

1. Objective: The objective is to select an appropriate process model for the software development of the Government Regulated Price Hike Control Application. Through thorough analysis and evaluation, we aim to identify a hybrid methodology that integrates elements of Scrum and Kanban to effectively manage the development process, streamline workflow, and enhance productivity. The selected process model should align closely with the project's requirements, promote collaboration among team members, and ensure efficient delivery of high-quality software solutions. Additionally, we seek to assess the rationale and consistency of the chosen methodology using appropriate tools and techniques, such as expert review, comparative analysis, and prototyping. The goal is to establish a robust and adaptive software development process that enables the successful delivery of the Government Regulated Price Hike Control Application, ensuring transparency, fairness, and consumer protection in market pricing while meeting stakeholder expectations and project objectives.

2. Software Development Life Cycle

2.1 Process Model

We believe the **Agile Method** is ideal for this project. Agile excels in dynamic and flexible environments where real-life problems necessitate ongoing adjustments due to a multitude of possible scenarios. This method also supports collaboration and continuous improvement, which are crucial for addressing the issue of price hikes.

Software development projects are inherently dynamic, subject to changes in requirements, circumstances, and stakeholders [1]. In response to this need for adaptability, various agile methodologies have been devised to cater to market demands for shorter development cycles, reduced costs, and enhanced flexibility [2, 3]. Among these agile approaches, Scrum and Kanban stand out as popular methods within the software industry [4], valued for their efficacy in managing the software development process [3, 5, 6]. The emergence of the Scrumban method, a hybrid of Scrum and Kanban, is rooted in these foundational agile principles, emphasizing the delivery of working software, collaboration among individuals, customer engagement, and responsiveness to change [7].

While Scrum offers significant benefits, such as improved team collaboration and iterative development, it also presents limitations that can impact project outcomes, including limited work visibility, challenges with scalability, and shifting task priorities [8, 9, 10]. Similarly, Kanban faces its own set of challenges, such as workflow bottlenecks and difficulties in managing large-scale implementations [11, 12]. Recognizing the individual constraints of each methodology, there is growing consensus that integrating multiple approaches may yield superior results compared to their standalone usage. For example, blending Kanban with Scrum has been proposed as a means to address the shortcomings of Scrum, leveraging the strengths of both methods to complement each other effectively [9, 13, 14, 15].

For this project, we will implement the **SCRUM Method**, a subset of **Agile Method**. After analyzing the problem's nature, we identified several key reasons for choosing Agile:

- **Real-time Monitoring and Updates:** The application must provide consumers with real-time price updates, necessitating frequent data monitoring.
- **User-Centric Interface:** The app should be user-friendly, catering to the needs of lower-class, middle-class, and student users.
- **Collaboration with Government and Consumers:** Effective collaboration between the government and consumers is essential for reporting issues and gathering feedback, requiring a flexible development approach.
- **Dynamic Market Conditions:** The software must adapt to ever-changing market and pricing conditions.
- **Continuous Improvement:** The application should evolve based on user feedback and changing requirements.

Reasons for Selecting Agile Development (Scrum):

- **Iterative and Incremental Development:** Scrum's iterative approach allows for continuous improvement and frequent software releases, aligning with the need for real-time updates and user-centricity.
- **Flexibility for Changing Requirements:** Scrum is known for its adaptability to changing requirements, crucial for managing dynamic market conditions.
- **Collaboration and Communication:** Scrum promotes open communication among all stakeholders, ensuring effective collaboration and quick feedback loops.
- **Transparency and Visibility:** Regular meetings and progress tracking in Scrum provide transparency, keeping stakeholders informed and involved.
- **Continuous Testing and Integration:** Scrum encourages continuous testing and integration, ensuring the application remains stable and functional.
- **Empowering Development Team:** Scrum empowers the development team to make decisions and self-organize, enhancing motivation and productivity.

Evidence Supporting Scrum Method:

- Scrum's iterative approach supports the need for real-time updates.
- The collaboration aspect enables effective communication between government officials and consumers.
- Scrum's flexibility is essential for adapting to changing market conditions.
- Continuous improvement ensures the application evolves based on user feedback.
- Scrum's transparency keeps stakeholders engaged, leading to better decision-making and project success.

In conclusion, Agile development, specifically Scrum, is the best choice for developing the proposed web-based application to mitigate price hikes. The presented evidence supports Scrum as an effective approach to deliver a valuable solution.

2.2 Project Role Identification and Responsibilities

Scrum Master: (MD. MEHEDI HASAN POLASH)

- Role: Facilitates the Agile development process and ensures adherence to the Scrum framework.
- Responsibilities:
 - Guide the team in implementing Scrum practices.
 - Facilitate Scrum ceremonies (sprint planning, daily stand-ups, sprint review, sprint retrospective).
 - Remove impediments hindering progress.
 - Ensure adherence to Scrum roles, artifacts, and rules.
 - Coach the team on continuous improvement and self-organization.
 - Collaborate with the Product Owner and team for a smooth development process.

Product Owner: (TRIDIB SARKAR)

- Role: Represents stakeholders and maximizes the product's value.
- Responsibilities:
 - Define and prioritize the product backlog.
 - Communicate product vision and requirements.
 - Decide on the release plan and sprint content.
 - Accept or reject work results based on acceptance criteria.
 - Gather feedback and refine the product backlog.
 - Ensure the team understands the product vision and goals.

Scrum Team: (CHAYAN ADHIKARY)

- Role: A self-organizing, cross-functional group responsible for product development.
- Responsibilities:
 - Work on sprint backlog items collaboratively.
 - Estimate effort for user stories during sprint planning.
 - Hold daily stand-ups to synchronize progress.
 - Conduct sprint reviews to showcase completed work.
 - Engage in sprint retrospectives for improvement.
 - Ensure product quality and meet the Definition of Done.

Customer (Stakeholders): (PROGGA PAROMITA DAS)

- Role: Represents end-users or consumers of the product.
- Responsibilities:
 - Provide input and feedback on product features.
 - Review and accept completed work during sprint reviews.
 - Collaborate to ensure the product meets expectations.
 - Share user feedback for product improvements.
 - Communicate progress and timelines with the team.

Management: (MD. YASIR ARAFAT TAMIM)

- Role: Represents the organization or project sponsors.
- Responsibilities:
 - Support Agile practices and Scrum framework adoption.
 - Remove organizational impediments and provide resources.
 - Set project objectives, budget, and timelines.
 - Participate in sprint reviews and provide feedback.
 - Align project goals with business objectives.
 - Support the Scrum Team's continuous improvement efforts.

Each role in Scrum plays a crucial part in the project's success. The Scrum Master, Product Owner, and Scrum Team collaborate closely, while the Customer and Management provide essential input and support to ensure the project meets its objectives and delivers value to end-users.

Impact:

a. Societal Impact:

- I. Improved Market Transparency:
 - The Government Regulated Price Hike Control Application can provide real-time pricing information, reducing information asymmetry between producers, consumers, and intermediaries across various sectors, including agriculture, energy, and consumer goods.
 - By making market data accessible, it empowers stakeholders to negotiate better prices and helps consumers make informed purchasing decisions.
- II. Reduced Price Volatility:
 - The application can help stabilize market prices by monitoring and regulating price hikes, ensuring fair pricing practices.
 - This can lead to a more predictable and stable market environment, benefiting producers, consumers, and businesses in multiple sectors.

b. Economic Impact:

- I. Enhanced Income for Producers:
 - By providing direct market access and reducing intermediary influence, the application can ensure that producers receive fair prices for their goods and services.
 - This can lead to an increase in incomes for small businesses, farmers, and manufacturers, contributing to broader economic development and poverty reduction.
- II. Market Efficiency:
 - The application promotes market efficiency by reducing transaction costs and minimizing market distortions caused by price manipulation.
 - Efficient markets can lead to optimal resource allocation and improved overall economic performance, benefiting a wide range of industries.

c. Consumer Impact:

I. Fair Pricing for Consumers:

- Consumers benefit from fair and transparent pricing, which helps protect them from exploitation by intermediaries.
- This can lead to increased consumer trust and satisfaction in various markets, including food, energy, and consumer goods.

II. Improved Access to Essential Goods:

- By ensuring fair prices and reducing price volatility, the application can contribute to improved access to essential goods and services.
- Stable and fair prices can make critical items like food, fuel, and healthcare more affordable for the broader population.

d. Technological Impact:

I. Adoption of Digital Tools:

- The application promotes the adoption of digital tools and e-governance across different sectors, fostering technological innovation.
- It encourages the use of mobile and web-based platforms among all stakeholders, enhancing digital literacy and accessibility.

II. Data-Driven Decision Making:

- The application collects and analyzes market data, providing valuable insights for policymakers and stakeholders.
- Data-driven approaches can lead to more informed and effective policy decisions, benefiting multiple sectors.

e. Regulatory Impact:

I. Strengthened Regulatory Framework:

- The application supports the enforcement of market regulations and policies aimed at protecting all market participants.
- It helps monitor compliance with pricing regulations, reducing market abuses and enhancing regulatory oversight.

II. Enhanced Accountability:

- By providing transparent and accessible pricing data, the application promotes accountability among market participants.
- It enables authorities to track and address instances of price manipulation or unfair practices more effectively.

f. Environmental Impact:

I. Sustainable Practices:

- By ensuring fair pricing, the application can incentivize producers to invest in sustainable practices across various industries.

- Higher incomes allow businesses and individuals to adopt environmentally friendly technologies and practices, contributing to environmental conservation.

II. Reduced Waste:

- Fair pricing and market stability can reduce the likelihood of waste caused by market imbalances and price fluctuations.
- Efficient markets ensure that goods and services are utilized and consumed in a timely manner, reducing waste.

g. Cultural Impact:

I. Empowerment of Marginalized Groups:

- The application can empower small and marginalized producers by providing them with market access and fair pricing.
- It fosters inclusivity and equity across different sectors, promoting social and economic empowerment.

II. Promotion of Local Markets:

- By supporting fair pricing and market stability, the application can encourage the growth of local markets and small-scale businesses.
- It helps preserve local traditions and promotes the cultural heritage of communities involved in various industries.

References:

1. P. Henderson, "Why large IT projects fail," *ACM Transactions on Programming Languages and Systems*, vol. 15, no. 5, pp. 795-825, 2006.
2. S. Conn, "A New Teaching Paradigm in Information Systems Education: An Investigation and Report on the Origins, Significance, and Efficacy of the Agile Development Movement," *Information Systems Education Journal*, vol. 2, no. 15, pp. 3-18, 2004.
3. W. Zayat and O. Senvar, "Framework study for agile software development via scrum and Kanban," *International Journal of Innovation and Technology Management*, vol. 17, no. 4, 2020.
4. E. Weflen, C. A. MacKenzie, and I. V. Rivero, "An influence diagram approach to automating lead time estimation in Agile Kanban project management," *Expert Systems with Applications*, vol. 187, 2022.
5. H. Alaidaros and M. Omar, "Software project management approaches for monitoring work-in-progress: A review," *Journal of Engineering and Applied Sciences*, vol. 12, no. 15, pp. 3851-3857, 2017.
6. H. Lei, F. Ganjeizadeh, P. K. Jayachandran, and P. Ozcan, "A statistical analysis of the effects of Scrum and Kanban on software development projects," *Robotics and Computer-Integrated Manufacturing*, vol. 43, pp. 59-67, 2017.

7. S. W. Ambler, "The Non-Existent Software Crisis: Debunking the Chaos Report," 2014. [Online]. Available: <http://www.drdobbs.com/architecture-and-design/the-non-existentsoftware-crisis-debunki/240165910>.
8. N. Tripathi, P. Rodriguez, M. O. Ahmad, and M. Oivo, "Scaling kanban for software development in a multisite organization: Challenges and potential solutions," in *Agile Processes, in Software Engineering, and Extreme Programming*, pp. 1783-190, 2015.
9. P. Rodriguez, J. Partanen, P. Kuvaja, and M. Oivo, "Combining lean thinking and agile methods for software development: a case study of a Finnish provider of wireless embedded systems," in *47th Hawaii International Conference on System Sciences (HICSS)*, pp. 4770-34779, IEEE, 2014.
10. N. Ozkan and M. Gök, "How Scrum Inhibits Agility," in *15th Turkish National Software Engineering Symposium (UYMS)*, pp. 1-6, IEEE, 2021.
11. M. O. Ahmad, D. Dennehy, K. Conboy, and M. Oivo, "Kanban in software engineering: A systematic mapping study," *Journal of Systems and Software*, vol. 137, pp. 96-113, 2018.
12. E. L. C. Law and M. K. Lárusdóttir, "Whose experience do we care about? Analysis of the fitness of scrum and kanban to user experience," *International Journal of Human-Computer Interaction*, vol. 31, no. 9, pp. 584-602, 2015.
13. A. Banijamali, R. Dawadi, M. O. Ahmad, J. Similä, M. Oivo, and K. Liukkunen, "An empirical study on the impact of Scrumban on geographically distributed software development," in *4th international conference on model driven engineering and software development (MODELSWARD)*, pp. 567-577, IEEE, 2016.
14. C. Ladas, *Scrumban-essays on kanban systems for lean software development*. Modus Cooperandi Press, 2009.
15. M. Alqudah and R. Razali, "A comparison of scrum and Kanban for identifying their selection factors," in *6th International Conference on Electrical Engineering and Informatics (ICEEI)*, pp. 1-6, IEEE, 2017.