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Improving Scrum Methodology Management using the Kano Model

تحسين إدارة منهجية سكروم باستخدام نموذج كانو

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Abstract:

The software development process requires the use of methodologies and methods that contribute to its construction in a way that ensures the achievement of its required quality. The Scrum methodology is one of these methodologies. Still, this methodology needs a mechanism to ensure a clear structure for its organization. Therefore, the goal of this paper is to improve the work of this methodology, as the Scrum methodology was integrated with the Kano model to work as an organized framework that facilitates developers to use it easily by integrating the Scrum methodology with the Kano model, which strategically aims to enhance software development practices and enhance the effectiveness of Scrum. Through practicality in a real-world scenario, this framework demonstrates exceptional stability and clarity in alignment with system requirements.

The main purpose of this study is to integrate the Scrum methodology with the Kano model to improve the performance of the Scrum methodology, clarify requirements, reduce the constant change in requirements, facilitate meetings, and organize teams and their work that is directly related to system requirements

The proposed framework was applied to a case study involving an e-commerce site evaluated using assessment tools, including GTMetrix, PageSpeed Insights, and Pingdom, which collectively highlights the system's powerful optimization potential, displaying excellent results in performance, structural audits, and load times. This research measures the effectiveness of the framework in improving the software development process, which leads to the development of a high-performance, user-centric e-commerce platform the results confirm that this approach can contribute significantly to the evolving landscape of agile methodologies and software development**.**

Keywords: Scrum, Kano, Agile, Software development, E-commerce website

ملخص الدراسة

تتطلب عمليه تطوير البرمجيات استخدام منهجيات وأساليب تسهم في بنائها بطريقه تضمن تحقيق المطلوب منها بجودة عالية، وتعد منهجيه سكرم إحدى هذه المنهجيات إلا إنّ هذه المنهجية تحتاج إلى آلية تضمن هيكليه واضحة لتنظيمها، وعليه فإنّ الهدف من هذه الرسالة هو تحسين عمل هذه المنهجية، حيث تم دمج منهجية سكرم مع نموذج كانو لتعمل كإطار عمل منظم يسهل على المطورين استخدامها بطريقه سهله وذلك بتحقيق التكامل بين منهجية سكرم مع نموذج كانو، والذي يهدف بشكل استراتيجي إلى تعزيز ممارسات تطوير البرمجيات وتعزيز فعالية سكرم. من خلال التطبيق العملي في سيناريو العالم الحقيقي، يُظهر هذه الإطار استقرارًا ووضوحًا استثنائيين في التوافق مع متطلبات النظام .

الغرض الرئيس من هذه الدراسة هو تحقيق التكامل بين منهجية سكرم ونموذج كانو لتحسين أداء منهجية سكرم وتوضيح المتطلبات وتقليل التغيير المستمر في المتطلبات وتسهيل الاجتماعات وتنظيم الفرق وعملهم الذي يرتبط بشكل مباشر بمتطلبات النظام.تم تطبيق الإطار المقترح على دراسة حالة

تتضمن موقعًا للتجارة الإلكترونية تم تقييمه باستخدام أدوات التقييم، بما في ذلك GTMetrix و Page Speed Insightsو Pingdom، والذي بدوره يسلط الضوء بشكل جماعي على إمكانات التحسين القوية للنظام، مما يعرض نتائج جيدة جدًا في الأداء وعمليات التدقيق الهيكلية وأوقات التحميل. يقيس هذا البحث مدى فعالية الإطار في تحسين عملية تطوير البرمجيات، مما يؤدي إلى تطوير منصة تجارة إلكترونية عالية الأداء تتمحور حول المستخدم تؤكّد النتائج على إمكانية هذا النهج على الإسهام بشكل كبير في المشهد المتطور للمنهجيات الرشيقة وتطوير البرمجيات.

I. INTRODUCTION

Agile software development methods have gained significant momentum and received global attention across various scientific communities and industries. The focal point of agile software development is the agile team. Several studies have been performed to obtain better insight and understanding of what influences agile teamwork performance and agile project success. Currently, Scrum is dominating the industrial agile software development practices. Yet, there is a lack of studies that directly explore the role of team maturity and key components of the Scrum framework in being successful at Scrum. This is its main goal. Scrum integrates the customer in all stages of project implementation, by involving him in all stages of work and conducting many interviews with the customer to know his needs. After knowing all his needs, we create a user story, and then we set priorities among these needs. In many cases, the required work is not done perfectly; hence the importance of Scrum towards contributing to satisfying the needs of the users satisfactorily. However, more improvement is needed to solve the problems facing Scrum, which will be addressed in our current topic (Sithambaram et al., 2021).

The current context of software development is complex and all the manual operations are moving toward automated solutions and new technology trends i.e. mobile and cloud. Thus, analytics are demanding for better life cycle management of software. One of the most important facts is that in traditional software development approaches the yearly delivery plan has come to two-week build cycles and then to daily builds (The sentence structure is not clear.) The systems are cautiously evolving with the rapid business requirement changes and stakeholders are demanding more transparency and measurements in the development (Samarawickrama & Perera , 2017).

Software has become essential in daily life, necessitating organizations to adapt to market changes and unstable business environments. Agile methods address traditional disadvantages by organizing complex multi-participant development while accommodating constant project change. Scrum is the most popular agile framework, involving a Scrum team, events, artifacts, and rules. (Zaimovic et al., 2021)

In today's competitive market, customer satisfaction is crucial for companies to remain competitive. In the era of popular shopping, customer feedback on products is vital for the company's bottom line. Satisfied customers bring benefits like repurchasing and promoting, and building a good reputation. Kano said that not all requirements/features have the same impact on customer satisfaction. So, the Kano model, as a two-dimensional model, considers both sides of the problem, the impact of this factor on customer satisfaction may be a positive increase, also possibly a negative reduction. Therefore,

Kano and his colleagues assigned different attributes to the factors affecting customer satisfaction in this two-dimensional model to analyze customer satisfaction efficiently and conveniently (Liu 2022).

Kano model is an effective tool for understanding and categorizing customer preferences according to their impact on customer satisfaction. It is a very useful tool for quality management and business planning and helps in assessing customer feelings regarding the presence and the sense of a particular product/service attribute. In other words, it helps in measuring customer satisfaction or dissatisfaction when a product/service/attribute is present or absent (Alaoui et al., 2022).

In his study, Zayat et al., (2020) explored the similarities and differences between Scrum and Kanban methodologies, based on personal experiences and guidelines from a focus group. The study highlights the challenges organizations face when implementing Scrum, including chaos among team members and poor initial time estimation, which can affect delivery timing.

Another study conducted by Anghel et al., (2022) aimed at comparing software development methodologies to identify potential improvements in project quality and whether the practical approach aligns with theoretical ones. This study was a comparative study of individuals from various software positions and companies to understand their personal experiences with these methodologies. The results aimed to provide a better understanding of their use. According to the results of this study's survey, Scrum was the most popular methodology. However, this is reflected in the responses. Scrum is not considered suitable for all types of projects. As is the case, the majority of participants complained that Scrum meetings require an extended period of time.

Agile software development is gaining popularity, with Scrum emerging as the leading approach. However, consensus on criteria influencing agile workgroup success remains challenging. An experimental study by Kadenic et al. (2023) involving 182 Scrum team members found that mature teams are more likely to succeed at Scrum, with teams that have undergone Scrum training, are fully allocated, have a low turnover rate, have all necessary skills and experience, and are self-managing. Teams that embody Scrum values, such as openness and courage, are more likely to view themselves as success stories. The success of Scrum is influenced by all three Scrum roles: the product owner's mandate, developers' ability to change plans daily, and the Scrum master's ability to ensure all events occur. Adhering to Scrum events as outlined in the framework impacts Scrum success. The study provides insights into internal dynamics and practices of Scrum teams, helping businesses and agile practitioners in agile development implementation and application.

In his study, Liu (2022) surveyed 100 OPPO mobile phone customers to test the Kano Model and assess customer satisfaction with the functional services of the company's mobile phones. Customer satisfaction is determined by the difference between what customers expect from a company and what they do. Customers have positive psychological hints about the product's functions and services before buying, indicating their needs. When they use the product, they compare their expectations with the actual situation, resulting in feedback that determines whether they will repeat the purchase in the future. The Kano Model analysis helps us understand customer 17 (?) satisfaction across OPPO mobile phone functions, aiming to enhance customer loyalty and satisfaction.

Pandey et al., (2022) conducted a systematic literature review and investigated the non-linear dimension of service quality and customer satisfaction in the different operative sectors of the tourism industry. The six broad operative sectors identified were: accommodation, attraction, food & services, outdoor recreation, transportation, and travel & trade. Results showed that three operative sectors – entertainment, event and tourism services – remain relatively unexplored in terms of identifying non-linear dimensions of service quality and customer satisfaction. The authors suggest expanding studies on tourism by employing Kano's model in the various operating sectors that remain unexplored. Doing so could help better understand tourists' complex behavior, improve existing service quality attributes, and explore new attributes that could further redefine and enhance tourist satisfaction.

The rest of this paper is organized into the following five sections: the proposed framework in section II. The results discuss the effectiveness of the proposed framework in the software development process in section III. Conclusion is discussed in section IV. Research recommendations are then presented in Section V.

II. Proposed Framework

The Kano Model in Scrum methodology enhances product development by prioritizing customer needs. It categorizes requirements into five categories, allowing stakeholders to collaborate on features. The team uses this priority backlog for sprint planning, focuses on key features, and adjusts the backlog based on customer feedback. This approach maximizes customer satisfaction.

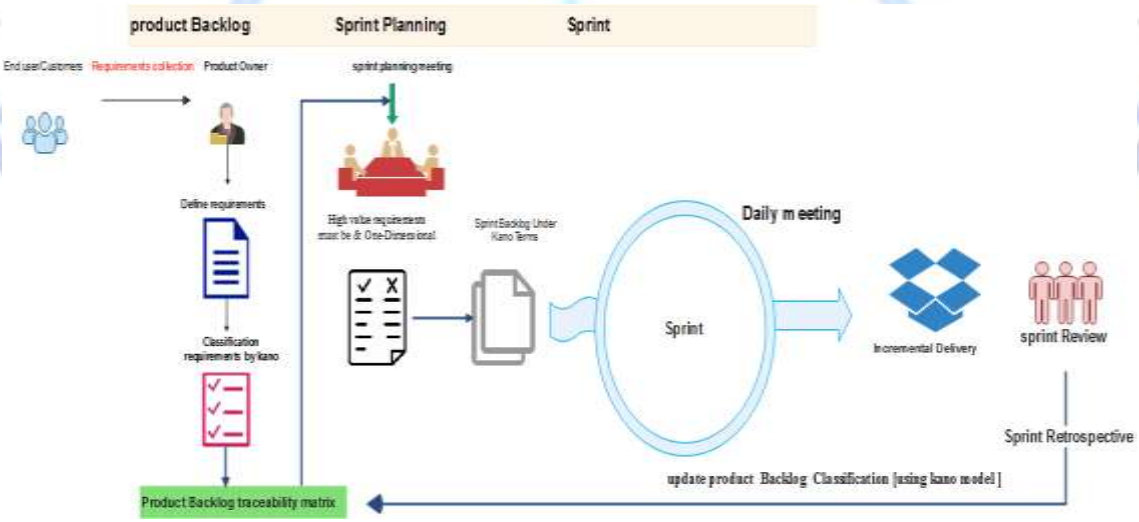

Fig1: The life cycle of the proposed framework

A) Lifecycle of the proposed framework

The life cycle of the proposed framework consists of the following phases derived from the integration of the Scrum methodology with the Kano model.

1) Product backlog: A key element of the proposed framework is the product backlog phase, where all the requirements or features that stakeholders want in the product are recorded. The Product Owner, in collaboration with stakeholders, develops and prioritizes these requirements into five categories using the Kano Model. The Kano model provides a

powerful tool for prioritizing product backlog items based on customer satisfaction. The model classifies requirements into necessary requirements, one-dimensional requirements, attractive requirements, indifferent requirements, and inverse requirements. This classification helps in analyzing the customer's needs and identifying the essential features of the product. Furthermore, the Kano model ensures that the backlog needs are properly identified and understood by the team. The team can avoid confusion or misunderstandings by analyzing the prerequisites and making sure, they are met. By prioritizing requirements based on customer satisfaction, the team can focus on the most important features and ensure that the product meets the customer's needs. Figure 1 shows the distribution of key elements in the backlog phase of the Scrum methodology.

Figure 2: product backlog phase with Kano model in proposed framework

2) Sprint Planning: Sprint Planning is a defining event that marks the beginning of a new sprint. During Sprint planning, the team working on the proposed framework collaboratively decides what work to carry out in the next sprint. Here are the steps involved in Sprint Planning in the proposed framework:

- The Product Owner ensures that the Product Backlog is updated and contains a priority list of important requirements
- The Scrum Master ensures that the team is prepared for the planning session and understands the purpose and objectives of the sprint.
- The team, including the Product Owner, Scrum Master, and Development Team members, gathers for the first part of the Sprint Planning meeting. The Product Owner presents the highest priority items from the Product Backlog traceability matrix and provides a clear understanding of their expectations and goals.

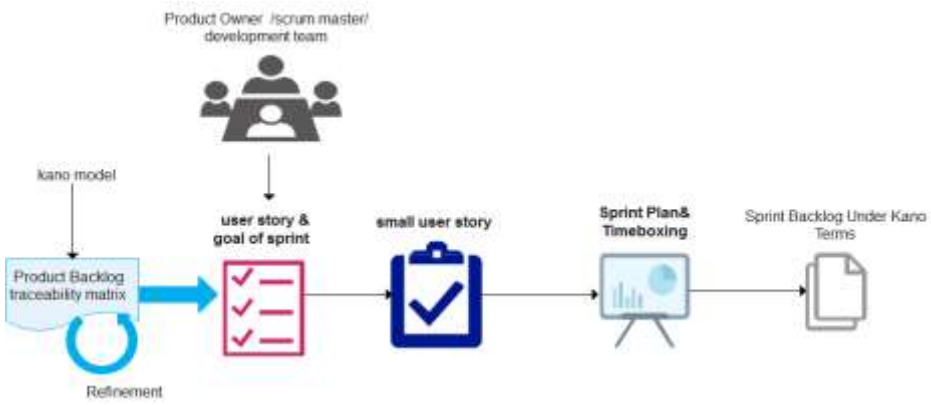

Figure 3: Sprint planning phase in the proposed framework

3) Sprint Backlog: In the proposed framework, the Sprint Backlog stage is a pivotal step. It follows the initial stages of project preparation and involves turning priority user stories, often categorized using the Kano model, into actionable tasks for the next enemy. This stage is where the development team collaborates to select and commit to specific user stories in line with customer needs and satisfaction levels. The Sprint Backlog crystallizes the sprint objectives, promoting a clear understanding of the action required and the path to achieving them. This process ensures that user stories are divided on each coming enemy in order of priority. This stage can be summarized in the following points:

- Define user stories that will be executed in the first sprint.
- Description of user stories in Enemy one.
- Collaborative Decision Making: During this phase, the development team. Collaborates to select and adhere to specific user stories, ensuring alignment with customer needs and satisfaction.
- Clarity in goals: The Sprint Backlog contributes to a clear understanding of the goals of the sprint, making it easier to identify necessary actions.

4) Sprint: In the proposed framework, the sprint phase plays a crucial role in the iterative development process. During this phase, the development team collaborates with various stakeholders to execute prioritized user stories based on the Kano model, ensuring the successful delivery of the product the following steps are followed:

- Showing User Stories: The sprint phase begins with the design of user stories, which capture user requirements and functionalities. These stories are prioritized based on their value according to the Kano mode.
- Implementation Process: Once user stories are defined, the development team initiates the implementation process, working collaboratively to turn these stories into functional software or product increments.
- Continuous Testing: The implemented features undergo continuous testing to ensure they meet specified requirements and maintain high quality. Testing methods can include both automated and manual processes.
- Continuous Feedback: Product owners, stakeholders, and users provide ongoing feedback during the sprint. This feedback is crucial for understanding stakeholder expectations and making necessary adjustments to the product, which may include changing feature priorities.
- Sprint Review: At the end of the sprint, a Sprint Review occurs. This review allows the team to present the implemented functions to product owners, stakeholders, and users. The primary focus is to assess customer satisfaction with the implemented features and collect feedback for future improvements.

Figure five Stages of the Sprint process. It all begins with the Sprint Backlog table as the initial input, followed by a seamless progression into the implementation of the first user stories, daily meetings, thorough analysis, meticulous design, and step-by-step task execution.

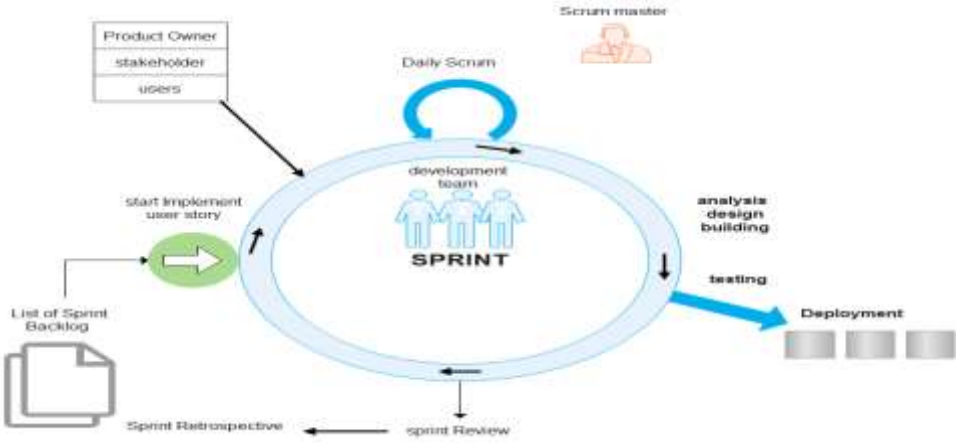

Figure 5: Sprint phase in the proposed framework

III. CASE STUDY SPECIFICATIONS

The proposed framework, combining Scrum methodology and the Kano model, is tested in a real-life case study of an e-commerce website system. The framework's effectiveness and applicability are demonstrated through its adaptability and ability to enhance key aspects of software development, such as project management efficiency, user satisfaction, system performance, and team performance.

A) Data Collection

Requirements gathering is a crucial stage in software development, ensuring project success by accurately understanding all aspects of the e-commerce website. As projects become more complex and user requirements diversify, it becomes more challenging to collect requirements, preventing potential problems in later stages.

- Personal interview: The personal interview is one of the most important and common methods of gathering requirements in software engineering.
- Observation: The observation method depends on observing the behavior and activities of the users and the processes related to the system to be developed.
- Previous studies: Previous studies are based on reviewing and analyzing similar previous projects and systems.

B) E-commerce website Case study

An e-commerce system is a platform for online stores to sell products like phones, computers, and books. It includes a user-friendly interface, a cart system, inventory management, and order and shipping management. The system allows customers to easily browse, select, and complete purchases, while also tracking inventory and ensuring timely delivery. The system's requirements are classified based on their importance.

1) Product backlog phase

In the context of an e-commerce system case study, the Product Backlog stage in the proposed framework is a critical stage where requirements from various stakeholders are collected and prioritized to create a comprehensive list of features and improvements needed for an e-commerce site.

In this step, the Kano Model is used to classify requirements. Huang (2017) introduced a questionnaire based on the Kano model and administered it to (42) respondents. During the Kano survey, the participants were business owners, store managers, boutiques, and

sales companies. The requirements were classified into five categories based on the Kano questionnaire. Finally, all questionnaires were collected.

Table 1: The results of Kano's questionnaire analysis

Product Backlog ID	Classification of requirements by Kano							
	M	**O**	**A**	**I**	**R**	**T**	**Si**	**Di**
PB1	27	8	3	3	1	42	0.2682926829	0.8536585366
PB2	31	6	4	1	0	42	0.2380952381	0.880952388
PB3	26	12	2	2	0	42	0.333333333	0.9047619048
PB4	24	9	2	7	0	42	0.2619047619	0.7857142857
PB5	25	11	4	2	0	42	0.3571428571	0.8571428571
PB6	26	9	3	4	0	42	0.2857142857	0.833333333
PB7	21	11	4	6	0	42	0.3571428571	0.7619047619
PB8	30	9	0	3	0	42	0.2142857143	0.9285714286
PB9	30	7	3	2	0	42	0.2380952381	0.880952381
PB10	23	14	1	4	0	42	0.3571428571	0.880952381
PB11	15	9	3	11	4	42	0.3157894737	0.6315789474
PB12	18	16	3	5	0	42	0.4523809524	0.8095238095
PB13	21	15	1	5	0	42	0.380952381	0.8571428571
PB14	13	22	5	1	1	42	0.658536585	0.8536585366
PB15	18	13	5	4	2	42	0.45	0.775
PB16	8	5	10	13	6	42	0.4166666667	0.3611111111
PB17	7	8	11	14	2	42	0.475	0.375
PB18	11	20	8	2	1	42	0.6829268293	0.756097561

Fig 6 categorizes requirements into one-dimensional, must, indifference, and attractive ones based on questionnaire results.

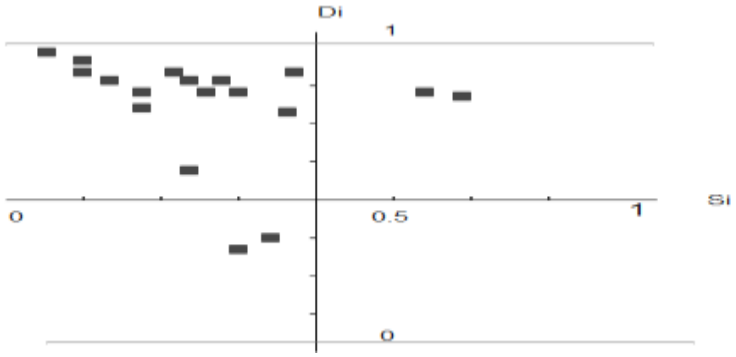

Fig 6: Coordinate system of requirements.

The classifications form the basis for the Product Backlog traceability matrix, a crucial tool for tracking requirements and testing stages, as illustrated in Table 2.

Table 4.2: Product Backlog traceability matrix

Product Backlog traceability matrix								
Online shopping site								
Product Backlog ID	**Product Backlog**	**Product Backlog description**	**Classification of requirements by Kano**					
			Must-be	One-dimensional	Attractive	Indifferent	Reverse	**Status**
1	Website response	The website should be responsive and adapt to different devices' screens, such as desktops, tablets, and smartphones, to provide an optimal user experience.	✓					
2	Provide detailed product specifications.	The website should display comprehensive and accurate product specifications, including features, technical details, images, and other relevant information	✓					
3	Integration with social media	The website should be integrated with popular social media platforms, enabling users to share products, content, or promotions easily	✓					
4	Add products to the site	The website should provide an easy-to-use interface for authorized users to add new products, update product information, and manage the product catalog efficiently.	✓					
5	Facilitate searches and filtering of products	The website should offer robust search and filtering functionality, allowing users to find products quickly	✓					
6	Easy payment methods.	the website should support secure and seamless payment methods	✓					
7	Track orders	The website should provide a tracking system that allows customers to monitor the status of their orders	✓					
8	Increase the download level	The website should be optimized for performance to ensure fast loading times and minimize any delays or downtime, providing a smooth user experience	✓					
9	ability to manage inventory	The website's inventory management system should be efficient and accurate, keeping track of product availability, stock levels	✓					
10	Provide the shopping cart feature to customers	The website should offer a user-friendly shopping cart feature that allows customers to add products, review their selected items, modify quantities, and proceed to checkout securely.	✓					

11	Create accounts for user	The website should enable users to create personal accounts, store their preferences, and order history, and facilitate a streamlined checkout process for returning customers.	✓					
12	Providing a featured products section	The website should have a dedicated section to display featured products, promotions, or special deals, attracting customers' attention and encouraging exploration of highlighted items.	✓					
13	Provide shipping and tracking information to customers	The website should display clear and transparent shipping information	✓					
14	Provide easy-to-use interfaces to manage products and inventory.	The website's backend should offer intuitive interfaces for administrators to manage products, update inventory, edit descriptions, and perform other administrative tasks efficiently.		✓				
15	Provide statistics on on-site operations and products.	The website shall contain analytics or reports to track the performance of the website	✓					
16	The importance of providing a news bulletin	The website should have a news or blog section to regularly publish updates				✓		
17	offer options for discounts and promotions.	The website should support the application of discounts, promotional codes, and special offers during the checkout process, encouraging customers to take advantage of exclusive deals.				✓		
18	Provide the site to clarify the return and refund policy	The website should have a clear and accessible return and refund policy		✓				

2) Sprint Planning

Sprint planning is crucial in e-commerce website development, aligning the development team with project goals and priorities. Agile planning is crucial for user experience, functionality, and site success. The Product Owner presents priority items from the product backlog, while the Scrum master prepares the team for a sprint planning session. Cross-functional members select user stories from the Product Backlog for development

Table 3 shows user stories, their classification, and priority

User Story ID	User	User Story Description	goal	Kano Category	Priority
US01	Customer	Log in to their account	The user needs to register a new account to enter the Website.	Must-be	Very High
US02	Customer	Access the website	View content comfortably on any device	Must-be	Very High
US03	Administrator	Log in to admin panel	Securely access product management features	Must-be	Very High

US04	Customer	View product details	View product details easily, clearly and in an organized manner	Must-be	Very High
US05	Administrator	Update product details	Create changes as needed for pricing and availability on products	Must-be	Very High
US06	Customer	Enter search keywords	Quickly find specific products based on search terms	Must-be	Very High
US07	Customer	Select payment method	Choose a preferred and secure payment option	Must-be	Very High
US08	Customer	Log in to account	Access personalized order tracking features	Must-be	Very High
US09	Customer	Access the website	Experience fast loading times for all pages	Must-be	Very High
US10	Administrator	Update product stock levels	Modify the available quantity of a product in the inventory	Must-be	Very High
US11	Administrator	Receive low stock alerts	Get notified when a product's stock level falls below a specified threshold	Must-be	Very High
US12	Administrator	Create a shopping cart	Create a shopping cart to facilitate the shopping process for the customer	Must-be	Very High
US13	Customer	Add products to the cart	Select items for purchase and place them in the cart	Must-be	Very High
US14	Customer	View shopping cart	Access an overview of selected items and their details	Must-be	Very High
US15	Customer	Access the homepage	View the prominently displayed section of featured products	Must-be	Very High
US16	Customer	Click on a featured item	Explore detailed information about the selected featured product	Must-be	Very High

US17	Customer	View product page or cart	Access information about shipping options, costs, and delivery times	Must-be	Very High
US18	Customer	Receive shipping confirmation	Obtain tracking details and updates about the order's shipping progress	Must-be	Very High
US19	Administrator	Edit product detail	Utilize an intuitive interface to update product information, including descriptions, prices, and availability	One-dimensional	High
US20	Administrator	Access analytics dashboard	Log in to view detailed reports and statistics on website performance and product-related metrics	Must-be	Very High
US21	Administrator	Post news articles	Use an easy-to-use interface to regularly publish updates and blog posts for customers to read	Indifferent	Desired
US22	Customer	View applied discounts	See the reduced prices due to the application of discounts and promotions during the checkout process	Indifferent	Desired
US23	Customer	Read return policy	Understand the terms and conditions of returning and getting a refund for purchased items	One-dimensional	High

3) Sprint Backlog

Table 4 shows the division of Sprint according to the priority of user stories in the Sprint Backlog phase

Sprint Backlog		
User Story ID	**User Story Description**	**SPRINT ID**
US1 US2 US3 US4	The user needs to register a new account to enter the website. Access the website and View the content comfortably on any device. Log in to admin panel securely and access product management features. View product details easily, clearly and in an organized manner.	SPRINT1

US5 US6 US7 US8	Update product details and Create changes as needed for pricing and availability on products. Enter search keywords and quickly find specific products based on search terms. Create a shopping cart to facilitate the shopping process for the customer. Select payment method and choose a preferred and secure payment option.	SPRINT2
US9 US10 US11 US12 US13	Access the website and Experience fast loading times for all pages. Update product stock levels and modify the available quantity of a product in the inventory. Receive low stock alerts and get notified when a product's stock level falls below a specified threshold. Log in to account and access personalized order tracking features. Add products, select items for purchase, and place them in the cart.	SPRINT3
US14 US15 US16 US17 US18	View shopping cart and Access an overview of selected items and their details. Display featured products in the featured section prominently. Click on a featured item to explore detailed information about the selected featured product. • View product page or cart and Access information about shipping options, costs, and delivery times. Receive shipping confirmation and Obtain tracking details and updates about the order's shipping progress	SPRINT4
US19 US20 US21	Edit product detail and Utilize an intuitive interface to update product information, including descriptions, prices, and availability Access analytics dashboard and Log in to view detailed reports and statistics on website performance and product-related metrics. Post news articles and Use an easy-to-use interface to regularly publish updates and blog posts for customers to read.	SPRINT5

US22 US23	View applied discounts and See the reduced prices due to the application of discounts and promotions during the checkout process. Read return policy and understand the terms and conditions of returning and getting a refund for purchased items.	

4) Sprint

The Sprint Backlog phase of the e-commerce site development process involves five cycles of sprints, each focusing on implementing user stories. In sprint 1, the focus is on implementing user stories. Unified Modeling Language (UML) diagrams provide a structured representation of the system's functions, such as shipping confirmation, product detail editing, analytics dashboard access, news article posting, discounts, and return policy. This visual language ensures a shared understanding among team members and stakeholders. Implementing user

Stories during sprint 1 marks progress in bringing the envisioned e-commerce site to life, enhancing communication and collaboration. This iterative approach aligns with Scrum methodology and focuses on customer-centric considerations

The software development process transitions from planning to execution, involving the design of the interface and programming. This pivotal stage involves crafting a visual and interactive layer, impacting user experience, and translating design concepts into functional code.

4.1 First Sprint

Fig 7: Home page

Fig 8: featured product part in home page

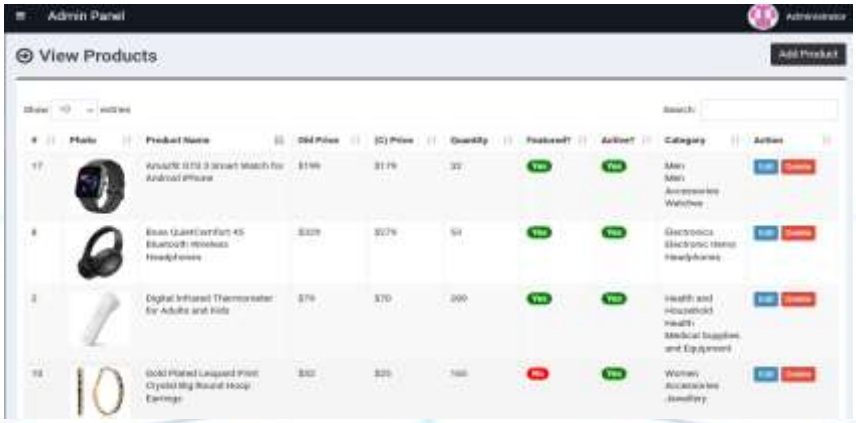

Fig 9: product management page

4.2 Second Sprint

Fig 10: Shopping cart page

Fig 11: Update product page

Fig 12: Search feature page

4.3 Third sprint

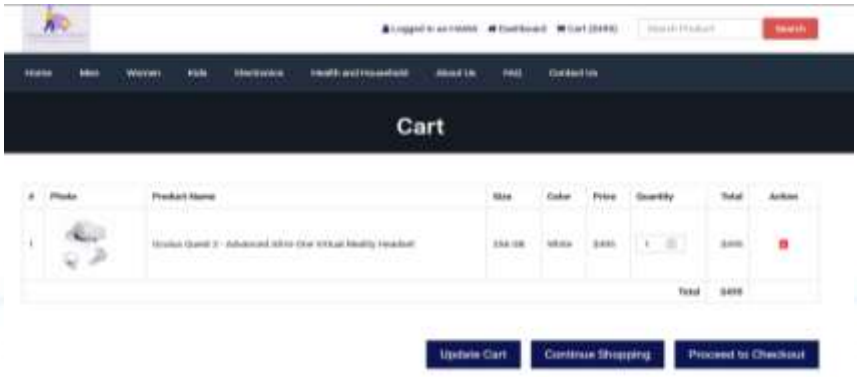

Fig 13: Adding products to the cart page

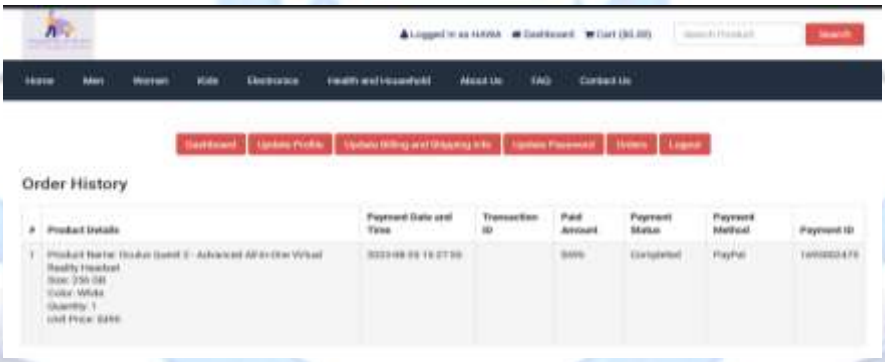

Fig 14: logging and tracking products page

4.4 Fourth sprint

Fig 15: featured products section page

Fig 16: product detail view feature page

4.5 Fifth sprint

Fig 17: displaying website performance statistics page

Fig 18: the return policy and discounts feature page

IV. RESULT AND DISCUSSION

This study examines the research questions and challenges of Scrum methodology, focusing on its intersection with the Kano model. It aims to enhance Scrum practices by incorporating customer-focused insights, promoting a more responsive and satisfaction-based approach, and revealing key stages and challenges

The challenges highlighted have a detrimental impact on the effective management of the Scrum methodology, with organizational factors being the most formidable, as emphasized by(Sithambaram et al. 2021). People-related issues also present significant hurdles. These challenges collectively impede the successful implementation of Scrum in organizations, underscoring the need for strategic solutions.

in the stage of Product Backlog, the proposed framework, requirements from various stakeholders are collected and prioritized to create a comprehensive list of necessary features and improvements, stakeholders are identified, and user stories are captured. This finding confirms that of Subih et al. (2019).

The Sprint Planning phase was also marked by the introduction of the Kano classification that reflects the opinion of stakeholders, and consistency requirements. This consistency in requirements contributes to setting a clear vision for the team. And the balance of their work on systems development, that's what the study lacks (Tupia-Astoray & Andrade-Arenas ,. 2021).

What distinguishes this study from the study by Adi and Permana (2015) was presented. Teams often use the Sprint Backlog during Sprint Planning meetings, without defining a clear Sprint Goal, leading to different Sprint Planning options such as multiple meetings, using only the Sprint Backlog, not setting goals, and not valuing stories in contrast to what this Goal Setting proposal offers. Clearly and fairly stable. The proposed framework presented the precise definition of user stories and explained the opposite of what was presented by the study (Khan 2016). In which he mentioned the shortcomings of this stage in that the product owner is unable to determine what it is most importantly, the items are not prioritized and the priority is not reviewed continuously and carefully. The developing team works on user stories for the next product shipment, chosen from the product backlog during planning meetings. Sprints are projects with specific objectives and features, usually lasting two to four weeks, but no more than one month. The sprint backlog is not allowed to change except for unresolved issues. Sprint durations can be revised with product owner coordination, but long sprints may lead to changes in the product backlog, increasing risks, costs, and complexity. Daily meetings ensure smooth progress (Zayat et al. 2020).

The proposed framework presented this stage an important phase during which all stakeholders cooperate and in which the user stories are implemented, which the Kano model presented as a top priority for implementation, which ensures stakeholder satisfaction and also the successful delivery of these stories. The e-commerce website was developed using an improved software development strategy, incorporating Scrum methodology and the Kano model, and evaluated using GTmetrix tool for performance, structural integrity, and load metrics. The performance evaluation achieved an impressive score of 93%, demonstrating the site's optimization prowess. The structural audit achieved a commendable score of 85%, demonstrating the effectiveness of the chosen framework in ensuring a flexible website structure

The site was evaluated using another evaluation tool the PageSpeed Insights tool has provided valuable insights into its overall performance. The obtained commendable performance score of 82% signifies the site's efficiency in delivering content promptly, contributing to a positive user experience. The Pingdom tool confirmed the site's performance with a 70% score, highlighting its well-balanced content, 1.0 MB page size, and swift loading times.

V. CONCLUSION

This study successfully integrates Scrum methodology with the Kano model, enhancing software development practices. The framework was applied to a dynamic e-commerce website, focusing on improving Scrum's effectiveness. The system includes a user-friendly interface, robust cart system, precise inventory management, and efficient ordering and shipping. The study highlights the transformative potential of integrating

Scrum with the Kano model in advancing software development methodologies. Therefore, The Scrum-Kano framework successfully streamlines and improves software development processes, leading to a high-performing, user-centric website. Comprehensive evaluation metrics validate the robustness of the approach.

The proposed framework contains the following stages derived from the integration of the Scrum methodology with the Kano model: 1. Product Backlog 2. Sprint Planning 3. Sprint Backlog 4. Sprint

It focused on the most important requirements identified by the customer and were identified using the Kano model to build and implement the system.

In conclusion, this research represents a significant achievement in both the implementation and evaluation of the Scrum-Kano framework within the dynamic environment of an e-commerce system. The study convincingly demonstrates the framework's effectiveness in not only streamlining but also markedly improving software development processes, culminating in the creation of a high-performing, user-centric website. The robustness of this integrated approach is underscored by the comprehensive evaluation metrics, which unequivocally validate its success in delivering a stable, optimized, and responsive online platform.

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