

E-Vigilant: An e-commerce assistant smartphone application with customer and seller fraud detection, seller identity check, legal help, e-shopping features

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Abstract—Ecommerce or online shopping is popular all over the world due to increased internet and smartphone usage, convenience, easy access to product and seller information, reduced communication difficulties, and changing consumer behaviors. The previous literary works on ecommerce assistants did not offer adequate support to both customers and sellers. This was due to the absence of an automated application that could predict customer and seller fraud, submit electronic complaints, search for legal help, and provide options for verifying the identity of sellers, products, and customers. To rectify the existing concerns, this paper exhibits an ecommerce assistant smartphone application that includes customer and seller side fraud prediction, seller, customer, and product identity checks, electronic complaint against fraud, legal help search, customer choice-based e-shopping feature, seller contact, inquiry, loan application for sellers, ecommerce tips, and seller review submission features. The app success measurement and fruitfulness investigation results revealed that more than 57% of investigators supported the proposed application with excellent feedback.

Index Terms—Ecommerce fraud, seller identification, smartphone app, complaint, product checking, legal help, e-shopping.

I. INTRODUCTION

E-commerce-based online shopping is gaining popularity in Bangladesh and around the world due to its ease of access to products, time savings, and reduction in communication difficulties. Every day, over 2500 registered e-commerce platforms ship over 50,000 products to customers nationwide [1]. According to [2], the e-commerce market size in 2021 was approximately 56 thousand crore (in BDT) and is expected to reach around one lakh fifty thousand crore (in BDT) by 2026. According to [3], e-commerce platforms in Bangladesh are expanding at a 25% annual rate. However, the presence of various fraudulent activities has resulted in a lack of trust between seller and customer in Bangladesh's e-commerce market. From 2006 to 2021, e-commerce sellers and MLM companies stole 21 thousand crore BDT from customers through various scams and e-commerce fraud.

Ecommerce fraud is a serious issue that affects both online merchants and consumers. Economic fraud can cause signifi-

cant financial losses and reputational harm to both sellers and customers. Both sellers and buyers are capable of engaging in fraudulent behavior. Seller fraud in the e-commerce market can take many forms, including unauthorized charges, late delivery, shipping fraud, incorrect brand and seller information, counterfeit product delivery, misrepresentation of product, no delivery, and faulty or damaged product delivery [4]. According to [4], customers with limited internet knowledge have fallen victim to a variety of fraudulent activities. Customers have filed several reports against sellers alleging additional product charges or faulty product delivery. It should be noted that e-commerce fraud includes not only seller fraud but also various types of customer fraud. The most common types of customer fraud in the e-commerce sector today are credit card fraud, false address, fake account, change of mind, false refund claim, payment fraud, account takeover, and false product change claim [5]. Several existing laws, including the Bangladesh Consumer Protection Act of 2009 and the Digital Ecommerce Policy 2020, can assist citizens in dealing with fraudulent cases. Law enforcement recently received several complaints about fraudulent activity on over twenty nine e-commerce platforms [6]. Customers and sellers are unable to receive adequate support for various types of ecommerce fraud as a consequence of a missing real-time system that includes an electronic complaint submission, police contact, seller and customer fraud prediction, legal assistance, product, seller, and a customer identification system [6].

Currently, various literary works exist in the fields of e-commerce fraud and shopping assistance systems. The work in [7] created a transfer learning-based product recommendation and sales analysis model for the Indian people. The article in [8] used various artificial intelligence (AI) techniques to investigate the relationship between online shopping and customer purchasing behavior. The authors of [9] used LSTM to predict customer churn rates and a deep learning model to segment customers based on loyalty and spending data. The article in [10] created a company sales forecasting model using both artificial bee colonies (ABC) and the adaboost technique. The

work in [11] used an RNN model to analyze user sentiment and a random forest model to predict customer purchase intentions. The authors of [12] created a blockchain-based e-commerce assistant system that uses non-fungible tokens (NFTs) to ensure the authenticity of product warranties. To ensure customer satisfaction, the work in [13] suggested that an e-commerce website should provide data confidentiality and security, product selection, a seller, customer, and product verification system. The authors of [14] used MLP and the XGBoost technique to predict e-commerce product demand in Indonesia.

According to literary work discussion, existing works did not deliver both seller and customer side fraud prediction features by taking into account various fraud types, customer and seller behavior, payment, product information, refund, and product delivery issues. The existing works did not provide electronic complaint submission options (to law enforcement or security forces) for both the seller and buyer. There is a lack of a system for verifying the identity of sellers, customers, and products. Previous works lacked features such as e-commerce inquiry submission and a legal advisor search feature. They did not dispatch any ecommerce help posts or product ordering options. There is a lack of an automated system for buyers and sellers that includes features such as e-commerce blog access, bank loan application, connecting with e-commerce sellers, legal information search, and application feature review. To vanquish the current shortcomings, this article discloses an ecommerce assistant automated mobile application that includes customer and seller side fraud detection, customer, seller, and product identity verification, legal assistance, electronic complaint facilities, and e-shopping features. The distinctive contributions of the presented application are pointed out as follows:

- The proposed “E-vigilant” ecommerce assistant smart application deploys a seller-side fraud prediction feature by collecting customer responses to questions about seller behavior, item status, product price, and delivery condition. This ecommerce assistant application also includes a customer-side fraud prediction feature that takes sellers’ responses to customer claim, refund, product change, and payment-related questions.
- The ecommerce assistant application checks the identity of sellers, customers, and products using their name, address, business ID, product ID, national ID, and QR code. This e-commerce assistant application includes an electronic complaint dispatch, e-shopping, and legal advisor search feature for both sellers and buyers, taking their personal interest, information, and incident into account.
- The ecommerce assistance app allows ecommerce help message posting, applying for a seller bank loan, searching for legal information, tips, and contacting ecommerce sellers. This article also includes app success and fruitfulness investigation findings based on customer feedback.

The background research on e-commerce assistance is given

in section II. Section three conveys the proposed ecommerce assistant mobile application features. Section four discloses the app’s success evaluation results. Section five releases the concluding remarks.

II. LITERATURE REVIEW

This section dispatches literary works discussion about e-commerce shopping assistant systems for sellers and buyers. The authors in [15] used both k-means clustering technique to segment customers based on their income and personal data. The work in [16] used different machine learning-based regression models (RF, DT, and SVM) to predict sales prices. The authors of [17] presented an e-commerce product recommendation system for both retailers and wholesalers that utilized data mining techniques and association rules. The article in [18] discussed how a hybrid scheme incorporating both CNN and Bi-LSTM techniques can provide better product review rating prediction for Bangladeshi products. The authors of [19] created a scheme for product recommendation that employs LSTM for text classification and CNN for image classification. The article in [20] developed a mobile app that tracks online purchase orders from an e-commerce website. According to the findings in [21], using augmented and virtual reality technologies can improve customers’ e-commerce product shopping experiences. The authors of [22] presented a CNN-based best ecommerce model selection and customer review classification scheme for Myanmar’s hotel industry. The work in [23] described a naive bayes-based emotion classification technique for Amazon products. The authors of [24] proposed a blockchain based inventory management system for a ecommerce platform. The work in [25] created a knowledge graph model based on the attention mechanism for agriculture product recommendation in India. The authors of [26] used multi-criteria-based heuristic technique to select appropriate products from a market. To identify the best e-commerce product based on user reviews, the researchers in [27] used a random logistic vector algorithm that considers both product quality and life information. The authors of [28] created a mechanism for extracting information from e-commerce product entities using both a Bi-LSTM and a CNN model. The work in [29] used the clustering technique (i.e., k-means) to investigate sales patterns, buyer segmentation, geographical analysis, and peak sales time results for e-commerce sellers. To predict financial fraud in the transaction, the authors in [30] used a hybrid technique combining both autoencoder and CNN techniques that took into account financial fraud cases and personal data. Table I outlines the differences between our work and some existing works. Unlike the previous ecommerce assistant literary works, this article provides an automated mobile application with customer and seller fraud prediction, legal help search, e-complaint, eshopping, ecommerce tips, inquiry solution, seller contact, loan help, seller, customer, and product identity checks feature.

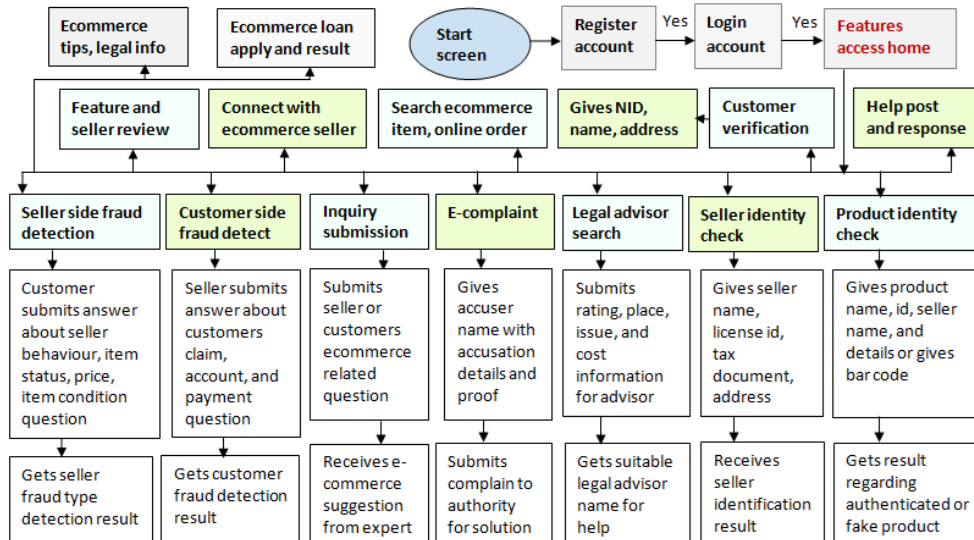


Fig. 1. Proposed e-commerce assistant app flowchart with seller-side and customer-side fraud prediction, e-complaint, e-shopping, and legal help features

TABLE I
A COMPARATIVE ANALYSIS WITH EXISTING WORKS

Scheme	Customer and seller side fraud detection	Seller, customer, product verification	legal advisor and complaint solution	User and data Security issue
Existing work [12]	not available	not available	not available	blockchain based
Existing work [20]	not available	not available	not available	firebase based security
Existing work [24]	not available	not available	not available	blockchain based (inventory)
Existing work [30]	only financial fraud detect	not available	not available	not available
Our work	featured all	featured all	featured all	included (firebase authentication)

TABLE II
APP FRUITFULNESS INVESTIGATION RESULTS (340 PARTICIPANTS)

Criterion	Magnificent	Supportable	Not supportable	Even handed
Cover the needs of buyers and sellers and deliver help	208	70	55	07
Stability, reliability, and easy access of features	213	65	50	12
Technical characteristics, maintenance, quick feedback	205	75	54	6
User- and business-centric app development	200	85	45	10

III. PROPOSED SCHEME

Figure 1 releases the developed ecommerce assistant smartphone application (“E-Vigilant”), which includes seller and customer side fraud prediction, electronic complaint, legal help, electronic shopping, seller, customer, and product credibility check, commerce tips, seller contact, and inquiry help feature. To select the best fraud detection algorithm, we have tested different ML algorithms such as regression, classical ML algorithms, XGBoost, and adaboost classifier. Finally, we have used an adaboost classifier algorithm for the seller side and customer side fraud prediction and achieved an accuracy of 97 percent. Our dataset size includes 537 customer side data and 193 seller side data. The dataset verification process is conducted by four experts (two customers and two sellers). The e-commerce help assistant smartphone application is

designed using Flutter SDK and Firebase SDK platforms from Google. In this work, the Firebase platform offers real-time database security and privacy for the customers. Furthermore, the customer and seller verification process of this work uses both account secret code and user phone number during login activity. The app response time is within 1s. Currently, the app can support up to 40 thousand customers at a time without any hassle. To handle a scenario like huge amount of users and data, a privately owned cloud server can be used.

A. E-commerce fraud prediction, inquiry, and e-complaint

Any customer or seller can sign in to the ecommerce assistant app by entering their identification personal number, as well as a user code (see Fig. 2(a)). In contrast, the account signup process requires the seller’s/customer’s name, phone number or NID number, email address, and user code (see Fig.

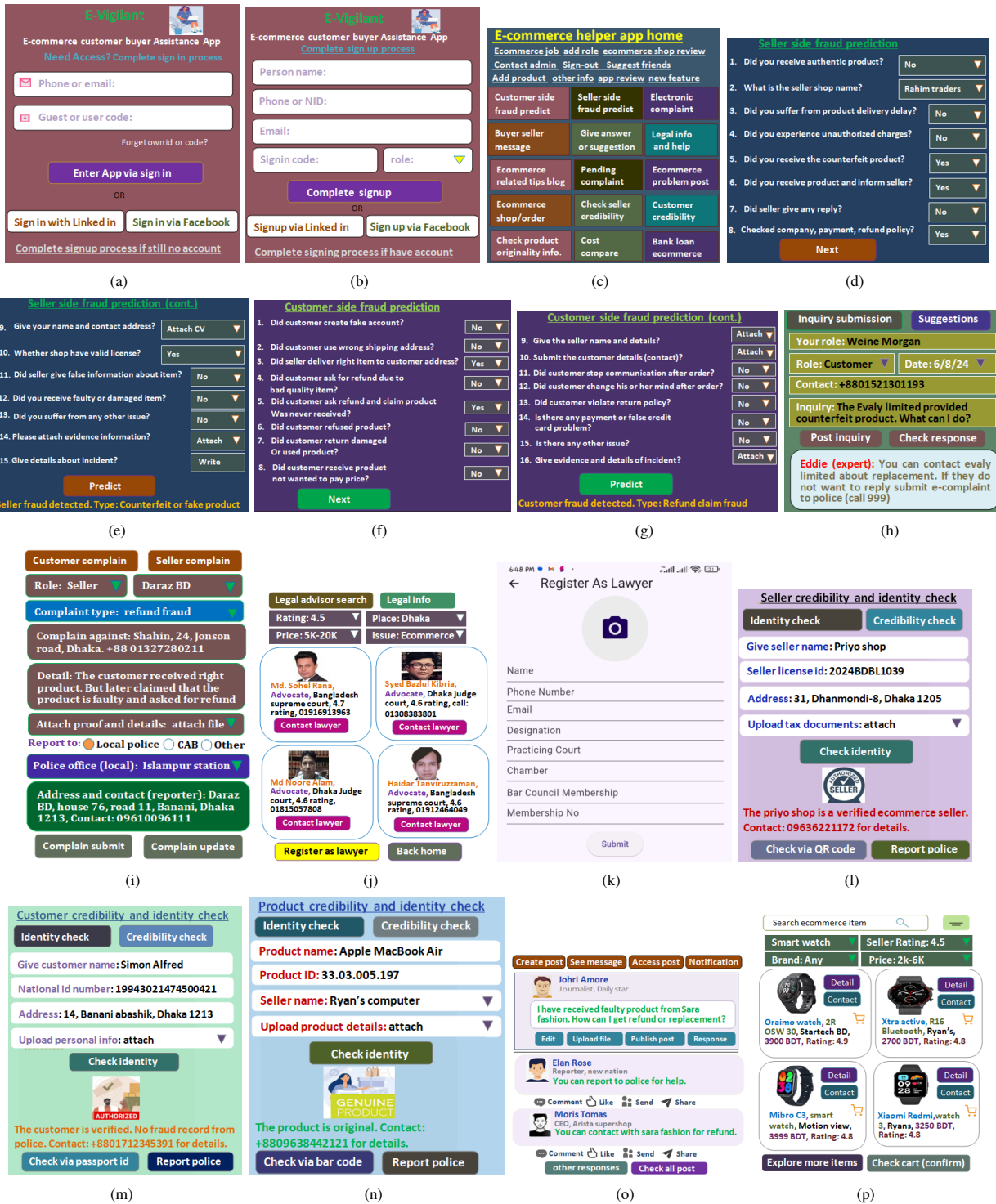


Fig. 2. (a) Enter the vigilant app, (b) vigilant app account development process, (c) ecommerce helper app home, (d) seller side fraud prediction, (e) seller side fraud prediction (continued), (f) customer side fraud prediction, (g) customer side fraud prediction (continued), (h) e-commerce inquiry, (i) electronic complaints, (j) legal advisor search, (k) register as a lawyer, (l) seller identity check, (m) customer identity check, (n) product identity check, (o) ecommerce help post creation, (p) e-shopping

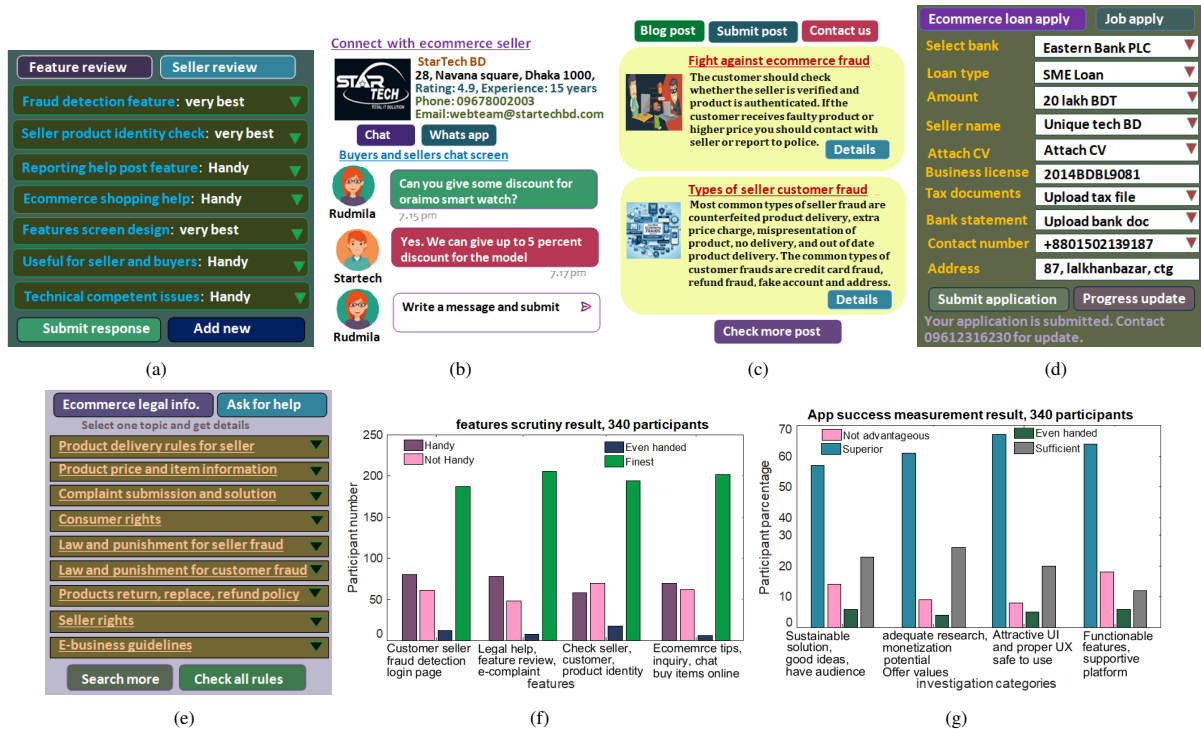


Fig. 3. (a) e-commerce assistant app features review and seller review, (b) contact with e-commerce seller, (c) e-commerce blog and tips, (d) e-commerce seller loan apply, (e) legal information, (f) features scrutiny result, (g) app success measurement result

2(b)). Figure 2(c) presents the ecommerce assistant application's home page, which includes all features. Figures 2(d) and 2(e) disclose the seller's fraud prediction screen. The investigator can obtain seller-side fraud detection results by responding to questions about seller shop identification, product delivery delay, extra product prices, counterfeit product delivery, and incident evidence submission. Figures 2(f) and 2(g) show a customer-side fraud prediction screen. The investigator can obtain customer-side fraud detection results by responding to questions about the customer account, address, ordered product reception, refund request submission, payment, change of mind, and false claims. Using the Figure 2(h) screen, anyone can post an e-commerce-related inquiry and receive advice from a specialist. The seller and consumer can use Figure 2(i) to submit an electronic complaint and request assistance from police officers, as well as provide any necessary proof and information.

B. Legal advisor search, seller, and customer identity check

Any customer or seller can search for a legal advisor by providing rating, price, location, and issue information (see Fig. 2(j)). Any lawyer can register as a legal advisor in our app using the Fig. 2(k) screen. Seller's credibility and identity check feature can also be checked by accessing next feature (Figure 2(l)). Any investigator can check the identity of a seller by providing the seller's name, business license number,

address, and tax documents. Similarly, any investigator can verify a customer's identity by providing their name, national ID number, address, personal information, or passport number (see Fig. 2(m)). The e-commerce product identity can be verified by using Fig. 2(n) screen. Figure 2(o) allows the customer to send an e-commerce-related help post and receive responses from others.

C. E-shopping, contact seller, blog post, feature review

A customer can search for any e-commerce product and order it online by entering the product name, seller name, rating, and payment information (see Figure 2(p)). The customer can submit an app feature review by responding to questions about app usefulness, design, and technical supremacy (see Figure 3(a)). The customer can contact the e-commerce seller through the next feature (Fig. 3(b)). The next feature allows any customer or seller to access and submit an e-commerce-related article or tip (Fig. 3(c)). The seller can apply for a bank loan by submitting their business, loan, bank, and personal information (see Figure 3(d)). The Figure 3(e) screen allows customers and sellers to view the most recent e-commerce-related rules.

IV. RESULTS AND ANALYSIS

The performance of the developed e-commerce assistant application is evaluated by collecting responses from 340

investigators via an online process. Figure 3(f) examines the app's feature competence. The features include customer/seller fraud prediction and login (first), legal assistance and e-complaints (second), seller/customer/product credibility check (third), and e-commerce tips, inquiries, and contact (fourth). Figure 3(f) shows that investigators' best, most useful, least useful, and even-handed remarks (for all features) range from 187 to 206, 58 to 80, 48 to 70, and 6 to 18, respectively. Figure 3(g) captures the app success measurement results after examining sustainability, idea, audience support, research depth, monetization potential, attractive design, safety, and functionality. Figure 3(g) demonstrates that investigators' superior, sufficient, not advantageous, and even-handed comment percentages (after examining all factors) range from 57-67%, 12-26%, 8-18%, and 4-6%, respectively. Table II presents the app's fruitfulness investigation results based on some criteria. The investigation criteria include stability, reliability, easy feature access, and quick feedback. Table I unfolds that investigators' magnificent, supportable, non-supportable, and even-handed remarks (after considering all criteria) range from 200 to 213, 65 to 85, 45 to 55, and 6 to 12, respectively.

V. CONCLUSION

This article discloses an e-commerce assistant smartphone application that predicts seller and customer fraud by analyzing seller behavior, product information, product condition, customer claims, account, address, and payment information. This application provides an e-commerce-related inquiry posting, e-complaint, and suggestion access feature. The e-commerce assistant application can verify the identity of a seller, customer, or product by scanning their QR code, license ID, product ID, national ID, and address. Our ecommerce assistant app also includes features such as legal advisor search, application feature review, e-shopping, ecommerce help post submission, and ecommerce-related tips. The app success measurement and fruitfulness investigation results indicated that at least 57% and 59% of investigators submitted superior and magnificent remarks about the proposed e-commerce assistant application, respectively. In future, this work can be expanded by looking into some research issues such as AI and deep learning-based ecommerce seller sales prediction, NLP and transfer learning-based seller and product recommendation, and blockchain-based product warranty checking system.

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