**The Development of Tourism Monitoring System for Bolinao**

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***Abstract*** *-* People continue to transition to the technology offered by the digital world. The transition to manual process to online process is evident because of the COVID-19 pandemic. Although tourism was halted prior to the pandemic, it continues to recover again together with new applications based on technology of the current era. The researchers developed Tourism Monitoring System for the Tourism Office of the Municipality of Bolinao which can monitor the tourist movement in tourists sites and establishments. Subjective sampling was used by the researchers in identifying the required respondents that helped in the finalization of the research. Interviews were conducted in the office of tourism in Bolinao to understand their current process regarding tourist data collection. The researchers used Scrum Model as the methodology for the web system development. GitHub was used as a collaborative tool that helped in the development of the web system through creating secured repositories that easily helps the researchers in backing up the web system and cloning it for testing. The findings has shown that the overall weighted mean of the web system is 3.78 which translates as acceptable in areas of the system such as Functionality, Reliability, Usability, Efficiency, Maintanability, and Portability. The developed features of the web system would provide the necessary data to the tourism office of Bolinao in order to monitor tourist activities in different sites and establishments. Further studies must be conducted to enhance the features of the web-application.

***Keyrwords***- GitHub, Repositories, Tourism monitoring system

**INTRODUCTION**

The tourism industry has experienced tremendous growth in recent years (Richards G., 2018). Such a massive leap has been partly attributed to the rapid development of communication and information technology across the globe as well as the widespread use of the internet, which has simplified the process of accessing large amounts of global data from potential tourism on points of interest, travel plans, and destinations. These systems allow tourists, local or international, to pave undemanding and facile ways on their desired destinations.

The Internet has a better influence on making a tourism spot popular, it is one of the factors that also gives a positive impact in tourism.

Tourism in Bolinao, Pangasinan is being recognized with every day that passes. It is one of the most famous destinations in the province of Pangasinan because it has numerous tourism spots that people would love to see and experience.

The average number of tourists visiting varies according to the season and the current travel restrictions. Due to the pandemic, average tourist arrivals have dropped significantly in the last two years. According to a statistical data requested by Erika, A. (2022), The average domestic tourist arrival pre pandemic was around 150,395 and around 518 is recorded to be of foreign visits. These figures dropped significantly around the year 2020, when total tourist arrivals in Bolinao were estimated to be around 10,712 total visitors. As per the year 2021, tourist arrivals had recovered by almost 529% (56,763 total tourist arrivals) because of the less travel restriction in both domestic and foreign travel.

Famous tourist spots in Bolinao are the following: Patar White Beach, Bolinao Falls, Enchanted Cave, and Cape Lighthouse (Bolinao Tourism, 2019). These spots attract tourists and numerous business owners. More than 88 establishments are registered in the Department of Tourism (DOT) for different kind of services (Bolinao Tourism, 2022). Among these establishments, 44 were offering Mabuhay Accommodation. Mabuhay Accommodation refers to services such as Tourist Inns, Motels, Beds, Vacation Homes, and Hotels. The remaining establishments composes of around 35 resorts that are closer to the beach spots of Bolinao. The remaining number then offers restaurant or food services.

On major days like holidays and summer seasons, Bolinao experiences heavy traffic in tourism activities. It causes inconvenience to visitors which can result in negative reviews in the locale.

Providing a website that has information on the historical traffic of a tourist destination would be knowledgeable to guests and tourists. This will be effective in decision making and policy making of LGUs especially in Bolinao.

A Tourism Monitoring System is a system designed to help manage the flow of visitors. It is a dynamic and responsive system, and it addresses the challenges of managing the records, missing records due to human errors, etc. (Shruti S., 2021).

The development of this web system would result in a more modern method of monitoring tourist traffic in specific destinations or areas, particularly in the Bolinao area.

This study can further help the growing demand of visitors to have more knowledge on what Bolinao tourism has to offer with the help of the latest web technology and frameworks proposed.

**METHODS**

The study involved the personnel of tourism office in the Municipality of Bolinao in developing the web system. Input Process Output (IPO) Model was created by the researchers to create a better understanding of the project goals, workflow, and direction of the development of the web system. Figure Shows the project’s IPO.

Figure 1: Input Process Output Framework Model.

|  |
| --- |
| **INPUT** |
| **Knowledge Requirements**   * Research on the background of the proposed study. * Review on related studies and literatures * Brainstorming   **Software Requirements**   * Identification of tools that will be used in the project (Microsoft Visual Code, Laravel PHP, Figma, Trello etc.)   **Hardware Requirements**   * Processor: Core i3/ Ryzen 3 * Disk space: 10 Gigabyte (GB) * Memory: 4 Gigabyte (GB) RAM   Network Interface Card with RJ-45 cables / Wi-Fi |
| **PROCESS** |
| **Initiation**   * Identify existing process in the system. * Identify user requirements. * Identify & Assign scrum roles.   **Planning and Estimation**   * Product Backlog Creation. * Sprint Initiation. * Initial Prototype and Design. * Create process workflow. * Scrum Board Creation.   **Implementation**   * Sprint Implementation. * Coding / Development of system. * Sprint Iterations.   **Reviewing**   * Scrum Meeting. * Testing of System. * Bug-fixes.   **Releasing**   * Deployment of the system.   (optional) Retrospective Meeting. |
| **OUTPUT** |
| **Tourism Monitoring System for Bolinao** |

The researchers used the Scrum Model in the development of the web system. Scrum is an Agile framework that is fast, flexible, adaptable and effective. It creates an environment of open communication, shared responsibility, and continuous improvement in developing the web system. Figure 2 shows the Scrum Model.

Diagram

Description automatically generatedFigure 2: Scrum Model.

This study used descriptive research  to determine the level of acceptability of Tourism monitoring system.

Interviews were conducted to the personnels of tourism office of Bolinao to gather enough data for better understanding of the existing process in the office related to tourism data collection. Internet research were also used to collected data to help in developing the base of the web system.

Subjective sampling was utilized by the researchers to determine the sample size of the respondents. The respondents of the study composes of – twenty-five (25) local respondents, twenty-five (25) end-users, two (2) tourist officers of LGU in Bolinao, and three (3) IT Expert of PSU - Alaminos City Campus. The fifty-five (55) subjectively chosen respondents helped in the validation of the developed web system. The researchers created a survey questionnaires adapted from ISO 9126-1 McCall (1997) for the acceptability test that aims to determine the quality and effectiveness of the application.

The researchers then used a Likert Scale to measure the acceptance level of the respondents towards the study. Table 1 shows the illustration of the rating scale including its descriptive ratings.

|  |  |  |
| --- | --- | --- |
| Scale | Range | Descriptive Rating |
| 4 | 3.26 – 4.00 | Acceptable |
| 3 | 2.51 – 3.25 | Moderately Acceptable |
| 2 | 1.76 – 2.50 | Fairly Unacceptable |
| 1 | 1.00 – 1.75 | Poorly Unacceptable |

**RESULT AND DISCUSSION**

The researchers sent a letter of intent to the tourism office of the Municipality of Bolinao for data gathering, product backlog creations, and system validation. Based on the gathered data, the tourism office collects tourist data through two monitoring techniques observed – (a) Manual Data Collection through registration forms, and (b) Google Forms. This two(2) techniques used is then compiled by the assigned technician to make sure that the collected data is accurate. After the encoding of the compiled data, the tourism office send this collected data to the Department of Tourism (DOT) for further analysis.

With the existence of the two monitoring techniques, the workload in the office is deemed to be inefficient time-wise. Additionally, the geographical location of selected tourist sites and establishments in Bolinao makes the compiling of this collected data to be time consuming specially to remote places that require island hopping. Moreover, the monitoring techniques may result to duplicate data incase the guests filled up both the registration form manually and through Google Forms.

**Features of the Developed Web System.**

The features of the developed Tourism Monitoring System are:  Online Registration of Users with OTP,  Live Dashboard of registered sites/establishments, Live Monitoring Map, Booking entry to preferred sites/establishments, Manual booking entry for staff accounts, Notifications for all users(normal and staff), and Generation of Reports

Upon completion of the web system, survey questionnaires were given to fifty-five (55) evaluators including the personnels of tourism office of Bolinao. Table 2 Shows the perception of the evaluators on the web system’s functionality. The system's functionality is rated by respondents with an overall mean of 3.8, which translates as Acceptable. In terms of suitability, the functions of the system are appropriate, with a total average weighted mean of 3.9, which translates to Acceptable. The measured data can be used by the tourism office for data appropriateness. In terms of accuracy, Tourism Monitoring System has a total average weighted mean of 3.78, which translates to Acceptable. The Tourism Monitoring System adheres to existing standards and policies with total average weighted mean of 3.74, which translates as Acceptable. For security, the system prevents unauthorized access with an average weighted mean of 3.76, which translates to Acceptable.

Table 2: System Evaluation According to Functionality.

|  |  |  |
| --- | --- | --- |
| FUNCTIONALITY | Mean | Description |
| 1. Suitability – The functions of the system are appropriate. | 3.9 | Acceptable |
| 2. Accuracy – The system’s results are accurate. | 3.78 | Acceptable |
| 3. Compliance – It adheres to existing standards and policies. | 3.74 | Acceptable |
| 4. Security – It prevents unauthorized access. | 3.76 | Acceptable |
| Weighted Mean | 3.8 | Acceptable |

Table 3 depicts users' perceptions of the web-application's dependability as evaluators. The web-application received a 3.56 mean, which translates to Acceptable, in terms of maturity, which states the minimal frequency of software faults and failures. This means that application errors are less likely to occur. In terms of fault tolerance, the web application received a mean of 3.72. This indicates that the application can handle system errors. The application received a mean of 3.76 for recoverability, indicating that it can easily recover its performance in the event of an error. The Tourism Monitoring System's overall weighted mean is 3.68, which is marked as Acceptable.

Table 3: System Evaluation According to Reliability.

|  |  |  |
| --- | --- | --- |
| RELIABILITY | Mean | Description |
| 1. Maturity – There is a minimum frequency of software faults/failures. | 3.56 | Acceptable |
| 2. Fault Tolerance – The system can handle system errors. | 3.72 | Acceptable |
| 3. Recoverability – System’s performance is re-establishing from failure. | 3.76 | Acceptable |
| Weighted Mean | 3.68 | Acceptable |

Table 4 shows users’ perceptions as evaluators of the application's usability. According to understandability, which states that the concepts incorporated in the application are easy to recognize, the application garnered a mean of 3.87. This shows that the words, icons, and buttons added to the web-application are easy to understand. In terms of learnability, the application garnered a mean of 3.72. This states that the processes occurring in the application are easy to understand. For operability, the application garnered a mean of 3.83 which states that the controls and different interfaces are easy to navigate. The overall weighted mean of the application is 3.82, marked as Acceptable.

Table 4: System Evaluation According to Usability.

|  |  |  |
| --- | --- | --- |
| USABILITY | Mean | Description |
| 1.Understandability – Concepts are easily recognized. | 3.87 | Acceptable |
| 2. Learnability – The system’s functions are easy to learn | 3.76 | Acceptable |
| 3. Operability – The system is easy to use or operate. | 3.83 | Acceptable |
| Weighted Mean | 3.82 | Acceptable |

Table 5 depicts users’ perceptions as evaluators of the web-application's efficiency. According to its time behavior, which states a fast response time from server to end-user, the application garnered a mean of 3.85. This means that the response time in sending and receiving data from server to end-users of the web-application is Acceptable. The application garnered a mean of 3.81 in terms of resource behavior. This states that the data inputs for the web-application are easy to provide. The overall weighted mean of the application is 3.83, marked as Acceptable.

Table 5: System Evaluation According to Efficiency.

|  |  |  |
| --- | --- | --- |
| EFFICIENCY | Mean | Description |
| 1. Time Behavior – There is a fast response time in the system. | 3.85 | Acceptable |
| 2. Resource Behavior – Resources used for system performance are accessible. | 3.81 | Acceptable |
| Weighted Mean | 3.83 | Acceptable |

Table 6 depicts users' perceptions of the web application's maintainability as evaluators. The application garnered a mean of 3.78 for its analyzability, which states that failures are easily identified. This means that the application does its job of informing the user about errors in the application's processes. The web-application’s changeability, which states as, effort in modifying the system garnered a mean of 3.74. It demonstrates that modifying the web-applications requires less effort. The application received a mean of 3.67 for stability. This indicates that the web-application's resources are simple to modify. The application's overall weighted mean is 3.73, which is marked as Acceptable.

Table 6: System Evaluation According to Maintainability.

|  |  |  |
| --- | --- | --- |
| MAINTANABILITY | Mean | Description |
| 1. Analyzability – There is less effort in identifying system failure causes. | 3.78 | Acceptable |
| 1. Changeability – Effort in modifying the system. | 3.74 | Acceptable |
| 1. Stability – Sensitivity to modification. | 3.67 | Acceptable |
| Weighted Mean | 3.73 | Acceptable |

Table 7 depicts users' perceptions of the web application's portability. The respondents rate the system's portability as Acceptable, as evidenced by an overall mean of 3.82. With an average weighted mean of 3.74, which translates as Acceptable, specification changes in the system are simple. In terms of Installability, there is an easy process deploying the web-application, with an average weighted mean of 3.87, which translates as Acceptable. The web-application conforms to portability standards with an average weighted mean of 3.85, which translates as Acceptable.

Table 7: System Evaluation According to Portability.

|  |  |  |
| --- | --- | --- |
| PORTABILITY | Mean | Description |
| 1. Adaptability – Specification changes are done easily. | 3.74 | Acceptable |
| 1. Installability – There is effortless process of installing the system. | 3.87 | Acceptable |
| 1. Conformance – System is compliant to portability standards. | 3.85 | Acceptable |
| Weighted Mean | 3.82 | Acceptable |

The overall weighted mean of the acceptance test is shown in Table 10.

Table 9: Overall Weighted Mean for All Respondents.

|  |  |  |
| --- | --- | --- |
| AREA | Avg. Mean | Description |
| 1. Functionality | 3.8 | Acceptable |
| 1. Reliability | 3.68 | Acceptable |
| 1. Usability | 3.82 | Acceptable |
| 1. Efficiency | 3.86 | Acceptable |
| 1. Maintainability | 3.73 | Acceptable |
| 1. Portability | 3.82 | Acceptable |
| Overall Weighted Mean | 3.78 | Acceptable |

**CONCLUSIONS**

Based on the findings, the following conclusions are drawn.

1. The existing process of the tourism office was collection of tourist data through distribution of registration forms from tourist sites and establishments. Collection of tourists’ data is done via manual collection and Google Forms. The two monitoring techniques stated has been simplified by using web-based approach to centralize the collected data more efficiently.

2. The tourism office encountered difficulties in collecting data because of how network signals are being interrupted specifically to remote areas of Bolinao that has tourist site or establishment. The developed web system offers a way to easily collect data in a more centralized way and considers the problem of network signals interruptions in other sites. The web system helps the tourism office in compiling collected data more efficiently and accurately. It is designed specifically to simplify the current process of the tourism office to make collection, encoding, compiling of data more efficient.

3. The developed web system would assist the tourism office in monitoring tourist movement via the readily available live count feature. Tourists and visitors can easily fill out their registration forms using the web system's simplified process. The system's collected data is simple to manage and organize, reducing the workload of the tourism office. In addition, the web system reduces the statistician's workload by verifying the accuracy of the collected data.

4. Based on the results of the proponent's survey, the weighted mean in terms of functionality, reliability, usability, efficiency, maintenance, and portability is 3.78, indicating that the developed web-based system is now ready for implementation by the Tourism Office of Bolinao.

It is recommended by the researchers to give hands-on training in using the web-application. Additionally, it is recommended for the staff accounts to know different action plans incase of interruptions in their assigned area. The recommended implementation procedures sought in this study will serve as a benchmark in crafting processes for the tourism office of Bolinao to conduct a more efficient, organized, and flexible monitoring of tourists’ movement or activities.

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