AI-Driven E-commerce for Agri-Products: Feature Integration and Usability in Quirino Province

[1]**Joselle D. Concepcion, **[2]**Thelma D. Palaoag**

[1*]University of the Cordilleras, joselledcconcepcion@gmail.com
[2]University of the Cordilleras, tdpalaoag@gmail.com

ABSTRACT

The demand for a dedicated online marketplace that supports Quirino Province's agri-based products while addressing the challenges of product authenticity and intermediary dependence highlights the potential impact of an AI-powered e-commerce application. This study aimed to identify and integrate relevant AI features into a proposed e-commerce platform customized to the needs of the province and assess its usability among local stakeholders. Employing a design thinking approach, the research started with a needs assessment survey through interviews, focus groups, and surveys to understand the requirements of business owners and consumers. During the define phase, affinity diagramming and a prioritization matrix were used to classify and prioritize AI features with high user preference for vendor collaboration and product authentication. Through brainstorming and storyboarding, key workflows were conceptualized in the ideate phase, followed by iterative prototyping. Testing was conducted using the System Usability Scale (SUS), revealed a usability score of 72.20. This AI-powered platform has the potential to transform Quirino's agricultural and commercial sectors, fostering economic growth and creating a sustainable model for regional e-commerce.

KEYWORDS

AI, E-commerce, Mobile App, SUSIntroduction

Quirino Province' residents' main source of income is agricultural production and wide array of goods, encompassing vegetables, fruits, and raw materials. The ingenuity and adaptability of Quirino's entrepreneurs have resulted in the utilization of the province's abundant agricultural resources into a variety of products, comprising refined and processed commodities, handcrafted products, and more. This demonstrates the province's dedication to promote innovation and resourcefulness [1].

In earlier researches, some challenges in e-commerce hinder the use of platforms. These include a lack of visibility on larger platforms [2], reliance on intermediaries, and challenges in preserving product authenticity [3]. In the absence of a customized e-commerce solution, local producers face challenges in effectively accessing wider markets, which restricts their profitability and diminishes opportunities for job creation within the province. A digital marketplace specifically designed for Quirino has the potential to fill these gaps, fostering direct engagement between vendors and consumers while guaranteeing product authenticity.

Artificial Intelligence (AI) offers transformative capabilities for e-commerce, with advanced functionalities that can streamline processes and improve vendor collaboration. An e-commerce platform can utilize an AI-driven matching algorithm to recognize synergies among local vendors, thereby enabling supply-chain partnerships and collaborative product development [4]. Additionally, AI has significant potential in addressing product authenticity, a critical factor in rural markets. By scanning product identifiers, AI systems can cross-check product records and details and detect anomalies ensuring consumers receive authentic, high-quality goods.

Despite the potential of AI, local e-commerce platforms remain largely unexplored, and few studies have examined usability within these contexts. Most AI-driven e-commerce applications are designed for larger, urban markets, where needs and challenges differ considerably. This study aims to address this gap by developing an AI-powered e-commerce

platform specifically designed for Quirino Province. It incorporates AI functionalities to enhance vendor collaboration and ensure product authentication, while also assessing its usability for local stakeholders.

Objectives

The primary objectives of this study are twofold: to identify and integrate AI functionalities that address the unique needs of Quirino's e-commerce landscape and to assess the usability of the developed application. This research aims to provide a framework for deploying effective, AI-driven e-commerce solutions in rural areas, creating a model that could be applied in other similar regions for sustainable economic growth.

Scope and Methodology

The scope of this study is limited to Quirino Province, emphasizing agri-based products and involving local stakeholders in design and testing to ensure relevance and usability.

This study applied a Design Thinking approach across five structured phases: Empathy, Define, Ideate, Prototype, and Test to meet the objectives of the study.

A. Design Thinking

The Empathy phase was aimed at understanding the specific e-commerce challenges and needs of Quirino's local business community. A needs assessment survey was conducted on through a combination of interview and focus groups with twenty (20) local business owners and consumers. This approach provided comprehensive insights into user preferences, common pain points, and functional needs, forming the foundation for AI feature selection. The data gathered helped to pinpoint areas where AI could most effectively enhance the e-commerce experience, specifically in vendor collaboration, product authenticity, and user engagement.

In the Define phase, findings from the needs assessment were organized using Affinity Diagramming, allowing insights to be grouped by theme. A Prioritization Matrix was then employed to rank potential AI features according to relevance, feasibility, and user preference.

Brainstorming and storyboarding sessions were conducted to conceptualize the application's workflows and user interactions with the proposed AI features in the Ideate phase. This involved visualizing key AI functions.

During the Prototype phase, the application was developed iteratively, which allowed for continuous refinements based on user feedback and usability considerations. This phase also emphasized the alignment of AI capabilities with usability standards, laying the groundwork for final usability testing.

To achieve the second objective which is determining the usability level of the proposed e-commerce application, a usability testing was conducted with a sample of local users, including both business owners and consumers from Quirino Province. The System Usability Scale (SUS) was employed as a primary tool for evaluating the application's usability, providing a quantitative assessment of user satisfaction.

B. Instrument Design

The data for this study is collected primarily through the administration of the System Usability Scale (SUS), a widely-recognized questionnaire for evaluating usability. The SUS questionnaire consists of ten statement items, rated on a 5-point Likert scale, to measure various aspects of usability, including user satisfaction, efficiency, and ease of use as seen in Table 1.

Table 1. SUS Questionnaire

No.	Statement Items
Q1	I think that I would like to use this application frequently.
Q2	I found the application unnecessarily complex.
Q3	I thought the application was easy to use.
Q4	I think that I would need the support of a technical person to be able to use this application.
Q5	I found the various functions in this application were well integrated.

Q6	I thought there was too much inconsistency in this application.
Q7	I would imagine that most people would learn to use this application very quickly.
Q8	I found the application very cumbersome to use.
Q9	I felt very confident using the application.
Q10	I needed to learn a lot of things before I could get going with this application.

C. Respondents and Sampling Method

The participants for the usability assessment were composed of five (5) IT experts and ten (10) local business owner and ten (10) consumers. IT experts were selected for their technical proficiency, making them valuable sources of insights regarding app usability and design. The sampling method used is stratified sampling to represent potential end-users of the application. The recruitment of participants meeting the inclusion criteria was accomplished through collaboration with local trade associations and local cooperatives.

D. Data Collection Procedure

The participants were presented with the e-commerce app and required to perform a series of tasks. The tasks aim to explore the app's major transaction process such as setting up a store, navigation, and transaction processes. Insights from the testing process are further supplemented by administering the SUS questionnaire to gather quantitative usability data. The response scale for each question is a 5-point Likert agreement scale like in Table 2.

Table 2. Likert Measurement Scale

Adjectival Rating	Scale
Strongly Agree	5
Agree	4
Neither Agree nor Disagree	3
Disagree	2
Strongly Disagree	1

E. Data Analysis

The System Usability Scale (SUS) score is determined through a set of 10 Likert ratings, typically completed by users following their exposure to the system over a defined period. The procedure for computing the SUS score entails two main steps. Firstly, for odd-numbered items or questions, 1 is subtracted from the user's Likert ratings. Secondly, for even-numbered items, the user's Likert ratings are subtracted from 5. Each item score falls within a range of 0 to 4 based on these calculations. Subsequently, the sum of these item scores is calculated and then multiplied by 2.5. This calculation yields the SUS score, which can fall within a range from 0 to 100 [5]. Averaging was employed to analyze the data in this study. The SUS scores will be interpreted like in Table 3.

Table 3. Grades, adjectives, and acceptability categories for raw SUS scores interpretation

Grade	SUS	Percentile Range	Adjective	Acceptability
A+	84.1-100	96-100	Best Imaginable	Acceptable
A	80.8-84.0	90-95	Excellent	Acceptable
A-	78.9-80.7	85-89		Acceptable
B+	77.2-78.8	80-84		Acceptable
B	74.1-77.1	70-79		Acceptable

B-	72.6-74.0	65-69		Acceptable
C+	71.1-72.5	60-64	Good	Acceptable
C	65.0-71.0	41-59		Marginal
C-	62.7-64.9	35-40		Marginal
D	51.7-62.6	15-34	OK	Marginal
E	25.1-51.6	2-14	Poor	Not Acceptable
F	0-25	0-1.9	Worst Imaginable	Not Acceptable

Through this Design Thinking approach, the study systematically identified and integrated AI features suited to Quirino's e-commerce needs and validated the usability of the developed application, ensuring it effectively served its target audience.

Literature Review

The integration of Artificial Intelligence (AI) in e-commerce has revolutionized how businesses interact with customers and optimize operations. This review explores recent scholarly work on AI implementation in e-commerce platforms, with a particular focus on usability measurements through the System Usability Scale (SUS).

Recent studies highlight that transitioning from standard internet technology to intelligent AI-based systems has become critical for e-commerce success. For instance, research by Wang et al. (2023) provides a conceptual framework showcasing how AI enhances customer interactions and operational efficiency. Similarly, Zhang (2024) emphasizes that identifying essential AI features begins with empathizing with target users. This aligns with the researchers' qualitative approach to identifying user pain points and preferences in designing AI-powered e-commerce platforms.

The SUS has been widely used to evaluate e-commerce sites, offering a reliable method to assess user interaction with platform interfaces. Akbar et al. (2023) note that SUS effectively identifies usability issues, echoing findings by Alsalem et al. (2022), where the technique uncovered both minor and major flaws in e-commerce site designs.

Studies further interpret SUS scores to determine usability levels. Scores above 68 are considered above average, while scores above 80 indicate excellent usability. Ahmad et al. (2021) demonstrated that SUS effectively assessed user satisfaction, with their study on an e-commerce application meeting and surpassing the acceptable usability margin.

In conclusion, SUS serves as a robust tool for evaluating e-commerce platforms when implemented correctly. Achieving success depends on careful planning, consistent execution, and a comprehensive analysis of results, ensuring that AI-powered platforms meet user needs and expectations.

Result and Discussion

A. Key AI Features

Table 4. Needs Assessment

Category	Findings
User Preferences	- Preference for direct sales channels - Interest in local authenticity indicators - Desire for ease of use
Pain Points	- Dependence on intermediaries, reducing profit margins - Limited visibility on larger platforms - Concerns over product authenticity

Functional Needs	- Customized e-commerce application - Authentication mechanisms for products - Need for vendor collaboration tools

The results of the needs assessment survey, presented in Table 4, provide key insights into user preferences, pain points, and functional needs, which guided AI feature selection. Users in Quirino Province prefer direct sales channels, value authenticity indicators for local products, and prioritize an easy-to-use platform. Key pain points include reliance on intermediaries, which reduces profit margins due to third-party commissions [6], limited visibility on larger platforms, and concerns about product authenticity to ensure products are genuinely from the province.

The assessment highlighted the need for a customized e-commerce application with product authentication and vendor collaboration tools. Simplicity and intuitiveness were also deemed essential, particularly for less tech-savvy users, underscoring the importance of a user-friendly interface [7]. These insights confirm that a design thinking approach would be effective for creating a platform tailored to local needs, promoting wider adoption and addressing challenges in Quirino's e-commerce market.

Table 5. Prioritization Matrix

AI Feature	Relevance	Feasibility	User Preference	Total Score
Vendor-Matching Algorithm	5	4	5	14
Product Authenticity Verification	5	5	4	14
Personalized Recommendations	3	3	3	9
Inventory Prediction	3	3	2	8

The prioritization matrix as presented in Table 5 helped narrow down AI functionalities that would be both impactful and implementable and it established a clear direction for application development. The Vendor-Matching Algorithm and Product Authenticity Verification emerged as the highest-priority AI features, directly addressing key needs in collaboration and authenticity as identified in the needs assessment. Both features align well with user preferences and are technically feasible, making them key features of the application's design. Meanwhile, Personalized Recommendations and Inventory Prediction, while beneficial, are considered lower-priority features and may be integrated in later phases, once major features have been established.
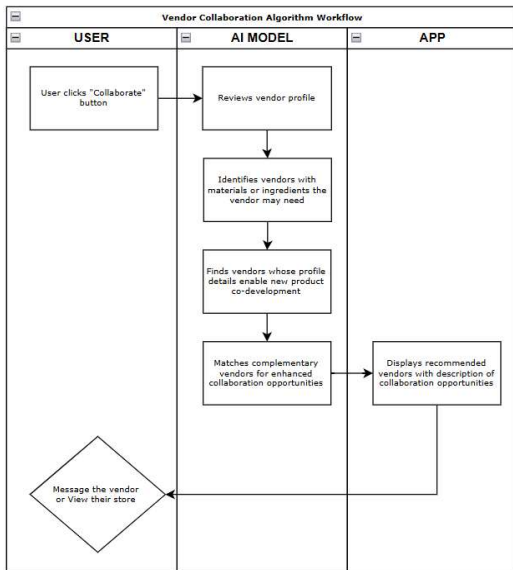
Figure 1. Vendor Collaboration Algorithm Workflow

The illustration in Figure 1 shows the role of user, AI model, and application in facilitating the vendor collaboration algorithm workflow.

The user initiates collaboration by clicking the "Collaborate" button. The AI model analyzes the vendor's profile, focusing on key attributes including resources needs and co-development possibilities ensuring that the suggested collaborations are relevant. The app displays recommended partners and collaboration details and the user can choose to message the suggested vendor directly or view the vendor's store, simplifying the decision-making process.
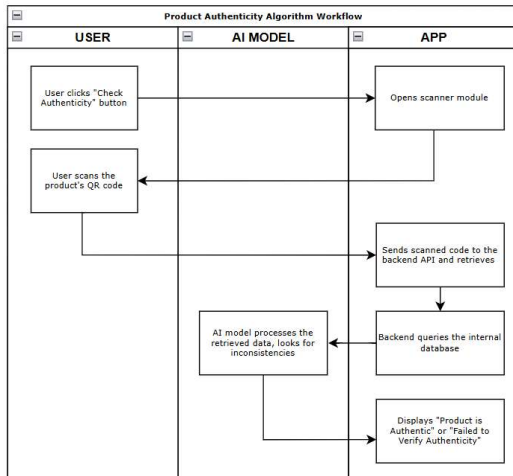

Figure 2. Product Authenticity Algorithm Workflow

The illustration in Figure 2 shows the role of user, AI model, and application in the workflow of the vendor collaboration algorithm. The user initiates the process by clicking on the "Check Authenticity" button. The app opens the scanner module to photograph the QR code in the product's packaging. The code is transmitted to the backend API, which acts as the intermediary between the user and the AI model. The backend API queries the internal database to retrieve the product information associated with the scanned QR code. The AI model processes the retrieved data, meticulously examining it for any irregularities. This analysis involves cross-referencing information from various sources from the vendor profile and product details. Based on the analysis, the AI model determines the authenticity of the product. The application displays the verification result to the user, clearly indicating whether the product is authentic or if its authenticity cannot be verified. This feedback empowers the user to make informed purchasing decisions.

The workflow for both vendor collaboration and product authenticity helped create a cohesive design for the application interface, ensuring that the AI features were seamlessly integrated into the user experience. This served as a blueprint for the subsequent development of the application.
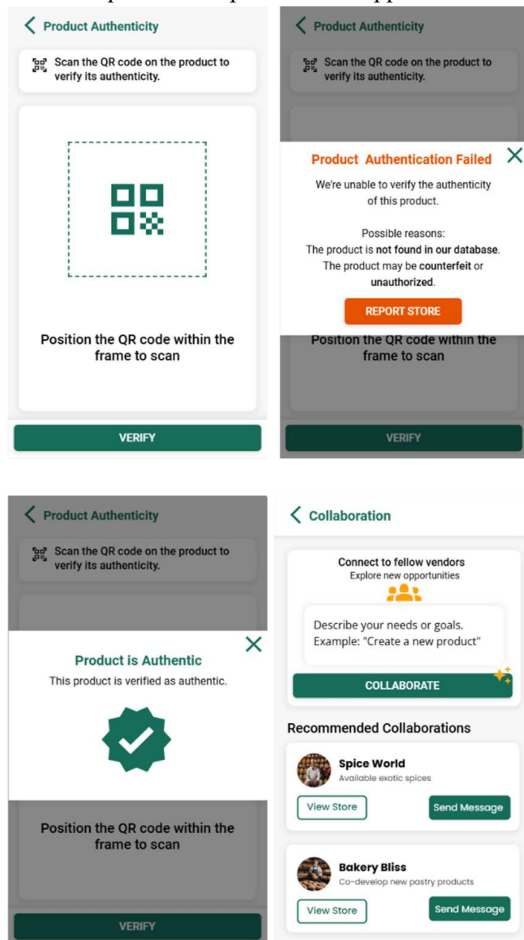

Figure 3. Product Authenticity and Vendor Collaboration Screens

With the help of the previous phases, the features of the application were developed as displayed in Figure 3. The user interface was designed for easy navigation. The AI algorithms were developed and trained on relevant datasets to accurately verify product authenticity and match vendors. APIs were used to connect the application to external databases and services, enabling real-time data exchange and verification.

B. Overview of SUS Score

Table 6 presents a summary of average SUS scores, which encapsulates the collective user experience with the application.

Table 6. Average SUS Score

Respondent	SUS Score	Interpretation
R1	77.50	Acceptable
R2	77.50	Acceptable
R3	75.00	Acceptable
R4	77.50	Acceptable
R5	77.50	Acceptable
R6	72.50	Acceptable
R7	65.00	Marginal
R8	77.50	Acceptable
R9	67.50	Marginal
R10	72.50	Acceptable

R11	85.00	Acceptable
R12	62.50	Marginal
R13	62.50	Marginal
R14	67.50	Marginal
R15	80.00	Acceptable
R16	75.00	Acceptable
R17	72.50	Acceptable
R18	67.50	Marginal
R19	77.50	Acceptable
R20	75.00	Acceptable
R21	62.50	Marginal
R22	77.50	Acceptable
R23	52.50	Marginal
R24	72.50	Acceptable
R25	75.00	Acceptable
Average Score	**72.20**	Acceptable

The application achieved a commendable average SUS score of 72.20, as illustrated in Table 5. This score places the application firmly in the "Acceptable" category, with an adjectival rating that falls within the range of "Good" and classified under grade B-. These findings are indicative of the app's usability, affirming its readiness for deployment and implementation.

The SUS score, being a reliable measure of usability [8], provides valuable insights into the user-friendliness and effectiveness of the e-commerce app. The "Good" rating not only signifies the app's acceptability but also suggests that users are likely to have a positive experience while using it.

This result emphasizes the practicality and user-centered design of the e-commerce mobile app, which has been a focal point in its development. The user-centric approach has played a significant role in creating an application that aligns with user preferences and expectations [9].

Findings

In this study, the researchers successfully addressed two objectives concerning the development of a proposed e-commerce application tailored for Quirino Province.

Firstly, the researchers identified and integrated specific features of AI that cater to the unique needs of local producers and consumers. By integrating AI-driven features such as vendor collaboration and product authenticity, the application enhances the shopping experience for consumers and empowers local business owners. These features not only modernize operations but also foster a more engaging and responsive interaction between businesses and their customers, ultimately driving growth in the local e-commerce landscape.

Secondly, the comprehensive usability evaluation using the System Usability Scale (SUS) to determine the usability level of the proposed application. The results indicated an overall SUS score of 72.20, suggesting that users find the application intuitive and effective. This positive feedback underscores the application's potential to meet user expectations and facilitate a seamless online shopping experience. However, the variation in scores between business owners and consumers highlights the necessity for targeted enhancements, particularly in areas such as payment options and loading times.

Limitations and Research Gaps

The study's findings are subject to several limitations. First, its geographic focus on Quirino Province may restrict the generalizability of results to regions with different socio-economic and technological contexts. Additionally, while the research incorporated feedback from local stakeholders, their perspectives may not fully capture the needs of other potential user groups, such as larger-scale buyers or external investors. The platform was evaluated using a prototype, which may not fully reflect the complete range of functionalities anticipated in the final product. Lastly, the usability assessment, based on the System Usability Scale (SUS), was conducted after limited user interactions, leaving long-term adoption patterns and sustained user satisfaction unexplored.

Despite the growing body of research on AI applications in e-commerce, significant gaps persist in understanding their contextual integration within rural, agri-based economies like Quirino Province. Existing studies often fail to address the

specific challenges and opportunities in these settings, particularly in areas such as product authentication and traceability, which are critical for small-scale producers.

Conclusion

In conclusion, this study does not only exhibit the feasibility of integrating AI into e-commerce application for Quirino Province but also emphasizes the importance of usability in guaranteeing the satisfaction of users. Furthermore, additional refinements based on user feedback will be essential to improve the application's performance and ensure its long-term success online. The integration of AI features, coupled with a strong focus on usability, positions the proposed e-commerce application as a valuable tool for supporting the digital transformation of agri-based product businesses in Quirino Province.

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