminars that are legitimate. This idea of giving a digital certificate is shown in the study of A. T. Radeef Application to Send Certificates of Participation in The Workshops of Al-Maarif University College [7].

With this idea, many people can just create a digital certificate. Adding a digital signature or algorithm adds an extra feature to the electronic certificate for legitimacy that is based on the study of Somsuk, K. [8] and with supplemental support about the survey on Digital certificates Approaches by G. Karopoulos [9]. Authentication system for e-certificate by using RSA's digital signature. These focuses on different application and purpose. Although an electronic certificate can be sent in a similar manner via the Multi-Event Tabulation System, this study focuses on events that are not included in the other study and attempts to address issues in other application.

The Multi-Event Tabulation System builds on existing solutions, offering flexibility for various events like cultural contests and pageants. Its customizable settings allow organizers to adjust criteria to match the specific requirements of different competitions, making it a practical and adaptable tool for event management.

The researchers have introduced the Multi-Event Multi-User (MEMU) Tabulation System to overcome the issue about manual tabulation, specially designed for academic use. This system makes managing events easier, more accurate, and more efficient. Key features include: (1) the ability to create and customize competitions with unique criteria, rate participants, and automatically compute scores, (2) generating rankings and final results, (3) exporting summary reports in PDF format, and (4) emailing certificates of appreciation and attendance directly to judges via their registered email addresses.

II. Material and Method

This study used a prototyping approach or methods in software development, a process where early versions of the software, or prototypes, are created. These prototypes are not fully functional but serve as initial models to shape the final product. Prototyping provides several advantages that includes the ability to gather early feedback from users, which helps developers and designers make necessary adjustments. It also allows both clients and developers to align expectations and ensure the software meets agreed-upon standards. Furthermore, this approach aids in evaluating whether project timelines and milestones are realistic and achievable. Below are the following phases using prototyping methodology.

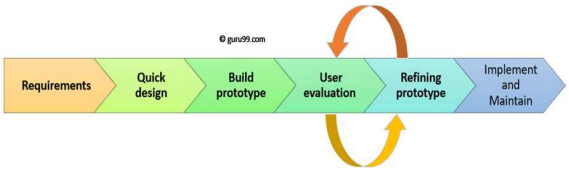

Fig. 1 Prototyping Process Flow

The process flow of a prototype methodology is shown in Figure 1. This illustrates the many phases of development that this study will go through, starting with requirements and ending with implementation and maintenance.

A. Requirements gathering and analysis

Analyzing requirements is the first step in a prototyping model. The system's needs are thoroughly determined during this phase. Interviews with system users are conducted throughout the process to learn about their expectations.

B. Quick design

A rapid or preliminary design is the second stage. At this point, the system's basic design is developed. It is hardly a comprehensive design, though. It provides the user with a quick overview of the system. Prototype development is aided by the speedy design.

C. Build a Prototype

Based on the data acquired from rapid design, an actual prototype is created at this step. It is a miniature operational model of the necessary system.

D. Initial user evaluation

At this point, the client is shown the suggested system for a preliminary assessment. Determining the working model's strengths and weaknesses is beneficial. Customer comments and suggestions are gathered and sent to the developer.

E. Refining prototype

If the user is dissatisfied with the present prototype, you must make changes based on their comments and recommendations.

This stage won't end until all of the user's needs have been satisfied. A final system is created based on the approved final prototype if the user is pleased with the developed prototype.

F. Implement Product and Maintain

Following development of the final system using the final prototype, it undergoes extensive testing before going into production. Regular maintenance is performed on the system to save downtime and avoid major malfunctions.

G. Respondents of the Study

The study was conducted at the Dingle campus of the Iloilo State University of Fisheries Science and Technology

(ISUFST), located in the scenic province of Dingle, Philippines. The college is known for its commitment to towards academic excellence, particularly in fields like agriculture and technology, ISUFST Dingle offers a variety of programs that cater to students interested in careers across several disciplines, including agriculture, hospitality, and information technology.

This study is focus on the university's frequent held of different events and contests, that is currently relying on manual methods for tabulating results. This process is time-consuming and demands considerable effort from both staff and participants, often leading to delays and inefficiencies. The study aims to improve this by developing a more efficient, automated tabulation system. This new system will speed up the process that can also provide automated certificate generation, reducing the workload for staff and enhancing the accuracy and efficiency of event management for ISUFST and similar institutions.

H. Research Instrument

The system was evaluated using the ISO 25010 criteria for software development. These criteria set the standards for the software's functional suitability, reliability, performance efficiency, operability, security, compatibility, maintainability, and portability.

I. System Design and Development

The system was designed using a combination of technologies to ensure it is robust, efficient, and user-friendly.

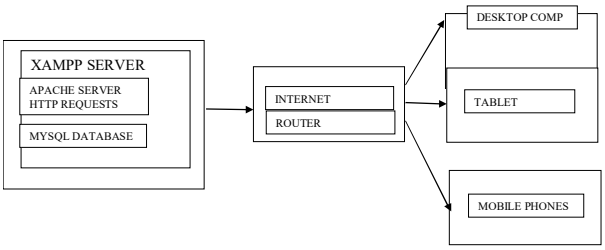

Fig. 2 System Layout

Figure 2 depicts the system's layout. This is the illustration of the tools, equipment, or other items that will be needed to put the method into practice. The system will include a data or record store unit and a server capable of handling HTTP requests. Either the local network or the internet can be used to access the system. The system or server can be accessed using the Uniform Resource Locator, Internet Protocol, or Domain Address.

J. Server and Database

A web server solution stack package that includes Apache, MySQL, PHP, and Perl. XAMPP was used to create a local server environment for development and testing. The web server component of XAMPP, which handles HTTP requests and serves web pages to users. The database management system used to store all data related to events, participants, judges, scores, and certificates.

K. Development Tools

The system was created by using combined tools and technologies to ensure robustness, efficiency, and user-friendliness. The Atom text editor was utilized for the coding part, it provides a flexible environment for writing and editing code in various programming languages. HTML was used to create the structure and design of the web pages, while CSS was employed to describe the presentation of the web pages, ensuring they are visually appealing and responsive. JavaScript was used to create interactive and dynamic elements on the web pages, and jQuery, a fast, small, and feature-rich JavaScript library, was implemented to simplify HTML document traversal, event handling, and animation.

For back-end development, PHP was used as a server-side scripting language to handle the application's logic sequence, process user requests, and interact with the MySQL database. It has AJAX technique for creating asynchronous web applications, it was implemented to allow seamless data exchange between the server and client without reloading the entire page. MySQL was used to support with PHP to manage database operations or processes. The system was integrated with Gmail functionality to automate in the sending of electronic certificates to judges, ensuring efficient generation and email distribution, thus reducing manual effort.

With these integration and combination of the different tools and technologies allows the system to handle various tasks related to event management, including participant registration, score tabulation, and certificate generation. The use of PHP and MySQL for back-end development ensures the system can manage large volumes of data securely and efficiently. The front-end technologies ensure the user interface is easy to use and accessible. It provides an ease experience for all users by integrating Gmail, the system automates the process of sending electronic certificates, further streamlining event management tasks.

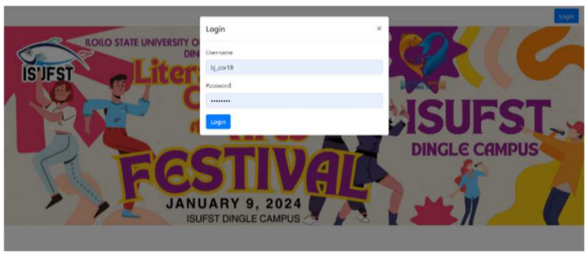

Fig. 3 Admin and Judges Log in Page

Figure 3 shows the system's log in page for the admin and for the judges. This interface where in the system can Identify what type of account is being logged in. It can direct the user to its correct landing page once the user is logged in successfully.

Fig. 4 Admin main menu page

Figure 4 illustrates the main menu page for the system's administrator. This interface allows the admin to carry out different tasks, that include creating and managing judge accounts, setting up judges' tables, monitoring user accounts, and entering competition details. The admin can go through these options to effectively manage the competition's logistical aspects.

Fig. 5 Adding Judges Accounts

The procedure for the administrator to add or create a judge account is shown in Figure 5. The administrator can enter the judge's account information in this interface, including the judge's email address to be used for electronic certificate submissions and password to be configured. With the help of this feature, every judge will have a safe and unique account for the competition.

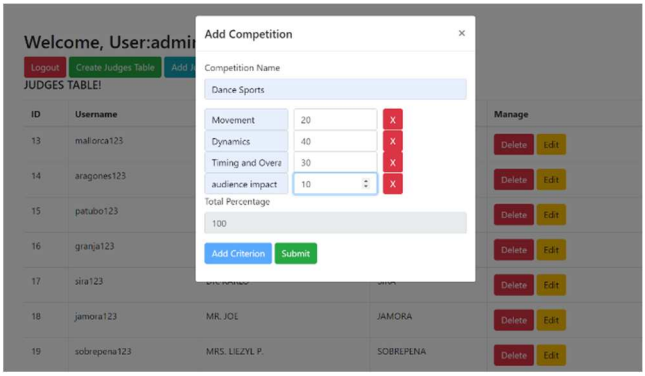

Fig. 6 Adding Competition and Criteria

Figure 6 illustrates the process for adding a competition by the system's administrator. This interface gives the admin to input the competition's name and details, such as the criteria and their corresponding percentages or points. It displays total percentage to make sure that the accuracy for calculation. This ensures that all aspects of the competition are clearly defined and managed within the system.

Figure 7 illustrates the various contests or events created within the system. The administrator can view and edit the details of each event, as well as deleting or removing specific contests. This page gives the admin with a direct approach in managing the contest details, ensuring efficient monitoring and in controlling of events.

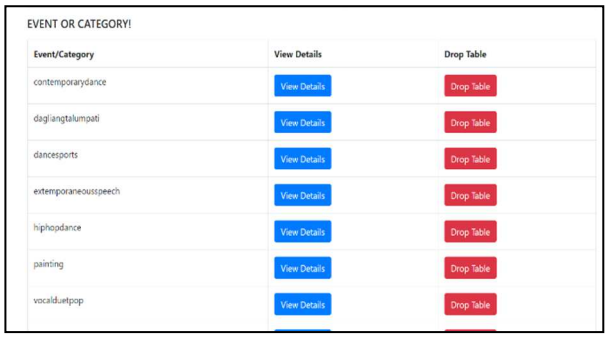

Fig. 7 Listing of all Events or Contests

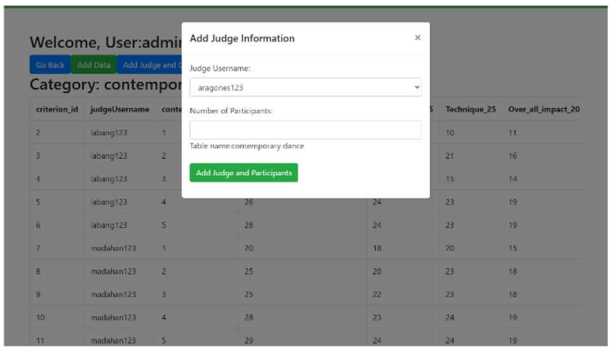

Fig. 8 Events Details

Figure 8 illustrates the details of each event. In this interface, the administrator can view the specifics of each competition. The admin can add judges to particular events by selecting from the database of all judges. Additionally, the administrator can specify the number of participants or contestants for each event. This functionality ensures comprehensive management of event details and judge assignments.

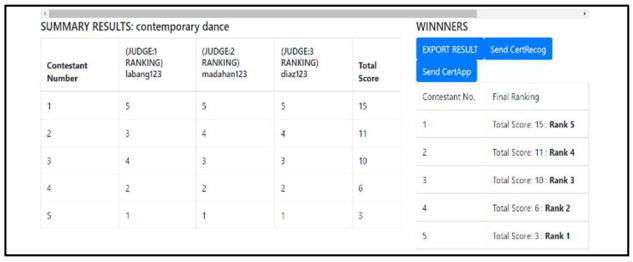

Fig. 9 Summary Results

Figure 9 illustrates the calculations for the competitions. It displays summary results, including the rankings assigned by each judge for each contestant. In addition, it can display the total score for each contestant and their final ranking. On this page, the administrator can view a comprehensive summary of the results for each contest.

Figure 10 illustrates the printable or detailed summary of the results. The PDF file includes the name of the event or contest, the list of judges, and the ratings given by each judge. It also displays the final ranking results for the event. Additionally, the document provides spaces for the judges' signatures and verification by the chair for tabulation, ensuring the authenticity and accuracy of the results.

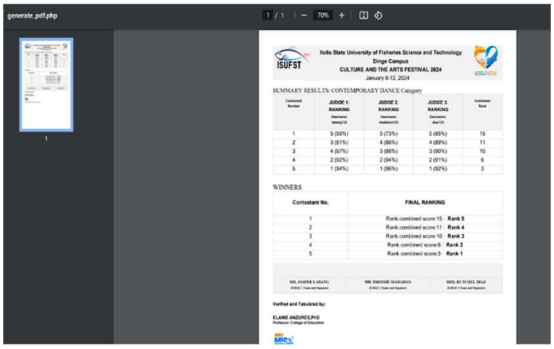

Fig. 10 PDF result

Fig. 11 Designing the E-certificate

Figure 11 illustrates the system has the ability to generate and modify electronic certificates. Before being uploaded to the system in the primary format for the certificate for the specific event or contest, the generated electronic certificate can be exported as a PNG file. The electronic certificate will be used as a template to give the judges the certificate of recognition or appreciation after it has been posted to the server.

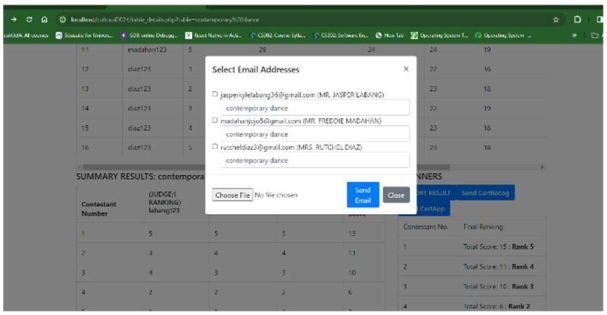

Fig. 12 Sending Email

Figure 12 illustrates that the administrator can send electronic certificates, like the certificates of appearance or recognition. This interface allows the administrator to view the list of email addresses for each judge, making sure that the valid email addresses are collected when creating judge accounts. This functionality facilitates the efficient distribution of electronic certificates to judges.

Figure 13 illustrates the process of judges receiving emails with attachments, such as certificates of recognition and certificates of appearance. Each judge will receive an acknowledgment email for the specific event or contest, ensuring they are duly recognized and have official documentation for their participation.

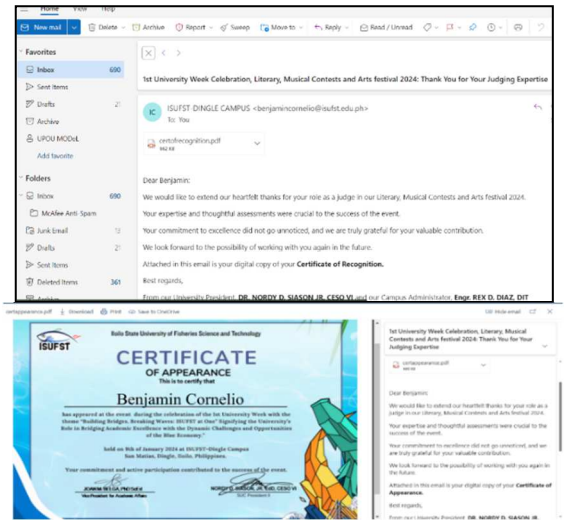

Fig. 13 Receiving Emails

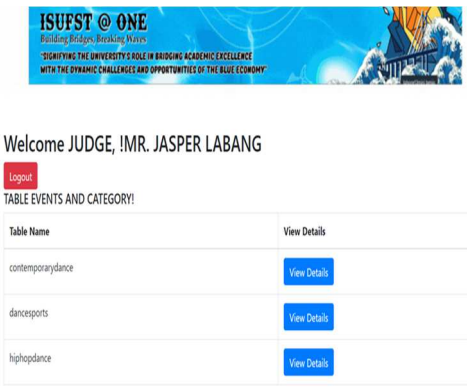

Fig. 14 Judges Menu

Figure 14 illustrates the main menu once a judge logs into the system. The judge can see a list of all events assigned to their account. They can view the names of the events and check the details of each event, that provides the complete overview of their judging responsibilities.

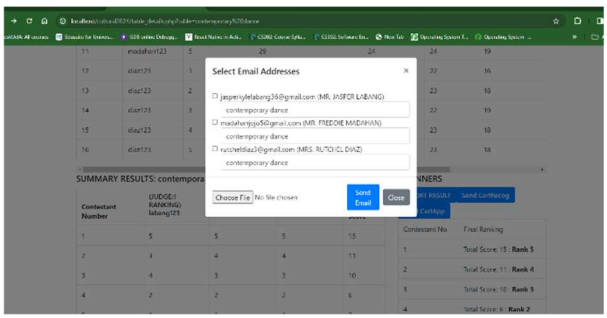

Fig. 15 Event Scoring

Figure 15 illustrates the event scoring interface for judges. In this interface, the judge can see the name of the event and the list of contestants. The judge can score each contestant, view the total score, and see the corresponding ranking. This ensures a clear and organized method for judges to evaluate and rank participants.

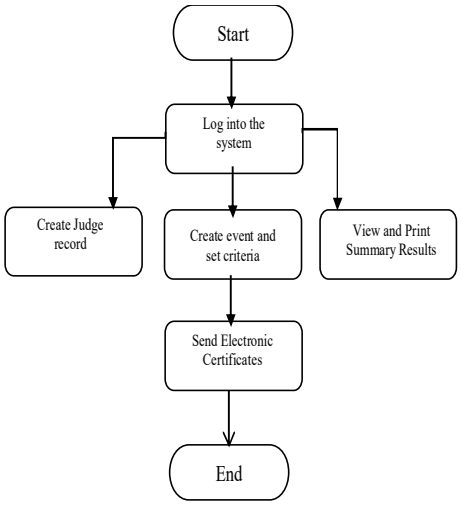

Fig. 16 Administrator Flow-chart

Figure 16 depicts the process flowchart for the system administrator. This interface displays various tasks performed by the administrator, such as creating judges' records and setting criteria for the event or contest titles.

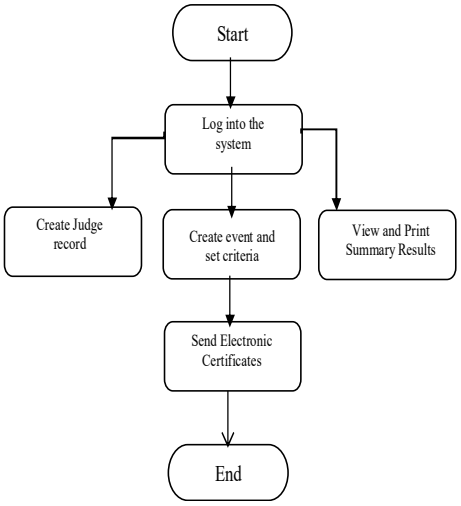

Fig. 17 Judges Flow-chart

Figure 17 illustrates the process flowchart for a judge user. This interface shows the various tasks a judge performs, such as viewing different categories, rating each contestant in each category, and viewing the summary of results.

III. Results and Discussion

The Systems and Software Engineering – Systems and software Quality Requirements and Evaluation (SQuaRE), also known as ISO 25010, was used to evaluate the quality of the MEMU Tabulation system. During the assessment procedure, the investigators took into account the opinions of ten recognized IT specialists and forty intended end users, who were specifically chosen from cultural event organizers, educators, and judges with local pageant experience. The evaluation's findings unequivocally demonstrate that the system is an extremely useable, high-quality system with an excellent rating of 4.89. Table I: Summary of Results according to ISO 25010.

TABLE I
SUMMARY OF RESULTS BASED ON ISO 25010

ISO 25010 Criteria	IT Expert	Interpretation	Other Personnel (Faculty, educators, organizers, judges)	Interpretation	Group Mean	Interpretation
Functional Suitability	4.86	Excellent	4.70	Excellent	4.78	Excellent
Maintanability	4.72	Excellent	4.70	Excellent	4.71	Excellent
Performance Efficiency	4.75	Excellent	4.75	Excellent	4.75	Excellent
Compatibility	4.85	Excellent	4.82	Excellent	4.84	Excellent
Reliability	4.78	Excellent	4.85	Excellent	4.82	Excellent
Usability	4.85	Excellent	4.92	Excellent	4.89	Excellent
Security	4.84	Excellent	4.86	Excellent	4.85	Excellent
Portability	4.84	Excellent	4.88	Excellent	4.86	Excellent
Over-all Mean	4.81	Excellent	4.81	Excellent	4.83	Excellent

The results show that the IT experts' overall evaluation of the system's software quality based on ISO 25010 criteria was excellent, with an overall mean of 4.81. Specifically, the ratings for functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability were all excellent, with scores of 4.86, 4.75, 4.85, 4.85, 4.78, 4.84, 4.72, and 4.84, respectively. IT experts acknowledged the system's usability, compatibility and functionality, these criteria show that the system can perform all required task with accuracy of its functions. The system can also share resources and can be easily be access throughout the environment. Also about its ability to work reliably and securely in different platforms. It emphasizes the system's usability, showing that it is accessible and user-friendly. It mentioned that it needs to incorporate more advanced and secure algorithms for improvements.

The results from other personnel, including faculty, educators, organizers, and judges, also showed an excellent evaluation of the system's software quality, with an overall mean of 4.81. Its ratings for functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability were 4.70, 4.75, 4.82, 4.92, 4.85, 4.86, 4.70, and 4.88, respectively. It shows appreciation for the portability, security, and usability of the system. The fact that these customers show such enthusiasm for the system's usability suggests that it is both visually appealing and easy to use. The results also show that the user gave the portability requirement a high mean score, suggesting that the system is easy to set up and flexible enough to work in a variety of environmental conditions. The reliability mean, which indicates that problems or defects may be readily fixed and that the system may be used and operated correctly, should also be carefully considered. The system's outstanding performance across a range of measures and good interoperability demonstrate how advantageous it was for their needs.

Overall, the system's software quality characteristics based on ISO 25010 criteria were rated as excellent, with a group mean of 4.83. The highest ratings were for usability, compatibility, and security, with scores of 4.89, 4.84, and 4.85, respectively. It shows that the system is somehow secure, it is user-friendly, and adaptable to various platforms and devices. Having the excellent ratings, IT experts emphasizes the need for continuous improvement and incorporating a more advance features, recognizing that technology is always evolving and offering new possibilities.

IV. Conclusion

The following conclusions are provided based on a comprehensive presentation, discussions, interpretation, and analysis of the study findings: The MEMU Tabulation system, designed and developed for the Cultural Office of the Iloilo State University of Science and Technology Dingle Campus, demonstrates significant functional utility. The system's primary objective is to create a system that can customize the competition in terms with the criteria, generate accurate and faster results for various contests, it can also print summary results in a PDF form and can provide email certification of judges' presence and participation. The research adopted a developmental approach to accommodate potential expansions based on the specific needs of the Cultural Office.

During the First University Week at the ISUFST Dingle Campus, the system was deployed and utilize. Before the cultural event or contest proper, the technical staff set up the network connection for fast and reliable connection. The server is configured and properly setup for seamless integrations and performance. Prior to the competition proper, the system was tested. The contest or category, details of the judges, and different criteria in each competition have been entered in the server in advanced. During the competition the system was able to perform the necessary functionalities needed in the cultural events. There were no technical issues experienced, from logging in by the judges or administrator, to the rating of each judges, up to the printing of summary of results. It was fast, reliable and accurate.

The evaluation of the MEMU Tabulation system was conducted using the ISO 25010 standard, involving feedback from 10 IT experts and 40 end users, including cultural event coordinators, faculty, staff, and experienced local pageant judges. The results revealed that the system is highly usable, achieving an excellent overall rating of 4.89.

Key factors influencing the system's effectiveness include the interference and the distance of the network router to each client computers, the client can either connect to the server via Wi-Fi connection or wired connection however, in some instance if there is interference and data congestions in the network can affect the transmission of data. It also considers the performance of computer processors, and other hardware components. The system is effective in creating a more flexible event with customizable criteria. The system can also produce a printable summary results for effective evaluation and verification by the tabulators. Electronic email certification can be sent reliably using the internet to each judges for paperless certificate issuance. The MEMU Tabulation system leverages efficient algorithms to ensure rapid and accurate tabulation, contributing to its high usability and reliability ratings.

For future improvements, network connectivity would further enhance the system's accessibility making it more secure and reliable. Embedding an editable electronic certificates that user can customize the design and content of the electronic certificates. Adding password encryption in the electronic certificates would enhance the security and effectivity of such process or approach as suggested by the IT experts.

In conclusion, the significant impact of the created system based on the testing and after the deployment was effective and reliable. Since most of the events or contests in the school or other community are still in manual process, with this paperless tabulation system, it eliminates the use of paper. With this system it minimizes the rigorous process in creating the criteria of a contest or event. The impact of this system timely and significant, it promotes sustainability, effectivity and efficiency. the MEMU Tabulation system not only meets but exceeds the ISO quality criteria, demonstrating exceptional performance, usability, and reliability. It stands as a valuable tool for the Cultural Office, significantly improving the efficiency and accuracy of contest results tabulation while ensuring secure and verifiable participation of judges.

Acknowledgment

The author acknowledges the provision of the infrastructure facilities required to complete the work, from Iloilo State University of Fisheries Science and Technology-Dingle Campus, Philippines.

References

[1] S. M. Afable and J. D. G. Quiloña, "Multi user Automated Pageant Tabulation System," *International Journal of Engineering and Advanced Technology*, vol. 9, no. 3, pp. 733–736, Feb. 2020, doi:10.35940/ijeat.B3833.029320.

[2] J. C. Agoylo, A. B. Kaindoy, F. M. V. Caliao, and D. S. Lintao, "Development of Dynamic Event Tabulation System," *Journal of Emerging Technologies and Trends*, 2024.

[3] J. A. Orioque, J. Cabardo, and H. D. Selpa, "Web-based Scoring System," in *2021 Second International Conference on Innovative Technology Convergence (CITC)*, Dec. 2021, pp. 33–37, doi:10.1109/CITC54365.2021.00014.

[4] R. S. Mission, "Multi-channel support and ticketing interface for online support management system platforms," *International Journal of Applied Science and Engineering*, vol. 18, no. 4, pp. 1–9, 2021, doi:10.6703/IJASE.202106_18(4).006.

[5] R. Mission, "Online Support Management System for University of Antique," *Journal of Innovative Technology Convergence*, vol. 2, no. 2, pp. 39–52, Jun. 2020, doi: 10.69478/jitc2020v2n2a05.

[6] J. Orioque, S. Pajaron, and J. Cabardo, "Contextualized Online Document Management System," *Journal of Innovative Technology Convergence*, vol. 6, no. 1, pp. 65–74, Apr. 2024, doi:10.69478/jitc2024v6n2a07.

[7] A. T. Radeef, M. R. H. Al-Dahhan, and S. J. Mohammed, "Application to Send Certificates of Participation in The Workshops of Al-Maarif University College," in *2022 International Congress on Human-Computer Interaction, Optimization and Robotic Applications (HORA)*, Jun. 2022, pp. 1–3, doi:10.1109/hora55278.2022.9799845.

[8] K. Somsuk and M. Thakong, "Authentication system for e-certificate by using RSA's digital signature," *TELKOMNIKA (Telecommunication Computing Electronics and Control)*, vol. 18, no. 6, pp. 2948–2955, Dec. 2020, doi: 10.12928/telkomnika.v18i6.17278.

[9] G. Karopoulos, J. L. Hernandez-Ramos, V. Kouliaridis, and G. Kambourakis, "A Survey on Digital Certificates Approaches for the COVID-19 Pandemic," *IEEE Access*, vol. 9, pp. 138003–138025, 2021, doi: 10.1109/access.2021.3117781.