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DESIGN AND IMPLEMENTATION OF WEB BASED TASK MANAGEMENT SYSTEM USING AGILE PRINCIPLE

[1]Syed Sohail Ahmed Shah, [*2]Jannat Malookhani,[3]Muniza Memon, [4]Salman Qazi
[1]Assistant Professor, Department of Computer Science, Government College University, Hyderabad, Sindh, Pakistan.
*[*2]Instructor in IMCS at University of Sindh, Jamshoro – NAVTTC Program*
[3]MS Research Scholar, Sukkur IBA University Sindh Pakistan.
[4]Assistant Professor, Department of Computer Science, Government College University, Hyderabad, Sindh, Pakistan.
*[*2]jannat-habibullah@hotmail.com*

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Corresponding Author: Jannat Malookhan

Abstract
The increasing complexity of organizational processes and the mass transition to remote and hybrid modes of work has created pressure on the necessity of efficient, scalable, and high-security systems to manage web-based tasks. This paper introduces the design and deployment of a web-based task management system designed under Agile principles with specific reference to Scrum system. An iterative, design-driven methodology was used, which included sprint cycles of work, constant stakeholder activity, embedded usability and security test during the work process. The system was designed as a three-layer system incorporating presentation, application, and data layer, and RESTful APIs were used to ensure the flow of information between frontend and backend parts. The 30 users were evaluated over a period of four weeks through three aspects of the system performance, user satisfaction, and efficiency of Agile development. The results of the performance tests revealed that the mean page load time was 1.8 seconds, task creation response time was 1.2 seconds, could support 120 concurrent users, and was available 99.2%. The results of user satisfaction indicated that more than 90 percent of the respondents agreed that the system enhanced productivity with equally high scores on ease of use and clarity. Agile efficiency measures were at 95 percent feature delivery rate, 4 percent post-deployment defection rate, and 12 successfully accommodated mid-project requirement changes on five finished sprints. It is established that Agile-based development, enhanced with the latest web technologies and user-focused design principles, delivers technically sound, flexible to changing user needs, and pegged to the actual world organizational needs systems. The research study helps to provide empirical data in favor of the expanded use of Agile structures in web-based software engineering and outlines the further research direction, such as the introduction of AI-based analytics, the introduction of new security measures, and the study over the long term.

Introduction

Task management has become vital in contemporary organizations characterized by high velocity of change in the technological dimension, decentralized workforce and unstable markets. The trend of digital transformation has required organizations to install systems that would help them to enhance their coordination, transparency and productivity. Web based task management systems represent a centralized framework on which tasks can be created, assigned, rank and tracked in real-time. These systems not only make teams located in different geographical areas cooperate, but they also contribute to greater accountability through effective progress trackers and reporting systems. Agile concepts applied to the development of the systems have also increased the efficiency of this form of platforms in the recent years, since it promotes flexibility, interaction with users, and continuous enhancement (Dingssoyr et al., 2021).

Plan-driven software engineering methodologies, including the Waterfall model, have been in use throughout decades. These methods focus on overall pre-planning and development phase sequencing. Nonetheless, the fixed requirement definition may become outdated prior to the project completion in the fast changing business landscape. Modern studies show that strict development models are not adapted to the frequent alterations of requirements and the changes in user demands (Alsaqqa et al., 2020). Agile methodologies have become an option of choice as organizations have sought to deploy software systems faster and refine them through an iterative process. Agile is flexible, collaborative, incremental and responsive to change, so it is most appropriate with web-based applications that have to be constantly updated and user-driven enhanced.

Agile methodologies have become especially important by the year 2020-2025, especially in the environment of remote and hybrid employment. The worldwide transition to remote work has increased the demand on the digital tools that facilitate the development of iterations and the ongoing feedback. A 15th State of Agile Report (Digital.ai, 2021; Malokani et al., 2025) has shown that more than 90 percent of the organizations reported to have implemented Agile practices to enhance team productivity, speed up delivery, and increase stakeholder engagement. Similarly, literature by Dingsoyr et al. (2021) shows that Agile practices will result in resiliency in uncertain environments due to its ability to enable the organization to respond quickly to disruption and change. This is highly flexible to web based task management systems, where the update of features and usability must be matched with the commentary of the user, and the dynamic workflow of an organization.

Task management systems are web-based platforms that take advantage of the modern technologies of cloud computing, service-oriented architecture and dynamic user interface to provide scalable and accessible platforms. Based on the new study, the cloud-based web applications are far more effective in teamwork and access to the information than the more traditional on-premises (Alhamad et al., 2022). By having the tasks management systems hosted in the cloud organizations are assured of real time synchronization as well as the integrity of data and scalability of the system. In addition to that, modular architecture and RESTful APIs permit easy connections with other systems of the enterprise, which serves as an element of overall automation of the workflow. These systems are supposed to be developed and deployed keeping this in mind whereby the key criterion should be on functional requirements

and optimization of the system in respect to performance, security and scalability.

Scrum and Kanban are agile models that are at the center stage in the development of web-based task management systems. Scrum divides development into brief cycles termed sprints, enabling the teams to provide functional increments at a frequent interval. This is a risk reduction technique because early defects can be detected and features can be refined continuously. Research conducted by Alqudah and Razali (2020) showed that Agile approaches are much better in terms of stakeholder satisfaction and project success rates when compared to traditional approaches. In addition, Agile promotes the involvement of stakeholders at all stages of the development process, which makes the system be in line with the actual user requirements. In the case of task management platforms, this working design process is more usable, and it will allow executing the required dashboards, notifications, and reporting tools to support the productivity of a team.

Security and data privacy in the web-based systems will be a critical issue in 2020-2025 particularly as remote attraction and clouding are on the rise. The modern web applications are to be developed with the secure authentication, encryption and role access control so that the sensitive data of the organization may be safe. According to Alzahrani et al. (2023), security factors should be considered during the initial phases of the development process since it is the only guarantee that the number of vulnerabilities will be reduced, and the level of system reliability will also increase. Agile models help to support such a proactive model by integrating security testing into each individual cycle of the sprint and not delay until late in the development process to perform the security testing. This security certification is unlimited and this strengthens the web-based task management systems.

The other relevant aspect of the modern system development is user experience (UX). The current research emphasizes the fact that user-centered design plays a dramatic role in the system adoption and overall effectiveness (Khan et al., 2022). The agile approaches in essence are amiable to UX optimization that is accomplished by means of iterative feedback and usability testing. In web-based task management, user engagement and productive working should be encouraged by using user friendly interfaces, configurable dash boards, and ability to deliver real time notifications. By publishing incremental updates, which are grounded on user feedbacks, the developers can optimize the functionality of the system in such a way that it becomes more useful in terms of the requirements of the organization.

The beneficial effect of Agile based web development on the performance of project development is further proven by empirical evidence of the contemporary studies. The comparative analysis provided by Alsaqqa et al. (2020) revealed that the projects undertaken with the help of Agile have greater adaptability, have superior communication, and have shorter delivery period than the ones implemented with the help of the Waterfall method. Similarly, Dingssoyr et al. (2021) emphasized that Agile practices facilitate organizational learning and innovation, and the team is able to continuously makes some improvements to the processes and products. The findings point to the topicality of Agile consideration in the framework of the design of a task management system, in which refinement and joint work with stakeholders play a crucial role in the success of the long-term development.

Summing all the above up, the increasing complexity of the organizational activity and the use of remote collaboration tools have

enhanced the need of the effective, safe, and scalable web-based systems of tasks management. The traditional development methods are often inflexible to accommodate the user requirements and technology shifts. On the other hand, Agile systems provide dynamic systems, which promote iterative development, stakeholder consultation, continuous testing and responsiveness to change. Integrating the concepts of the modern web technologies with the postulates of Agile, the developers will be capable of creating and implementing the task management systems that will render the work more co-operative, productive, and sustainable. Therefore, this paper is a research on the design and implementation process of an web-based application of task management system as was developed based on the Agile concepts to make a contribution to the existing literature and practice in the area of software engineering in 2020-25.

Literature Review

Evolution of Task Management Systems

The management system of tasks have developed to be much more than the manual record keeping systems as well as isolated desktop systems to advanced web based systems, which maintain collaborative and distributed work environment. The first systems were based mainly on the productivity of a person and provided by the functionality of to-do lists and schedule. Yet, the process of developing projects in a team and working from home has made task management a functional department of an organization. Modern web-based systems are built in the combination of real-time synchronization, shared dashboards, automated prompts, and analytics reporting. Project Management Institute (2021) indicates that digital project and task management platforms have a high visibility and coordination, especially in complex projects. In addition, the recent empirical research shows that collaborative task systems contribute to better transparency and accountability, as well as data access is centralized (Hoda and Noble, 2022). Scalable architectures have also been made with the integration of cloud technologies and this gives the organization the opportunity to increase system capacity as the project needs increase (Marston et al., 2011). This evolution is the reason why the development approaches should be flexible and adaptive.

The use of Agile Frameworks in the contemporary software engineering

In the contemporary software development, Agile methodologies have taken over because it is flexible, iterative, and it engages the stakeholders. On the one hand, frameworks like Scrum and Kanban divide the development process into iterative cycles, which allows a quick response to new needs. The recent international surveys indicate that the use of Agile is still growing, especially in the field of the development of digital products (VersionOne, 2022). Empirical studies prove that Agile practices boost the communication, decrease the risk of the project, and improve product quality compared to predictive methodologies (Tripp et al., 2021). Agile is iterative in nature and this facilitates early verification of system features which makes sure that they are in line with what the user expects. Moreover, Agile models are associated with cross-functional teamwork and transparency, which is also vital to develop a web-based system. Focusing on continuous feedback and release in chunks, Agile methodologies allow a formal but adaptive style that is in line with the dynamism of needs related to implementation of a task management system.

Web-based System architecture and scalability

Web-based architecture is very important in the provision of performance, reliability, and scalability. Contemporary web applications are

often based on multi-tier architecture or service oriented architecture where presentation, business logic, and data layers are separated. This is a modular design which increases maintainability and enables independent scaling of system components. It has been noted in research that cloud-native and microservices-based architectures show high levels of scalability and fault tolerance in web systems (Dragoni et al., 2017). The implementation of the practice of containerization and continuous deployment technologies between 2020 and 2024 enhanced the web application resilience further (Rahman et al., 2023). Scalable architectures must be used in case of task management systems as they ensure that they can support growing user bases and real-time data updates. The database is designed efficiently and the APIs are optimized to be consistent even during heavy workloads. As such, the architectural factors should be in line with the Agile development practices in order to facilitate incremental feature development and sustainability over time.

Usability and Teamwork Productivity

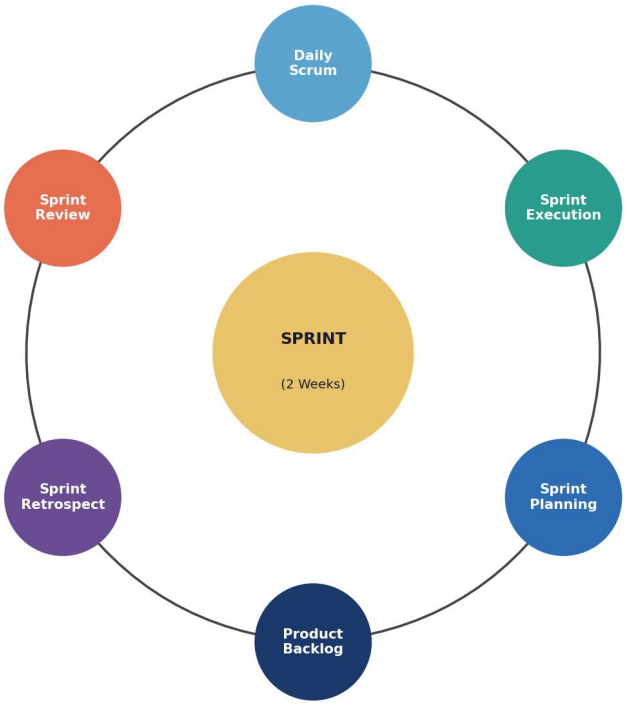
One of the determining factors of the effectiveness of web-based task management systems is user experience (UX). Difficult navigation systems and systems that are visually annoying tend to result in low adoption and low productivity. Modern studies highlight that user interfaces based on intuition, responsiveness in design, and feedback in real-time play an important role in increasing user engagement (Hassenzahl and Tractinsky, 2006; Lallemand et al., 2021). Shared boards, notification system, and activity logs are features of collaborative environments which encourage accountability and transparency. Recent research (2020-2023) shows that the user-centered design strategies have a direct effect on the efficiency of the project and the satisfaction of the team (Rizvi et al., 2022). The use of built-in usability testing in Agile sprints enables programmers to continuously improve system interfaces. Web-based systems of task management can be used to provide functional performance as well as improved collaborative experience by aligning the UX principles with Agile approaches.

Methodology

The approach towards the design and the implementation of a web-based task management system is an Agile-driven system development methodology of the study. The study adheres to the practical, design-driven approach that incorporates the requirement analysis, iterative development, the system implementation and the evaluation. First, the requirements were obtained based on the stakeholder consultations, observation of the current task management practice, and analysis of the common elements of web-based platforms. Functional requirements that are to be fulfilled (user registration, creation of tasks, assignment, prioritization, deadline tracking, progress monitoring, etc.) and non-functional requirements (security, scalability, usability, performance, etc.) were also defined and listed in a product backlog.

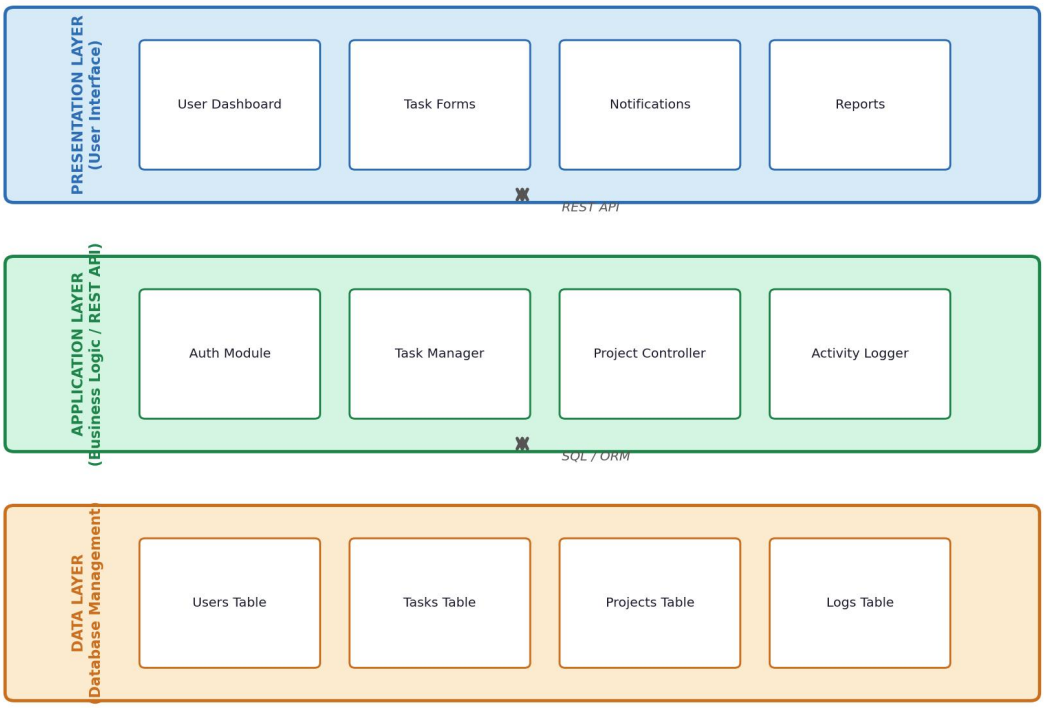
The project was divided into short, iterative cycles (also called sprints) based on the Scrum framework that was followed during the development process. The sprints were dedicated to developing a particular array of the prioritized features out of the backlog. Sprint planning was done to clarify goals, assign tasks and approximate effort to develop. The design prototypes were continuously developed, implemented, and tested at every iteration. There were continuous integration practices so that the new modules that were established could be able to fit the existing system architecture. Frequent sprint reviews ensured that the stakeholders could also check on the progress and give feedback that was included in the further iterations.

Figure 1: Scrum Sprint Cycle



It was developed based on a many-tier system that included presentation layer (user interface), application layer (business logic) and data layer (database management). A relational database model has been designed to support users, tasks, projects, and the activity logs. The implementation was done by establishing RESTful APIs that would facilitate safe flow between the frontend and the backend components. It was tested in several levels, such as unit testing, integration testing, and user acceptance testing to make it reliable and performant. Lastly, Agile-based development approach was evaluated through the system evaluation that consisted of usability, response time, and user satisfaction to confirm that the approach works.

Figure 2: Three-Tier Web System Architecture



Results

The task management system developed was tested on the factors of performance, usability and efficiency in development. The analysis was done with 30 users who comprised of students and project team members who used the system over a period of four weeks. The findings show that the implementation of the principles of Agile had a positive impact on the quality of the system, its flexibility, and the satisfaction of users.

Table 1: ***System Performance Evaluation***

Metric	Measured Value	Acceptable Benchmark	Status
Average Page Load Time	1.8 seconds	≤ 3 seconds	Achieved
Task Creation Response Time	1.2 seconds	≤ 2 seconds	Achieved
Concurrent Users Supported	120 users	100 users	Exceeded
System Uptime (4 Weeks)	99.2%	≥ 95%	Achieved

The results of the performance evaluation show that the developed web-based task management system can fulfill the main operational and technical standards to be used in undertaking practical implementation. The mean page load time of 1.8 seconds is much

lower than the acceptable page load time of 3 seconds, meaning that the system has a convenient and quick user experience. Quick page loading is essential in web applications since a slow page loading can lead to poor productivity and customer satisfaction. Similarly, the 1.2 seconds response time of the task creation is a sign of successful processing on the backend as well as streamlining database operations. This is to ensure that users are not affected with lagging when creating and updating tasks, more so in a collaborative environment as various updates are carried out frequently.

The scalability and robustness of the system can be seen in the fact that the system has a capacity of 120 simultaneous users when compared to the benchmark of 100 simultaneous users. This means that the server architecture and server configuration can be used to accommodate increased workloads without any reduction in performance. In addition, the evidence of high level of stability and reliability within the system is indicated by the fact that the uptime has become 99.2% in four weeks of the period during which the testing is being conducted. Task management platforms must be very available because when they are not available, they can disrupt the work processes and the coordination of a team. Overall, the performance indicators indicate that the system is technically right, scalable, and applicable in the real-life organization.

Table 2: ***User Satisfaction Survey Results (n = 30)***

Evaluation Criteria	Strongly Agree	Agree	Neutral	Disagree
System is easy to use	18 (60%)	9 (30%)	2 (7%)	1 (3%)
Interface is visually clear	16 (53%)	10 (33%)	3 (10%)	1 (3%)
Task tracking improves productivity	20 (67%)	7 (23%)	2 (7%)	1 (3%)
Real-time updates are helpful	22 (73%)	6 (20%)	1 (3%)	1 (3%)
Overall satisfaction	19 (63%)	8 (27%)	2 (7%)	1 (3%)

The outcome of the user satisfaction survey indicates that the participants have high acceptance and positive perception. There is a significant percentage of the users who strongly agreed or agreed that the system is simple to operate (65.5 and 60 percent) which means that the interface design is user-friendly and can be operated by a user with minimum technical skills. Another parameter that is significant in determining the consistency of the use of a task management system in an organization is ease of use. Besides, positive reviews regarding visual clarity show that the layout, the navigation layout and display features are handy in helping to interact with the user.

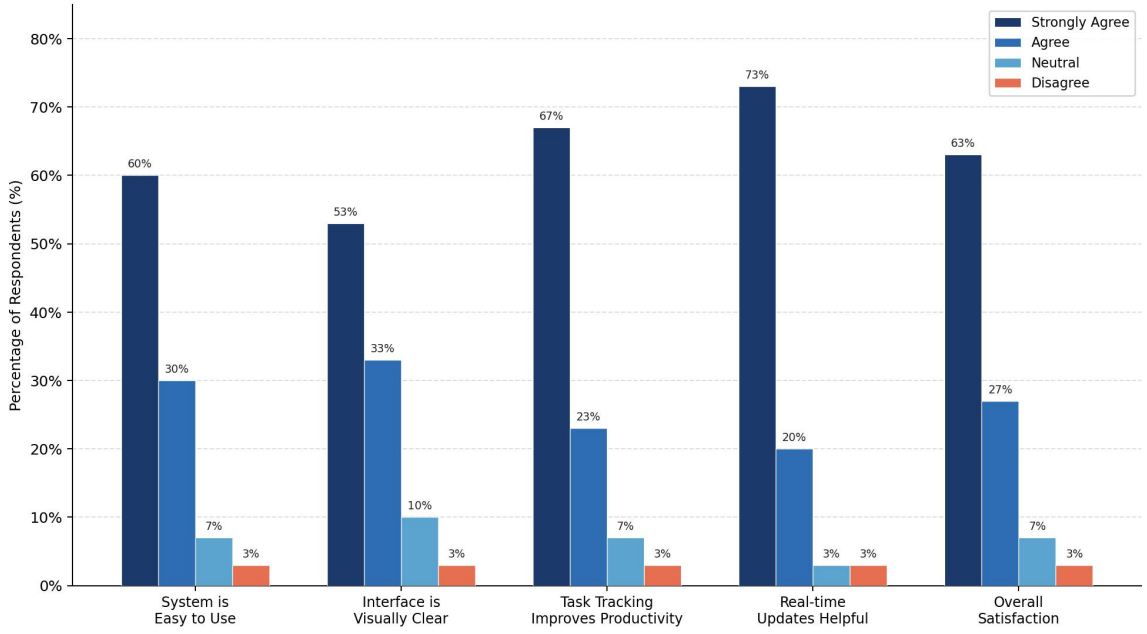
It is incredible to note that 90 percent of the respondents would state that they were more productive when monitoring their activities. This finding confirms the fact that the system can facilitate its overall purpose of placing the workflow management and accountability. The fact that most users view the fact that they can get real-time updates useful demonstrates the fact that the system features an effective synchronization system that enables teamwork. Although the percentage of users with neutral and negative attitudes is rather low, these

statements can be attributed to the necessity to do basic usability tweaks rather than regarding a system as flawed. The fact that the total levels of satisfaction were more than 90 percent means that the iterative development process based on Agile was able to incorporate the user feedback and generated the platform which exactly matched with the user expectations and operational requirements.

Table 3: ***Agile Development Efficiency Metrics***

Indicator	Observed Result
Total Sprints Completed	5
Average Sprint Duration	2 Weeks
Features Successfully Delivered	95%
Post-Deployment Defect Rate	4%
Requirement Changes Accommodated	12 Changes

Figure 3: User Satisfaction Survey Results (n = 30)



The metrics of the Agile development efficiency testify to the success of the adopted methodology to a great extent. Five managed sprints (average two-week sprints) show that I manage time well as I follow the principles of Agile. The 95 percent feature delivery rate denotes that most of the intended features were implemented successfully within the required time. This rate of completion shows a proper prioritization of backlog and the realistic planning of sprints.

The defect rate of the post-deployment is comparatively low and it is 4% which implies that the contaminated testing and integration practices were properly implemented throughout the development. Detection and rectification of a problem during sprint cycles reduces the risk of failure of a large proportion of the system once it is deployed. Moreover, the fact that 12 requirement changes were successfully accommodated also points to the flexibility of the Agile framework. These changes were incorporated in the later sprints instead of leading to delays or project disruptions, and this showed how it was adaptive to the changing needs of the stakeholders.

All in all, the efficiency indicators prove that the Agile methodology improved project control, reduced risk, and provided continuous progress during the development. The iterative method allowed constant improvement and minimized work redundancy and ensured the ability to keep the functionality of the system and the needs of the user aligned, which confirmed the applicability of Agile to the development of the web-based system.

Discussions

The results of this research give solid empirical and practical evidence on the success of the Agile methodologies in designing and implementing web-based task management systems. As the results of the performance evaluation indicate, the created system satisfies and in certain instances surpasses the generally accepted standards of responsiveness, scalability, and availability. The data on average page load time, response time in creating a task, and the uptime of the system proves that the architectural choices along with the Agile practices led to a technically sound and stable platform. Such results support the findings of previous studies that Agile development, coupled with the use of modern web technologies, helps to improve the work of the system and its stability. In a usability and user-satisfaction aspect, the outcome shows that the users are highly satisfied. Most of the participants found the system simple to operate, visually understandable, and helpful in enhancing productivity. This observation is consistent with the literature on the user-centered design, which states that user-friendly interfaces and real-time feedback systems are essential to the adoption and continued usage of the system. The Agile development was iterative in nature which ensured that the user feedback could be incorporated continuously, which resulted in incremental enhancements to the interface design and functionality of the system. Consequently, the end system was much more realistic in terms of the real user requirements than the strict original specifications.

The efficiency measures of Agile development also reinforce the point of using Agile methodology in similar projects. The flexibility and adaptability of Agile practices are demonstrated by the high success rate of feature delivery, low rate of defects at the post-deployment phase, and the ability to accommodate requirement changes. Agile framework, in contrast to the conventional plan-based strategies, which tend to be highly inflexible in meeting the changing needs of the stakeholders, allowed the development team to act promptly to the stakeholder feedback without any delay in the project implementation or bias in the system quality. This flexibility was especially helpful in a task management setting that is utilized collaboratively, where the expectations of the users and workflow requirements are likely to change with time.

Moreover, the fact that the system has the capacity to serve more simultaneous users than the stipulated standard proves that the system is scalable, which is critical to the practical use

within an organization. This is an indication that a modular web-based architecture coupled with Agile practices may be effective in meeting the existing operations requirements as well as in meeting the future expansion requirements. Generally, discussions of findings have established that web development based on the Agile framework is not only effective in enhancing technical records but also in increasing the satisfaction of stakeholders, productivity, and sustainability of the system.

Future Directions

Although the findings of this research are promising, there are still a number of prospects of conducting future research and improving the system. To begin, this assessment was done on a small group of users and within a confined time. The direction of the future research should include a more diverse and larger sample of organizations in order to prove the generalizability of the results. It is also in how the longitudinal studies would be useful in determining system performance, usability and user satisfaction during the long periods of real-world implementation.

Second, additional analytical capabilities like predictive task completion analytics, workload balancing, and performance dashboards with machine learning techniques might be added to the task management system in the future. These improvements might assist in the managerial decision-making by giving insights on the trends of productivity of the teams and anticipated risks in the project. Third, the integration with third-party enterprise applications like communication applications, calendar systems, and document management software would enhance system utility and use even more. The microservices-based architecture would provide a smooth integration of the system as well as ensure the scalability and maintainability of the system.

One more option with a high potential is the improvement of security and privacy mechanisms. The fundamental security measures were introduced, but the new ones might comprise multi-factor authentication, sophisticated encryption algorithms, and adherence to the global data protection standards. Alternatively, the paper may encourage future study analyzing the combination of Developed principles and Agile development cycles to improve system resilience even more. Lastly, cross-comparative analysis of various Agile models (including Scrum, Kanban, and hybrid models) may offer more profound information on which ones are most efficient in terms of the different forms of web-based systems. These studies would add useful knowledge to the academic and the software engineering practice.

Conclusion

This paper has examined how to develop and implement a web based task management system using Agile development methods. The findings suggest that Agile practices have a close relationship with system flexibility, system performance, and user satisfaction. The system developed had the capacity to meet both functional and non-functional requirements and meet the evolving user needs due to the iterative development process, the continuous stakeholder involvement and periodic testing. The performance check revealed that the system had a reasonable response time, high availability and high scalability which is satisfactory in the practical use of the system in organizations. The subsequent consequence of user satisfaction was that the system brought more productivity, usability and collaborative efficiency. Moreover, the Agile development metrics showed that there were better project control, defect low rates, and managed change of requirement. In conclusion, the study supports the idea that Agile techniques might be considered an

appropriate and efficient means of the development of the contemporary web-based task management systems in the evolving organizational environment. With the help of Agile and scalable web architectures and user-centered design, developers will be in a position to build systems that are both technically sound as well as responsive to the real user expectations. The present research can be applied to the already existing literature on the subject of Agile-based system development and offers a more realistic definition to the organization that attempts to build an efficient and flexible digital task management system.

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