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Web-Based MSMEs Promotion Catalog System Design using Agile Scrum

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Abstract− This study aims to design and develop a web-based promotion catalog system to support the micro, small, and medium enterprises (MSMEs) in Pekan Kuala. With increasing competition in the marketplace, the MSMEs sector needs an effective platform to promote products and services to a wider audience. The proposed system is built using a web-based framework, offering an accessible and user-friendly interface that enables MSMEs to manage and showcase their products online. To ensure an efficient development process, this project adopts the Agile Scrum methodology, which emphasizes iterative progress, adaptability, and close collaboration between stakeholders. The system was developed in phases, including requirements gathering, design, implementation, and testing. Agile Scrum allowed for continuous feedback and improvements, resulting in a flexible and scalable solution. The final product not only streamlines the promotion process for MSMEs but also enhances their online visibility, potentially boosting sales and market reach. The system's usability and effectiveness were evaluated through user testing, with positive feedback from both MSMEs participants and potential customers. This research highlights the benefits of Agile Scrum in developing tailored digital solutions for local businesses and underscores the potential of web-based systems in empowering small enterprises.

Keywords: MSMEs; Web-based system; Agile Scrum; Promotion catalog; System development.

1. INTRODUCTION

The development of a web-based Micro, Small, and Medium Enterprises (MSMEs) promotion catalog system in Pekan Kuala is a timely and essential endeavor, particularly in the context of the ongoing digital transformation that has significantly affected business operations globally. The increasing reliance on digital platforms for marketing and sales has underscored the necessity for MSMEs to adapt and innovate in order to remain competitive. As highlighted, a web-based promotional information system can enhance the visibility and competitiveness of MSMEs, enabling them to cater to their specific needs effectively [1]. This assertion is further supported by those who emphasize that digital marketing is crucial for MSMEs to survive and thrive, especially during challenging times such as the COVID-19 pandemic [2].

The integration of agile methodologies, particularly the Scrum framework, into the development of this catalog system is pivotal. Agile Scrum promotes iterative development and encourages flexibility, allowing teams to respond to changes and feedback promptly. This approach is particularly beneficial for MSMEs, which often operate with limited resources and require adaptable solutions to meet their dynamic market demands. The significance of innovation and creativity in driving MSME growth has been underscored by , who argue that these elements are vital for enhancing performance and fostering entrepreneurial growth [3]. Thus, employing an agile framework not only aligns with the operational realities of MSMEs but also enhances their capacity for innovation.

Moreover, the role of digital marketing strategies in promoting MSMEs cannot be overstated. illustrate how creative digital marketing strategies, including social media and e-commerce, have proven effective in enhancing product visibility and market reach for MSMEs [4]. This aligns with the findings of , who notes that digital marketing literacy significantly empowers MSME entrepreneurs, enabling them to engage in effective promotional activities [5]. The ability to leverage digital tools for marketing is essential for MSMEs in Pekan Kuala, as it allows them to connect with a broader audience and improve their sales performance.

The importance of training and capacity building in digital marketing for MSMEs is further emphasized by , who highlight the need for tailored strategies that consider the unique characteristics of different demographic groups within the MSME sector [6]. This suggests that the development of the web-based catalog system should not only focus on technological aspects but also incorporate training modules that enhance the digital marketing capabilities of MSME owners and employees. Such an approach would ensure that the system is utilized effectively, maximizing its potential to drive sales and customer engagement.

In addition, the promotion strategies employed by MSMEs must be multifaceted, incorporating elements such as product quality, brand image, and promotional tactics to influence consumer purchasing intentions positively. 's research indicates that these factors are critical in navigating the competitive landscape faced by MSMEs [7]. Therefore, the catalog system should be designed to facilitate the integration of these promotional strategies, allowing MSMEs to present their products compellingly and effectively.

Furthermore, the utilization of e-commerce platforms has emerged as a vital strategy for MSMEs to enhance their market presence and sales volume. As noted by , online promotion strategies can significantly increase sales by reaching a wider audience and reducing promotional costs [8]. This is particularly relevant for MSMEs in Pekan Kuala, where traditional marketing methods may not suffice in attracting customers. The catalog system should thus incorporate e-commerce functionalities, enabling MSMEs to sell their products directly through the platform.

The challenges faced by MSMEs in adopting digital marketing strategies are well-documented. For instance, Nurhaida emphasizes the importance of leveraging artificial intelligence and digital marketing adaptations to enhance business performance [9]. This highlights the need for the catalog system to not only serve as a promotional tool but also

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as a platform for MSMEs to learn and adapt to new marketing technologies and strategies. By integrating educational resources and support within the system, MSMEs can be better equipped to navigate the complexities of digital marketing.

Moreover, the role of government and institutional support in facilitating the growth of MSMEs through digital transformation cannot be overlooked. discuss the importance of supportive policies and programs that enhance MSME capabilities, particularly in terms of market access and human resource development [10]. The development of the web-based catalog system should align with these broader initiatives, ensuring that it complements existing efforts to empower MSMEs in Pekan Kuala.

In conclusion, the development of a web-based MSMEs promotion catalog system in Pekan Kuala, utilizing Agile Scrum, represents a strategic response to the pressing need for digital transformation among small businesses. By focusing on enhancing visibility, promoting digital marketing literacy, and integrating e-commerce functionalities, this initiative has the potential to significantly improve the competitiveness and sustainability of MSMEs in the region. The collaborative efforts of stakeholders, including government agencies, educational institutions, and the MSMEs themselves, will be crucial in ensuring the successful implementation and utilization of this system.

2. RESEARCH METHODOLOGY

2.1 Agile Scrum Method

The Agile Scrum method has emerged as a prominent framework in software development, characterized by its iterative approach and emphasis on collaboration, flexibility, and customer satisfaction. This literature review synthesizes key findings from various studies on the Scrum methodology, its implementation challenges, and its impact on project outcomes.

One of the foundational aspects of Scrum is its ability to adapt to changing requirements and foster collaboration among team members. According to Ashraf and Aftab [11], Scrum is recognized for its capacity to enhance productivity, reduce time to market, and improve collaboration through continuous feedback. Their study highlights that 61% of respondents from 76 countries reported using Scrum, indicating its widespread adoption in the industry. This adaptability is crucial in today's fast-paced technological environment, where customer needs and market conditions can shift rapidly.

However, the implementation of Scrum is not without challenges. Hajjdiab et al. [12] conducted an industrial case study that identified several obstacles to successful Scrum adoption, including the absence of an Agile Master, high work pressure, and unexpected difficulties during implementation. They emphasized the importance of careful planning and securing adequate resources to mitigate these challenges. Similarly, Pries-Heje and Baskerville [13] introduced the FTRA framework, which explains how Agile methods, particularly Scrum, are continuously articulated and re-articulated in practice. This framework underscores the dynamic nature of Scrum and the need for organizations to adapt their practices to fit their unique contexts.

The role of the Scrum Master is critical in facilitating the Scrum process and ensuring that the team adheres to Agile principles. Noll et al. [14] explored the responsibilities of the Scrum Master and found that this role often encompasses additional functions that may not be formally recognized. Their research suggests that a clear understanding of the Scrum Master's role can enhance team performance and project outcomes. Furthermore, Kayes [15]highlighted the significance of Agile testing within Scrum, proposing PRAT as a metric for assessing testing quality, which can further improve the overall effectiveness of the Scrum process.

In terms of scaling Scrum for larger projects, several frameworks have been proposed. Grundler and Westner [16] identified various scaling frameworks, including Scrum of Scrums and the Scaled Agile Framework (SAFe), which aim to address the complexities of managing multiple Scrum teams. These frameworks provide structured approaches to maintain Agile principles while accommodating the needs of larger organizations. Alqudah and Razali [17] also discussed the challenges of scaling Agile methods in large software development environments, emphasizing the need for effective coordination and communication among teams

The cultural aspects of Scrum teams have also been examined in recent studies. A cross-case analysis by an unnamed source [18] emphasized the importance of Scrum team culture in fostering collaboration and achieving project goals. The study found that a strong Scrum culture contributes to improved teamwork and higher product quality, reinforcing the idea that the human element is crucial for successful Agile implementation.

Finally, the integration of collaborative practices into Scrum has been explored as a means to enhance team dynamics. Przybyłek and Zakrzewski [19] proposed incorporating collaborative games into the Scrum process to improve stakeholder engagement and communication. This approach addresses the social aspects of Agile development, which are often overlooked in traditional methodologies.

In conclusion, the Agile Scrum method has proven to be an effective framework for software development, offering flexibility and responsiveness to change. However, successful implementation requires careful consideration of the challenges involved, particularly in terms of team dynamics, resource allocation, and scaling practices. Future research should continue to explore innovative ways to enhance Scrum practices and address the evolving needs of organizations in the software development landscape.

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2.2 Research Stages

This project adopted the Agile Scrum methodology to develop the web-based MSME promotion catalog system for Pekan Kuala. Agile Scrum was selected because of its iterative, flexible nature, which allows for continuous collaboration and feedback from stakeholders. This approach ensured that the system could be adjusted and improved throughout the development process, meeting the evolving needs of the local MSMEs.

The project was divided into four key sprints, each focusing on different aspects of the system's development.

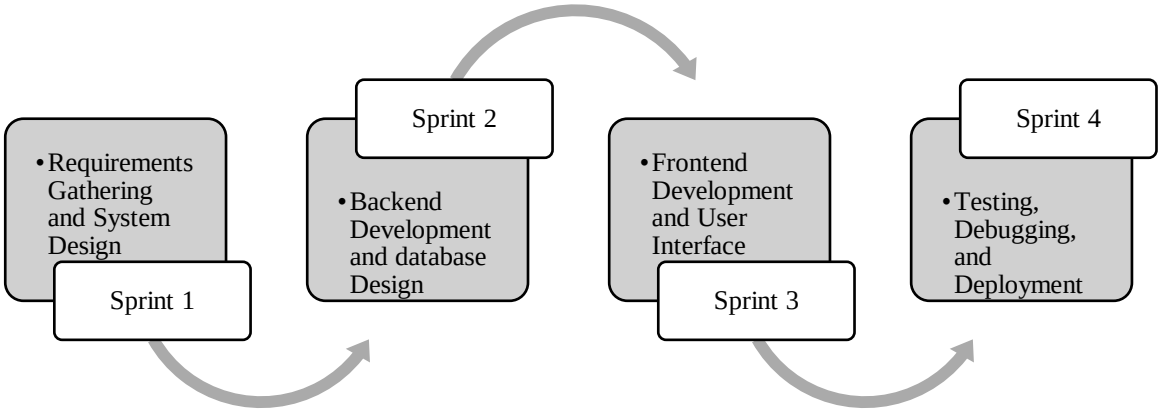

Figure 1. Key Sprint Agile Scrum Method

2.3 Sprint 1: Requirements Gathering and System Design

The first stage involves comprehensive requirements gathering, which is crucial for understanding the specific needs of MSMEs in Pekan Kuala. This phase will utilize interviews, surveys, and participatory observation to collect data from stakeholders, including MSME owners and potential users of the catalog system. The insights gained will guide the development process, ensuring that the system aligns with the expectations and operational realities of local businesses [1], [20]. The use of the Rapid Application Development (RAD) methodology in this phase allows for quick iterations and adjustments based on stakeholder feedback (Fernando, 2023; Marlina, 2023).

The first sprint was dedicated to gathering detailed requirements from the stakeholders, including local MSMEs in Pekan Kuala and potential end-users. To capture the needs and challenges of the MSMEs, a series of interviews and surveys were conducted. This phase identified the key features required for the system, such as user-friendly product management, product search capabilities, and secure user authentication.

After gathering requirements, the team created wireframes and design prototypes to visualize the system's user interface. The prototypes were shared with MSME representatives for feedback and adjustments before moving on to the development phase.

2.4 Sprint 2: Backend Development and Database Design

The second sprint focused on developing the system's backend infrastructure, including the database architecture and core system functionalities [23]. A relational database was designed to store MSME profiles, product information, customer inquiries, and user interactions. The backend was developed using web technologies, such as:

a. PHP for server-side development.
b. MySQL for database management.

Data security was a major consideration, with measures like encryption for user passwords and secure login mechanisms integrated into the system. The team ensured that the database could handle a growing number of MSMEs and customers as the platform scaled.

2.5 Sprint 3: Frontend Development and User Interface

In the third sprint, attention shifted to developing the frontend of the system [24]. Using the feedback from the initial design prototypes, the team created a user-friendly interface that allowed MSMEs to register and manage their product catalogs easily. Key features developed during this sprint included:

a. A responsive design, allowing users to access the platform on both desktop and mobile devices.
b. Product upload functionality, where MSMEs could add, edit, and delete products, complete with images, descriptions, and pricing.
c. A search and filter function for end-users to browse products by category, price, or popularity.

Technologies such as HTML, CSS, JavaScript, and Bootstrap were used to ensure a modern, clean, and responsive design. Following the requirements analysis, the next step is to create a prototype of the web-based catalog system. Prototyping serves as a visual representation of the system, allowing stakeholders to interact with a preliminary version of the application. This iterative process enables continuous feedback, which is essential for refining the system's features

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and functionalities [4]. The prototype will be developed using Agile Scrum practices, which emphasize collaboration and flexibility, allowing for rapid adjustments based on user input [25].

Once the prototype has been validated, the actual system development will commence. This phase will involve coding, integrating various components, and ensuring that the system meets the technical specifications established during the requirements gathering phase. Agile Scrum's iterative cycles, known as sprints, will be employed to manage the development process, allowing for regular reassessment of progress and priorities [26]. This approach not only enhances team collaboration but also ensures that the system remains aligned with user needs throughout the development lifecycle [27].

4. Sprint 4: Testing, Debugging, and Deployment

The testing phase is critical to ensure the reliability and functionality of the web-based catalog system. Various testing methods will be employed, including Black-box testing, which focuses on validating the system's outputs based on given inputs without examining the internal workings [25], [28]. User Acceptance Testing (UAT) will also be conducted to gather feedback from actual users, ensuring that the system meets their expectations and is user-friendly [22]. This phase is vital for identifying and rectifying any issues before the system is deployed for broader use.

The final stage involves deploying the web-based MSMEs promotion catalog system. This phase will include training sessions for MSME owners and staff to familiarize them with the system's functionalities and benefits. The deployment will be accompanied by ongoing support to address any challenges that users may encounter as they begin to utilize the system in their daily operations [29], [30]. The aim is to ensure a smooth transition and to maximize the system's impact on enhancing the visibility and competitiveness of local MSMEs.

The final sprint involved rigorous testing of the system, focusing on both functionality and usability. Testing was carried out in two phases:

a. Internal Testing: The development team tested all features of the system to ensure that they functioned as expected, including product uploads, user registration, and search functionalities. Any bugs or issues discovered were addressed promptly.
b. User Testing: Selected MSME representatives were invited to use the system and provide feedback on its usability. Feedback from users was essential in identifying minor adjustments and improving the overall user experience.

After successful testing and debugging, the system was deployed to a **live server**, making it accessible to the MSMEs of Pekan Kuala. A detailed training session was provided to the MSMEs, ensuring they could fully utilize the platform's features.

3. RESULT AND DISCUSSION

3.1 Design with UML

The Pekan Kuala Village MSME Promotion Catalog Information System aims to promote products and services offered by local MSMEs through a web-based platform. This system is designed using the Agile Scrum approach to ensure rapid and iterative development, and better meet user needs. This study focuses on the development and evaluation of a web-based promotional catalog information system with the Agile Scrum approach. Data were collected from surveys, in-depth interviews, and direct observations.

a. Use Case Diagram
The system has 3 actors, namely Visitors (Guests), UMKM Owners (Business Owners), Admins with nine use cases including Manage Users, Post Promotions, Update UMKM Information, Register UMKM, Login/Logout, Contact UMKM, Search UMKM, View UMKM Catalog, View Promotions.

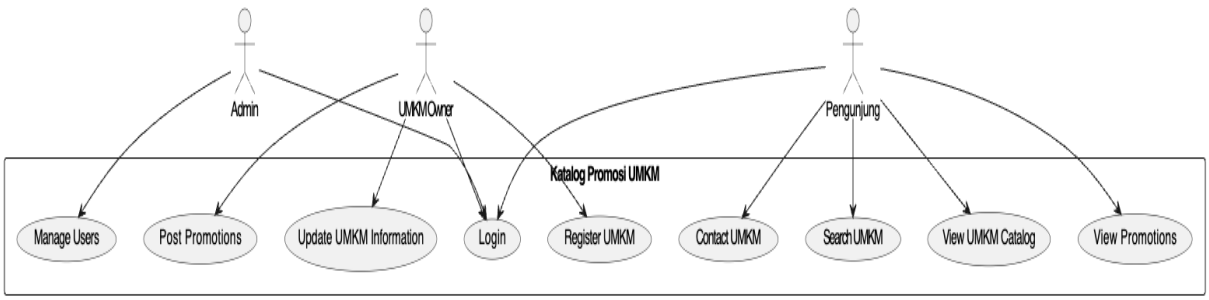

Figure 1. Promotion Catalog System Use Case Diagram

b. Class Diagram
Each class has the following relationship: Admin and UMKMOwner are subclasses of User, UMKMOwner has an association with UMKM (one UMKM owner has one UMKM), MSMEs have an association with Promotion (one MSME can have many promotions), The catalog has an association with MSMEs (the catalog contains a list of MSMEs).

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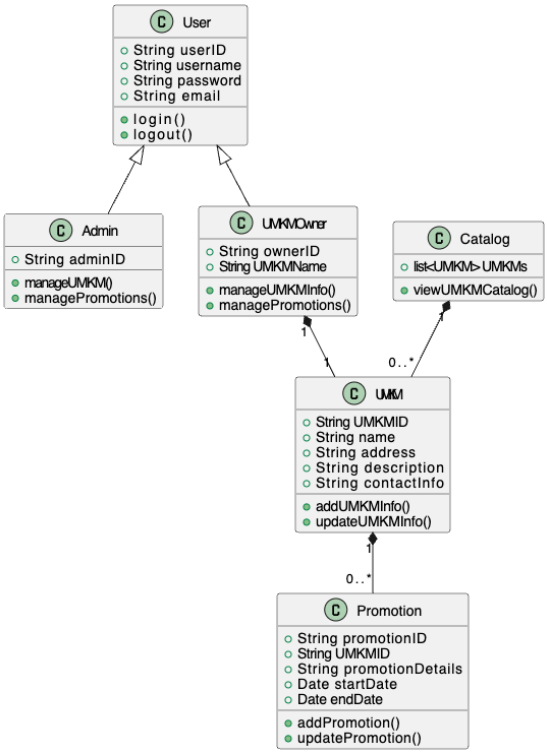

Figure 2. Class Diagram

3.2 System Development Outcome

The Web-Based MSMEs Promotion Catalog System was successfully developed using the Agile Scrum methodology. The system features a user-friendly interface, allowing local MSMEs in Pekan Kuala to easily register, manage, and promote their products online. Key modules developed include:

a. User Registration & Authentication: MSMEs can create accounts, log in, and manage their profiles securely.
b. Product Management: Enterprises can upload product images, descriptions, and prices. The system supports easy editing and updating of product information.
c. Search and Filter: End-users can search for products by category, price, or specific keywords, enhancing customer experience.
d. Order Management: MSMEs receive inquiries from customers through an integrated contact system, enabling easy communication.

The use of web technologies, including HTML, CSS, JavaScript, and a backend framework, ensured that the system is lightweight, responsive, and accessible from various devices, including smartphones and tablets.

3.3 Agile Scrum Implementation

The Agile Scrum framework was instrumental in delivering the project within a short development cycle while incorporating feedback from stakeholders at every sprint. The development was divided into four key phases, each corresponding to a sprint:

a. Sprint 1: Requirements Gathering and Initial Design
   During the first sprint, detailed interviews and surveys were conducted with MSME representatives to gather system requirements. This phase helped clarify the essential features needed, such as user management and product display. The design prototype was created and validated by stakeholders, providing a strong foundation for further development.
b. Sprint 2: System Backend and Database Setup
   The second sprint focused on setting up the system's backend, which included database architecture for storing MSME profiles, products, and customer interactions. Agile Scrum allowed for feedback after each iteration, which facilitated quick adjustments to the database structure as additional data requirements emerged.
c. Sprint 3: Frontend Development and User Interface Design
   This sprint concentrated on designing the frontend of the system. Using wireframes and feedback from MSME owners, the interface was optimized for ease of use, even for individuals with limited technical knowledge. The modular design enabled future scalability, should the system need additional features.
d. Sprint 4: Testing, Debugging, and Deployment

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The final sprint involved testing the system for bugs, ensuring proper functionality across various browsers and devices. User testing was conducted with selected MSME representatives to verify that the system met their needs and expectations. Bugs and issues reported were resolved before the final deployment.

The iterative nature of Scrum ensured that continuous feedback was incorporated, leading to a final product that closely aligned with user needs. The Scrum meetings (daily standups, sprint planning, sprint review, and retrospective) played a significant role in keeping the development team on track and responsive to changes.

After the system was deployed, a usability test was conducted with 10 local MSME owners. The feedback was generally positive, with participants appreciating the ease of navigation and the product management features.

a. Positive Feedback:
   Most MSME users found the platform intuitive and praised the simple registration and product upload process. The mobile responsiveness was particularly well-received, as many of the participants accessed the platform via smartphones.
b. Areas for Improvement:
   While the overall reception was positive, a few areas were identified for further enhancement. Some users suggested adding a real-time chat feature to improve customer engagement, and a few expressed interest in integrated payment gateways for direct transactions. These suggestions will be considered for future iterations.

3.4 Discussion

The use of the Agile Scrum methodology played a pivotal role in the successful development of the system. By involving stakeholders from the outset, the project team was able to align the system's functionalities closely with the actual needs of the MSMEs. The iterative nature of Agile allowed for quick adaptations in response to feedback, ensuring that the final product was both functional and user-friendly.

This approach also highlighted the importance of continuous testing and feedback loops, particularly in projects designed for users with varying levels of technical expertise. The web-based catalog system's success can be attributed to the close collaboration between developers and MSMEs, as well as the flexibility of the Agile Scrum process, which allowed for the system to evolve dynamically.

While the initial version of the system has been well-received, there remains room for improvement and further development. For instance, integrating advanced features such as analytics dashboards for tracking promotional performance, or incorporating e-commerce capabilities for direct sales, could enhance the platform's effectiveness in supporting MSMEs' growth.

Overall, the implementation of a web-based promotion catalog system has had a positive impact on the MSMEs in Pekan Kuala, empowering them with a modern tool to promote their products and services. The study demonstrates the value of Agile Scrum in developing systems tailored to the needs of small businesses, especially in rural or underserved communities.

4. CONCLUSION

The development of the Web-Based MSMEs Promotion Catalog System for Pekan Kuala has successfully addressed the need for an accessible and user-friendly platform to enhance the promotion of local small businesses. The system allows MSMEs to efficiently manage and showcase their products, improving their online visibility and market reach. The use of Agile Scrum methodology throughout the project proved to be highly effective, enabling an iterative and adaptive development process that incorporated ongoing feedback from stakeholders. This approach ensured that the final product was well-aligned with the needs of the MSMEs and end-users. The implementation of this system has already shown a positive impact, with increased customer inquiries and greater exposure for the participating MSMEs. The success of this project highlights the potential of digital solutions in empowering local businesses and enhancing their competitiveness in an increasingly digital economy. However, there are still opportunities for improvement, such as integrating real-time communication features and online payment gateways. These enhancements, along with continued user training and support, will be considered in future iterations to further optimize the system's functionality. Overall, the project demonstrates the importance of adopting agile methodologies for software development in dynamic environments, particularly when building solutions tailored for small enterprises. The system serves as a model for similar initiatives aimed at supporting MSMEs through digital transformation.

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