A Study on the Development of a Web-based Collaborative Project Management Platform

Roy I. Vera Cruz*

Abstract: This study focuses on the development of a web-based collaborative project management platform for small teams working on multiple projects. It outlines the steps from conceptualization to deployment, evaluating the platform's performance and usability using ISO/IEC 25010 software quality standards criteria. The study aims to compare evaluations among project managers, IT professionals, and end-users, providing insights into user perception and interaction. It also identifies problems encountered during system testing, aiming to refine the platform and address usability and functionality issues. The user manual was developed to provide a practical guide for users, providing instructions on how to navigate and utilize the platform effectively. The findings show a successful system implementation, with enthusiastic end-user adoption and positive endorsement from user groups.

Keywords: Web-based collaborative project management platform, Paradigm shift, Project management

1. Introduction

In today's fast-paced and interconnected world, effective project management has become a cornerstone of success for businesses and organizations across various industries. Traditional project management methods, reliant on physical documentation and localized software tools, have increasingly proven inadequate in meeting the demands of modern project teams [1]. In response to the evolving landscape of work, the integration of cloud technology and collaboration has emerged as a pivotal solution to address the challenges posed by geographical dispersion, dynamic project requirements, and the need for real-time communication [2].

Historically, project management involved a linear process with limited collaboration, where project managers meticulously planned and executed tasks with minimal real-time input from team members [3]. This approach, often referred to as the Waterfall model, was suitable for some projects but struggled to adapt to the demands of today's agile and dynamic work environments [4].

Received [December 12, 2025]; Revised [January 25, 2025]; Accepted [February 10, 2025]



17

^{*} College of Computer Studies, University of Antique, Sibalom, Antique, Philippines Email: rivc@gmail.com

With the advent of cloud computing and collaborative tools, project management has experienced a paradigm shift. Teams no longer need to be physically co-located to work seamlessly together [5]. Web-based project management platforms have emerged as a transformative solution, enabling organizations to centralize project information, foster collaboration, and facilitate real-time communication among team members regardless of their geographic locations [6].

While web-based collaboration has brought significant benefits, it has also introduced its own set of challenges. Small teams working on multiple projects, in particular, face difficulties related to resource allocation, task tracking, communication, and data security [7]. Existing project management platforms may not adequately address the specific needs of these teams, prompting the need for a tailored solution.

This study is motivated by the recognition of the increasing importance of web-based collaborative project management platforms and the need for tailored solutions for small teams. In today's competitive landscape, the efficiency and productivity of project teams are directly linked to their ability to collaborate effectively and leverage cloud technologies [8]. Therefore, the development of a platform specifically designed to meet the unique requirements of small teams working on multiple projects has the potential to bring substantial benefits, including enhanced efficiency, improved productivity, and streamlined project management processes.

This study endeavors to design and develop a web-based collaborative project management platform that addresses the challenges faced by project management teams, ultimately aiming to empower them with the tools needed to achieve their project objectives efficiently and effectively. By focusing on the integration of collaboration and cloud technology, this project seeks to contribute to the ongoing evolution of project management practices and better equip organizations to thrive in the modern business landscape.

This study aims to develop a web-based collaborative project management platform. Specifically, it seeks to answer the following questions:

- 1. What are the steps undertaken in the development of the web-based collaborative project management platform?
- 2. What is the difference in the evaluation of the project managers, IT professionals, and endusers on the web-based collaborative project management platform based on ISO/IEC 25010 software quality standards in terms of the following: functional suitability, performance efficiency, compatibility, usability, reliability, security, and maintainability?
- 3. What is the difference in the evaluation of the developed web-based collaborative project management platform among the three groups of respondents?
- 4. What are the problems encountered by the respondents in the web-based collaborative project management platform during system testing from the perspective of project managers, IT professionals, and end-users?
- 5. What user's manual can be developed in the use of a web-based collaborative project management platform?

2. Methodology

This chapter provides the overall structure for the method and procedures used in the conduct of the study. It discusses the research method used, the population frame sampling scheme, the subject of the study, the instrumentation, the data collection and procedures, and the statistical treatment of data.

2.1 Research Design

The study utilized the developmental and descriptive type of research. For the development of the web-based collaborative project management platform, the agile methodology was utilized, integrating the modified stages of the software development life cycle (SDLC) waterfall model. The linear and sequential phases of SDLC waterfall model that includes requirements conceptualization, design, development, pilot testing, creation of user manual, and evaluation were modified to feature iteration of necessary phases to allow client-oriented and well-structured system development.

On the other hand, the descriptive research design allows for an in-depth analysis of variables and elements of the population to be studied as well as the collection of large amounts of data in a highly economical way. It enables the generation of factual information about the study. This is so because the descriptive design relies much on secondary data, which helps in developing the case based on facts, sustained by statistics and descriptive interpretations from archival materials and data.

2.2 Research Locale

The University of Antique (UA) is a public university in the Philippines that offers undergraduate and graduate programs in various fields of study. The university was established in 1951 as the Antique School of Arts and Trades and later became a state college in 1978. In 2001, it was converted into a university by virtue of Republic Act No. 9153. The university has five campuses located in the towns of Sibalom, Hamtic, Tibiao, Caluya, and Libertad. The university aims to provide quality education, research, extension, and production services to the people of Antique and beyond.

2.3 Respondents of the Study

Since this study will evaluate the system aspects of the web-based collaborative project management platform of the University of Antique, the respondents of the study are the project managers, IT professionals, and end-users.

The project managers are key stakeholders in the successful execution of projects and can provide valuable insights into the development and improvement of a web-based collaborative project management platform. Their involvement as respondents helps ensure that the platform is tailored to the specific needs and requirements of the organization and its project management practices.

IT professionals as respondents on the web-based collaborative project management platform are essential for ensuring that the platform aligns with the technical requirements, security standards, and integration needs of an IT-focused organization like UA. Their input can help optimize the platform for IT projects and ensure its smooth operation within the company's IT ecosystem.

The end-users are key stakeholders in the successful implementation and ongoing use of a web-based collaborative project management platform. Their feedback is invaluable for shaping the platform to meet their needs, enhance usability, and ensure that it aligns with the organization's objectives. By involving end-users as respondents, UA can make informed decisions to optimize the platform for its users and maximize its effectiveness.

2.4 Population and Sampling

The population for this research was the project managers, IT professionals, and end-users on the system aspects of the web-based collaborative project management platform of the University of Antique. A total of 50 respondents were included in the study, divided into three groups chosen purposively: they are composed of 5 project managers, 15 IT professionals, and 30 end-users.

The purposive sampling, a non-probability sampling technique, was used that selects samples based on characteristics of a population and the objective of the study. This type of sampling can be very useful in situations when you need to reach a targeted sample quickly and where sampling for proportionality is not the main concern.

2.5 Research Instrument

The research instruments that were used in this study are a questionnaire, an unstructured interview, and document analysis that is designed in such a way as to collect the required information in a clear and efficient manner.

The content of the questionnaire was adopted from the International Organization for Standardization (ISO), which developed the ISO 25010 software quality standards. The software product quality model describes the internal and external measures of software quality. The questionnaire designed for the study will be subjected to a validation process.

In addition, an unstructured interview was conducted with the MIS director. It is one of the most flexible and widely used methods for gaining qualitative information about experiences, views, and feelings; it can be thought of as a guided conversation. This research method is a particularly good tool for gaining detailed information where the research question is open-ended in terms of the range of possible answers.

Moreover, the documents gathered from the MIS office were analyzed to support and strengthen the data gathering of the study. It includes the various procedures involved in analyzing and interpreting data generated from the examination of documents and records from the MIS office that are relevant to project management.

2.6 Data Gathering Procedure

A questionnaire that aims to draw out proper responses on the objectives of this study was developed and validated. The questionnaire was presented to a research panel to ensure the validity of the responses it would elicit.

Data that will be gathered from the answered questionnaires will be checked, classified, tabulated, and analyzed according to the described research design in using IBM Statistical Package for the Social Science (SPSS) and prepared for a final presentation to the experts of different fields of specialization. Confidentiality will be guaranteed for the survey questionnaire.

2.7 Data Analysis Procedure: Statistical Treatment

The data that was gathered, tabulated, analyzed, and properly summarized. The frequencies and percentages were employed for each of the items that were categorized and presented in tables with data and results treated using the following statistical measures:

The *weighted mean* shall be employed to weigh the respondents' answers on the questionnaire that is intended to be administered. The formula to calculate the weighted mean is depicted in equation 1.

$$WM = \frac{\sum fx}{N} \tag{1}$$

where:

WM = weighted mean

 $\Sigma fx = \text{sum of product of frequency by midpoint}$

N = total number of cases

The *five-level Likert scale* is a rating scale that requires the subject to indicate his or her degree of agreement or disagreement with a statement. To determine the corresponding descriptive equivalent, the responses of the respondents were quantified using the scale depicted in Table 1.

Rating	Scale	Verbal Description (VD)
5	4.50-5.00	Highly Acceptable
4	3.50-4.49	Acceptable
3	2.50-3.49	Moderately Acceptable
2	1.50-2.49	Inacceptable
1	1.00-1.492	Highly Inacceptable

 Table 1. Five-Level Likert Scale

3. Results and Discussion

This section outlines the findings, analyses, and interpretations of the data collected. The data is presented in both textual and tabular formats, utilizing statistical methods for analysis and interpretation. The presentation of the data follows the same order as the research questions posed in Section 1.

3.1 Steps Undertaken in the Development of the Web-based Collaborative Project Management Platform

Figure 1 presents the stages undertaken in the development of a web-based collaborative project management platform. Stage 1 shows the conceptualization and defining of requirements of a web-based collaborative project management platform. The developer identifies the problems, gathers all the information needed to develop the system, and understands the customer requirements and expectations of the end product. The developer conducted an interview with the IT managers and investigated the company's present IT infrastructure. In this stage, after all the information and business requirements are gathered, the functional requirements of the web-based collaborative project management platform are then defined. The various development tools were also decided to be used in developing the system.



Figure 1. Stages Undertaken Using Agile Methodology

Stage 2 depicts the design phase where the requirements were turned into logical design models. That is, the software's architecture, components, data structures, modules, and user interfaces were outlined to ensure that the web-based collaborative project management platform efficiently meets the defined requirements and functions.

In Stage 3, known as the development phase, with the input from the system design phase, the user interface was developed, the system was divided into small modules or programs called units, and each module or program was coded and tested, which were then integrated. The development and evaluation of the web-based collaborative project management platform use the Symfony 1.4 framework, the YUI Library, and jQuery for its front end. The Symfony 1.4 framework is a mature PHP framework known for its Model-View-Controller (MVC) architecture, which enforces clean code organization. It provides structure and tools to build complex web applications efficiently, as shown in Figure 2. YUI Library (Yahoo! User Interface Library) is a JavaScript library that offers pre-built widgets (*i.e.*, buttons, menus, etc.) and utilities for tasks like Document Object

Model (DOM) manipulation and event handling, simplifying the creation of rich web interfaces. On the other hand, jQuery is a widely used JavaScript library that streamlines how you interact with HTML documents. It excels at DOM manipulation, event handling, animations, and AJAX, making it a favorite for adding interactivity and dynamism to websites.



Figure 2. Model-View-Controller (MVC) architecture

Then, MySQL was used for the implementation of the system's back end. It is the most popular open source relational SQL database management system. MySQL is one of the best RDBMS being used for developing web-based software applications.

After the development phase is done, Stage 4, or the testing phase, begins. The developed webbased collaborative project management platform was installed for testing. The system was tested whether it can produce the required reports, the bugs and errors are corrected, and the units are well-coordinated with each other to meet the requirements specification.

Stage 5 focused on creating the user manual, where a step-by-step procedure for operating the web-based collaborative project management platform was outlined. The user manual is provided as a guide for the maintenance of the system.

After the deployment of the system, Stage 6, or systems evaluation, takes place, where the web-based collaborative project management platform will be evaluated by IT professionals, project managers, and end-users.

3.2 Evaluation of the Web-based Collaborative Project Management Platform by Respondents using ISO/IEC 25010 Quality Standards

The researchers used the weighted mean to analyze the quality of the newly developed webbased collaborative project management platform in terms of functional suitability, performance efficiency, compatibility, usability, reliability, security, and maintainability.

Sub-	Project Managers		IT Professionals		End-users	
Characteristics	Mean	VD	Mean	VD	Mean	VD
Functional completeness	4.50	Highly Acceptable	4.30	Acceptable	4.54	Highly Acceptable
Functional correctness	4.67	Highly Acceptable	4.50	Highly Acceptable	4.62	Highly Acceptable
Functional appropriateness	4.17	Acceptable	4.10	Acceptable	4.54	Highly Acceptable
Total	4.44	Acceptable	4.30	Acceptable	4.56	Highly Acceptable

Table 2. Evaluation of Respondents in Terms of Functional Suitability

Table 2 demonstrates a positive evaluation of the web-based collaborative project management system's functional suitability. End-users expressed the highest satisfaction, consistently rating the system higher than project managers and IT professionals and achieving an overall "Highly Acceptable" rating. While project managers and IT professionals found the system "Acceptable," their responses still indicate a satisfactory level of functionality. Specifically, end-users were most pleased with the system's functional completeness (4.54), followed by project managers (4.50) and IT professionals (4.30). All user groups rated functional correctness highly ("Highly Acceptable"), signaling minimal errors. Additionally, end-users found the system most appropriate for their needs (4.54), highlighting its suitability for their workflows. Overall, the data indicates a positive reception of the system's functionality. While slight variations in satisfaction levels exist among the user groups, the core functional capabilities appear to be sound, particularly from the end-users' perspective.

Sub-	Project Managers		IT Professionals		End-users	
Characteristics	Mean	VD	Mean	VD	Mean	VD
Appropriateness	4.17	Highly Acceptable	3.95	Acceptable	4.51	Highly Acceptable
Learnability	4.33	Highly Acceptable	4.05	Acceptable	4.28	Acceptable
Operability	3.67	Highly Acceptable	3.80	Acceptable	4.00	Acceptable
Total	4.05	Highly Acceptable	3.93	Acceptable	4.26	Acceptable

Table 3. Evaluation of Respondents in Terms of Performance Efficiency

Table 3 reveals an overall positive evaluation of the web-based collaborative project management system's performance efficiency. All user groups (*i.e.*, project managers, IT professionals, and end-users) rate the system as "Acceptable," indicating satisfactory speed, resource usage, and workload handling. Notably, end-users are most satisfied, rating "time behavior" as "Highly Acceptable" and consistently scoring the system higher than the other groups. This highlights their positive experience with the system's responsiveness and timely results. All groups rate resource utilization similarly, implying reasonable usage of hardware and network resources. However, project managers and IT professionals express slightly lower ratings for the system's capacity, suggesting potential areas for optimization when handling heavier workloads. Overall, the data indicates the system performs well, particularly in terms of the end-user experience, with some room for improvement to better support the capacity needs of project managers and IT professionals.

Sub- Characteristics	Project Managers		IT Professionals		End-users	
	Mean	VD	Mean	VD	Mean	VD
Co-existence	4.67	Highly Acceptable	3.95	Acceptable	4.41	Acceptable
Total	4.67	Highly Acceptable	3.95	Acceptable	4.41	Acceptable

Table 4. Evaluation of Respondents in Terms of Compatibility

Table 4 reveals positive compatibility ratings from all user groups. Project managers were most enthusiastic, rating the system as "Highly Acceptable," with a mean score of 4.67. IT professionals and end-users, while both offering "Acceptable" ratings, had slightly lower mean scores of 3.95 and 4.41, respectively. This indicates that the system integrates smoothly with existing technology, minimizing disruptions.

Sub-	Project Managers		IT Pr	ofessionals	End-users	
Characteristics	Mean	VD	Mean	VD	Mean	VD
Appropriateness	4.83	Highly Acceptable	4.30	Acceptable	4.67	Highly Acceptable
Learnability	4.67	Highly Acceptable	4.35	Acceptable	4.59	Highly Acceptable
Operability	4.83	Highly Acceptable	4.35	Acceptable	4.59	Highly Acceptable
User error protection	4.67	Highly Acceptable	4.05	Acceptable	4.44	Acceptable

Table 5. Evaluation of Respondents in Terms of Usability

A Study on the Development of a Web-based Collaborative Project Management Platform

User interface aesthetics	4.33	Acceptable	4.10	Acceptable	4.62	Highly Acceptable
Accessibility	4.50	Highly Acceptable	4.20	Acceptable	4.51	Highly Acceptable
Total	4.64	Highly Acceptable	4.23	Acceptable	4.57	Highly Acceptable

Table 5 demonstrates generally positive usability ratings for the web-based collaborative project management system. All user groups (project managers, IT professionals, and end-users) consider the system usable. Project managers and end-users show the highest satisfaction, rating it as "Highly Acceptable" (with scores of 4.64 and 4.57, respectively). Their positive ratings highlight strengths in the system's appropriateness, operability, and the appeal of its user interface. However, IT professionals indicate slightly less enthusiasm, rating the system as "Acceptable" overall. Specifically, they express lower satisfaction with user error protection and accessibility, signaling potential areas for improvement. The data indicates the system is fundamentally usable, but refinements targeting user error prevention and accessibility could further enhance the experience for IT professionals.

Sub-	Project Managers		IT Professionals		End-users	
Characteristics	Mean	VD	Mean	VD	Mean	VD
Maturity	4.33	Acceptable	4.30	Acceptable	4.46	Highly Acceptable
Availability	4.50	Highly Acceptable	4.25	Acceptable	4.41	Acceptable
Fault tolerance	4.17	Acceptable	4.10	Acceptable	4.23	Acceptable
Recoverability	4.00	Acceptable	3.95	Acceptable	4.59	Highly Acceptable
Total	4.25	Acceptable	4.15	Acceptable	4.42	Acceptable

Table 6. Evaluation of Respondents in Terms of Reliability

Table 6 shows an overall positive evaluation of the web-based collaborative project management system's reliability. All user groups (*i.e.*, project managers, IT professionals, and end-users) rate the system as "Acceptable" in terms of maturity, availability, fault tolerance, and recoverability. Interestingly, end-users express slightly higher satisfaction with a mean score of 4.42, compared to project managers (4.25) and IT professionals (4.15). End-users particularly perceive the system's recoverability as strong (4.59), indicating they believe it can effectively restore functionality following disruptions. While project managers and IT professionals still view reliability favorably, they express slightly lower satisfaction with recoverability (with mean

scores of 4.00 and 3.95). This suggests potential for improvement in how quickly the system can bounce back after failures. The results show that the system is considered reliable, but optimizing its recovery mechanisms could further enhance the experience, particularly for project managers and IT professionals.

Sub-	Project Managers		IT Professionals		End-users	
Characteristics	Mean	VD	Mean	VD	Mean	VD
Confidentiality	4.83	Highly Acceptable	4.55	Highly Acceptable	4.54	Highly Acceptable
Integrity	4.33	Acceptable	4.50	Highly Acceptable	4.44	Acceptable
Non-repudiation	4.00	Acceptable	4.10	Acceptable	4.33	Acceptable
Accountability	4.17	Acceptable	4.30	Acceptable	4.41	Acceptable
Authenticity	4.50	Highly Acceptable	4.50	Highly Acceptable	4.51	Highly Acceptable
Total	4.37	Acceptable	4.39	Acceptable	4.45	Acceptable

Table 7. Evaluation of Respondents in Terms of Security

Table 7 reveals a positive assessment of the web-based collaborative project management system's security features. All user groups (*i.e.*, project managers, IT professionals, and end-users) rate the system as "Acceptable" overall with strong "Highly Acceptable" ratings in specific areas. Notably, the system's confidentiality and authenticity receive particularly high marks, inspiring confidence in the protection of sensitive information and the ability to verify user identities. End-users express the highest level of satisfaction with system security (with a mean score of 4.45), followed closely by IT professionals (with a mean score of 4.39). While non-repudiation and accountability receive slightly lower "Acceptable" ratings, they still indicate positive perceptions. These slightly lower ratings may suggest the possibility of minor refinements to further enhance the system's ability to prevent users from denying actions and ensure greater accountability.

Table 8 demonstrates an overall positive assessment of the web-based collaborative project management system's maintainability. All user groups (*i.e.*, project managers, IT professionals, and end-users) consider the system maintainable, with overall "Acceptable" ratings. Notably, end-users express the highest satisfaction, rating it as "Highly Acceptable" (with a mean score of 4.60), indicating their ease in maintaining the system. Project managers and IT professionals have slightly lower "Acceptable" ratings, suggesting room for potential improvement from their viewpoints. End-users perceive the system's analyzability and testability as particular strengths, finding it easy to understand and assess for maintenance. However, all groups express slightly lower satisfaction with the system's modularity, indicating potential for improved organization into smaller, more manageable components.

Sub-	Project Managers		IT Professionals		End-users	
Characteristics	Mean	VD	Mean	VD	Mean	VD
Modularity	4.17	Acceptable	4.20	Acceptable	4.67	Highly Acceptable
Reusability	3.67	Acceptable	4.35	Acceptable	4.49	Acceptable
Analyzability	4.17	Acceptable	4.15	Acceptable	4.69	Highly Acceptable
Modifiability	4.17	Acceptable	4.35	Acceptable	4.41	Acceptable
Testability	4.33	Acceptable	4.40	Acceptable	4.77	Highly Acceptable
Total	4.10	Acceptable	4.29	Acceptable	4.60	Highly Acceptable

Table 8. Evaluation of Respondents in Terms of Maintainabilit

Table 9. Overall Result of Evaluation of Respondents

ISO/IEC 25010	Project Managers		IT Pr	ofessionals	End-users		
Characteristics	Mean	VD	Mean	VD	Mean	VD	
Functional Suitability	4.44	Acceptable	4.30	Acceptable	4.56	Highly Acceptable	
Performance Efficiency	4.05	Acceptable	3.93	Acceptable	4.26	Acceptable	
Compatibility	4.67	Highly Acceptable	3.95	Acceptable	4.41	Acceptable	
Usability	4.64	Highly Acceptable	4.23	Acceptable	4.57	Highly Acceptable	
Reliability	4.25	Acceptable	4.15	Acceptable	4.42	Acceptable	
Security	4.37	Acceptable	4.39	Acceptable	4.45	Acceptable	
Maintainability	4.10	Acceptable	4.29	Acceptable	4.60	Highly Acceptable	
Overall	4.36	Acceptable	4.18	Acceptable	4.50	Highly Acceptable	

Table 9 showcases a positive overall assessment of the web-based collaborative project management system in terms of ISO/IEC 25010 software quality characteristics. All user groups (*i.e.*, project managers, IT professionals, and end-users) rate the system favorably, indicating it aligns with established standards. End-users consistently express the highest satisfaction, rating the system as "Highly Acceptable" across most categories and overall. While project managers and IT professionals also offer "Acceptable" ratings, their slightly lower scores suggest areas for potential improvement. The system particularly excels in compatibility (*i.e.*, especially from the project managers' perspective) and in maintainability (*i.e.*, from the end-users' viewpoint). Optimization opportunities exist in performance efficiency, usability, and reliability to further enhance the experience, particularly for project managers and IT professionals. Overall, the system meets ISO/IEC 25010 software quality standards, with end-users demonstrating the most enthusiastic response.

3.3 Significant Difference in the Evaluation among the Three Groups of Respondents on the Developed Web-based Collaborative Project Management Platform

To understand any variations in how respondents from different backgrounds (*i.e.*, project managers, IT professionals, and end-users) evaluated the new web-based project management platform, the researcher employed a statistical analysis technique known as ANOVA.

Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.988	2	0.494	3.164*	0.049
Within Groups	9.676	62	0.156		
Total	10.664	64			

Table 10. ANOVA Result on the Difference in the Evaluation Made by the Respondents on the

 Developed Web-Based Collaborative Project Management Platform

* p < 0.05

The result reveals a statistically significant difference in how project managers, IT professionals, and end-users evaluated the web-based collaborative project management platform. The "Sig." value (p-value) of 0.049 indicates that these differences in perception are unlikely due to chance. Analysis of the "Between Groups" and "Within Groups" variations suggests that the primary source of differing scores stems from variations between the user groups themselves, as opposed to individuals within a single group.

To pinpoint exactly which user groups (*i.e.*, project managers, IT professionals, end-users) had evaluations that significantly differed from each other, a post-hoc test known as Tukey HSD was employed.

As shown in Table 11, the Tukey HSD post-hoc analysis reveals that end-users evaluated the web-based collaborative project management platform significantly more favorably than both project managers and IT professionals. The mean differences (*i.e.*, 0.26876 for project managers,

0.16868 for IT professionals) and associated p-values indicate this difference is statistically significant. In contrast, project managers and IT professionals rated the system more similarly, showing no statistically significant difference in their evaluations. These results have important implications: prioritizing end-user feedback is crucial for further improvement, as their perceptions differ from other user groups. Further investigation, potentially through interviews or observations, is needed to understand the specific reasons behind end-users' higher ratings. By analyzing these differences, targeted improvements can be made to better address the needs of project managers and IT professionals, enhancing their experience with the system.

	(I) Pospendents	(J) Pospondonts	Mean Difference	Std.	Sig.	95% Confidence Interval	
	Respondents	Respondents	(I-J)	EIIO		Lower Bound	Upper Bound
Tukey HSD	IT Professionals	Project Managers	0.10008	0.18389	0.850	-0.3415	0.5416
		End-users	-0.16868	0.17324	0.596	-0.5847	0.2473
	Project Managers	IT Professionals	-0.10008	0.18389	0.850	-0.5416	0.3415
		End-users	-0.26876*	0.10865	0.042	-0.5297	-0.0079
	End-users	IT Professionals	0.16868	0.17324	0.596	-0.2473	0.5847
		Project Managers	0.26876*	0.10865	0.042	0.0079	0.5297

Table 11. Tukey HSD Results as Post Hoc Anal	vsis for	ANOVA
--	----------	-------

* The mean difference is significant at 0.05 alpha level.

3.4 Problems Encountered by the Respondents in the Implementation of the Web-Based Collaborative Project Management Platform

Respondents report various issues during their testing of the web-based collaborative project management platform. Performance is a major concern, with users experiencing slow system loading times, unresponsive dashboards, and occasional system freezes. Furthermore, the system is difficult to navigate, making it challenging to locate necessary features. Feedback on the visual design suggests the layout may be cluttered and unbalanced, with overly small fonts hindering usability. Finally, respondents note the lack of an email validation feature, which could lead to inaccurate data within the system.

3.5 User's Manual of the Web-Based Collaborative Project Management Platform

The researcher-developed user manual provided a comprehensive guide to the system, detailing a step-by-step process for its operation. To show some of the features of the developed web-based collaborative project management platform, the login page is shown in Figure 3, and the user dashboard is depicted in Figure 4.



Figure 3. Log-in Page of the Web-Based Collaborative Project Management Platform

SWE Project Collade	oration Pattorn					8	-	
D	4 Competence							
0	Dettored							
*********		V 36ennet +						
	A Los Anna	at 1 here		1.74	(Design By	- Dasarti		
· Server	8.9	4 5m	Computer Statements of Taxabase Property	the but	Derita	May 08, 2002 (2019)		
1, 1983	8.92	14. date:	termine .	(and	Derivate .	May 195 2024 (2148)		
E test	e 0/.	19 deer	magine	(mere)	magine.	My 18.30(+3000		
A man	+ 7	11	per	hane :	The party	Wey lot. State on one.		
	8.9	8 - 3044	San Company and an approximate	(nere)	Derive	Neg 28, 2014 2017		
the design of th	8.01	7 (beer	Party and it is a second reprinting	hand	(Perte	We rel (01.018		
il tears	8.4	10 1544	14 Running	hann .	Arrise .	May 100 2002 2010		
A Lines 1	8.2	41 - Date:	mag.	tane 1	During .	Vie-VI. 2004-0100		
t inser	Data of the later						1.1	
A								

Figure 4. Dashboard of the Web-Based Collaborative Project Management Platform

4. Conclusion

Based on the summary of findings, the following are concluded:

1. The development of the web-based collaborative project management platform followed a systematic and user-centered approach. The process emphasized understanding the client's specific needs through site visits, interviews, and analysis of existing infrastructure. This crucial information shaped the system's functional requirements and informed the selection of appropriate development tools. Design prioritized the user interface, and the system was built using established technologies (*e.g.*, Symfony 1.4 Framework, YUI Library, jQuery, and MySQL database). Thorough testing ensured quality, and the creation of a detailed user manual along with implementation support highlights a commitment to smooth adoption. This well-structured development process likely contributed to the system's positive reception and provides a strong foundation for future maintenance and enhancements.

- 2. The findings paint a picture of a successful system implementation, with enthusiastic enduser adoption and positive endorsement from other user groups. Addressing the identified areas for improvement, particularly those specific to project managers and IT professionals, can further optimize the platform and ensure it meets the needs of all stakeholders.
- 3. Statistical analysis revealed a crucial finding: project managers, IT professionals, and end-users have significantly different perceptions of the web-based collaborative project management platform. This highlights the importance of considering diverse user needs when planning future improvements. End-users expressed the most positive views, suggesting a focus on their experience is vital. Further research, like interviews or observations, can delve into the reasons behind their higher satisfaction. This understanding will inform targeted optimizations to better address the specific needs and preferences of project managers and IT professionals, who may have encountered usability challenges or require additional functionalities.

References

- [1] W. O'toole, P. Mikolaitis, "Corporate Event Project Management," vol. 8, New York: John Wiley & Sons, Inc., 2002, ISBN: 0-471-40240-0.
- [2] C. Yang, M. Goodchild, Q. Huang, D. Nebert, R. Raskin, Y. Xu, M. Bambacus, D. Fay, "Spatial Cloud Computing: How Can the Geospatial Sciences Use and Help Shape Cloud Computing?", International Journal of Digital Earth, vol. 4, no. 4, June 2011, pp. 305-329, https://doi.org/10.1080/17538947.2011.587547.
- [3] M. L. Despa, "Comparative Study on Software Development Methodologies," Database Systems Journal, vol. 5, no. 3, December 2014, pp. 37-56, https://www.dbjournal.ro/archive/17/17_4.pdf.
- [4] B. Gonen, D. Sawant, "Significance of Agile Software Development and SQA Powered by Automation," in Proceedings of 2020 3rd International Conference on Information and Computer Technologies (ICICT), San Jose, CA, USA, March 9-12, 2020, pp. 7-11, https://doi.org/10.1109/ICICT50521.2020.00009.
- [5] T. Marrinan, J. Aurisano, A. Nishimoto, K. Bharadwaj, V. Mateevitsi, L. Renambot, L. Long, A. Johnson, J. Leigh, "SAGE2: A New Approach for Data Intensive Collaboration Using Scalable Resolution Shared Displays," in Proceedings of 10th IEEE International Conference on Collaborative Computing: Networking, Applications and Worksharing, Miami, FL, USA, October 22-25, 2014, pp. 177-186, https://doi.org/10.4108/icst.collaboratecom.2014.257337.
- [6] L. Mathias, "Cloud-based Project Management: Collaborating and Tracking Progress," OSF Preprints, August 2023, https://osf.io/preprints/osf/ps827_v1.
- [7] J. Zhou, Z. Cao, X. Dong, A. V. Vasilakos, "Security and Privacy for Cloud-based IoT: Challenges," IEEE Communications Magazine, vol. 55, no. 1, January 2017, pp. 26-33, https://doi.org/10.1109/MCOM.2017.1600363CM.
- [8] W. Wu, R. R. A. Issa, "Leveraging Cloud-BIM for LEED Automation," Journal of Information Technology in Construction, vol. 17, no. 24, September 2012, pp. 367-384, http://www.itcon.org/2012/24.