A Study on User Perception of Resale Platforms Using Structural Topic Modeling (STM)

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Backgrounds: The fashion industry stimulates consumers' desire for ownership by continuously releasing limited-edition products in collaboration with luxury brands, celebrities, and designers (Kim et al., 2014). With the increasing preference for experiential consumption over ownership, the rise of resale tech has emerged, extending to luxury resale (Ahn, 2023). Korea's MZ generation, known for expressing individuality (Hong, 2021) and active engagement on social media, has a high demand for limited-edition products (Kim, 2021), typically sold in limited quantities and for a limited time (Seo, 2017). The popularity of these limited-edition products has evolved beyond a simple resale action and positioned itself as a transaction with investment purposes, referred to as "resale-tech."(Choi & Lee, 2021). StockX, the leading global resale platform for limited edition sneakers, is valued at $3.8 billion as of October 2022(David, 2023). Kream, the largest resale platform in Korea, witnessed a 12-fold increase in revenue in 2022 compared to the previous year (Opensurvey, 2023).

 Trading luxury fashion goods with limited quantities, such as clothing, sneakers, handbags, etc., typically occurs in resale platforms. Because the monetary value of these resale merchandise increases over time, consumer demand for transaction safety heightens (Lee, 2022). Thus, users' trust in the resale platforms facilitating the transactions becomes a crucial competitive factor, and it is crucial to examine consumer perception of resale platforms (Jeong & Jeong, 2022). However, previous studies have mainly focused on sneaker products (e.g., Choi & Lee, 2021; Slaton & Pookulangara, 2022) and overlooked user perception of resale platforms using text mining based on online review data. Therefore, this study explores the following research questions based on online review data using STM: RQ1) What topics are extracted from online review data on resale platforms? RQ2) Whether users respond positively or negatively to each topic, RQ3) How does the prevalence of each topic change over time? and RQ4) How are topics structured?

Structural Topic Modeling: Due to the vast amount of data available on online review platforms, traditional research methods face challenges in analyzing them (Rodriguez & Storer, 2020; Jung, 2023). Topic modeling analysis, as an unsupervised machine learning algorithm, complements the traditional inductive approach by automatically discovering latent structures in extensive textual data (Tonidandel et al., 2022). LDA, a widely used topic modeling technique, has been employed by many researchers across various fields (Park, 2020; Choi, 2021). However, LDA assumes that topics are independent and fails to explain the tendency of topics to co-occur in the same document (Hu, 2019). Furthermore, it relies solely on word frequency and does not utilize metadata, which can result in inaccuracies (Roberts, 2019). To overcome these limitations, Roberts (2019) introduced STM. Compared to LDA, it incorporates covariates during the formation of document-level topic distributions and topic-word distributions. By considering the correlations among topics, STM is particularly suitable for exploring causal relationships in social science research, as it can examine the relationship between the topics and other meta data. Therefore, this study utilized STM to explore the research questions mentioned above.

Research Methods: We collected 5,425 review data by Koreans using the Google Play Store Scraper and Appstore Scraper from the initial review creation date of the resale platforms Kream and Soldout on January 28, 2020, until the start of the study on March 5, 2023. In addition, metadata such as platform type, user ratings, review creation time were collected. After preprocessing such as removing irrelevant documents and stop words due to its unstructured nature in user-generated data (Park et al., 2022), a total of 2,288 data were further tokenized and only nouns were extracted for future analysis. In the STM analysis, the appropriate number of topics needed for topic modeling was determined through the searchK function. Next, we named the extracted topics and performed positive/negative topic identification with user ratings as a covariate to investigate whether users perceive positively/negatively to each topic. Then, a topic correlation analysis was conducted to identify the structure of the topics. Lastly, time series analyses were performed to uncover the changes in the topic proportion over time.

Results: Topic names and the top 5 words are listed in Table 1, and the results of positive/negative topic identification are indicated in Figure 1. The topic with the highest proportion (17.05%) is **"Inspection system."** Users express positive opinions regarding the assurance of authentic high-end products, such as luxury goods, and trust the inspection system. The topic with the second highest proportion (12.49%) is **"Automatic Login Issues,"** showing users' negative opinions about automatic login expirations or login errors. The topic with the third highest proportion (12.14%) is **"Seller's Opinion about Penalty,"** representing sellers' adverse reactions toward penalties frequently imposed on reselling products under inspection standards. The **"Platform Improvement"** topic (10.90%) emerged, expressing buyers' desire for various sizes and styles and satisfaction with the ability to check real-time market prices. Although **"Raffle Entry"** is a positive topic (10.51%) representing participation in raffle events for limited edition products like Jordan sneakers, difficulties in participating in events after iOS system updates were also found. **"Buyer Complaints"** (10.23%) are buyers' negative opinions about transaction fees and concerns about counterfeit or defective products, indicating buyers' ambivalent attitudes toward the inspection system considering the positive "Inspection System" topic. **"CS Center"** (9.87%) shows users' substantial discomfort about CS staff's automated, irresponsive, and inflexible services. Although **"Delivery"** (9.16%) is a positive topic due to offering free shipping periods, negative opinions existed because of the recent introduction of paid expedited shipping services. Lastly, **"Membership Registration Errors"** (7.66%), a negative topic, was extracted.

Table 1 Topic Summary

Topic1	Topic2	Topic3	Topic4	Topic5	Topic6	Topic7	Topic8	Topic9
Inspection System	**Automatic Login Issues**	**Seller's Opinions about Penalty**	**Suggestions on Platform Improvement**	**Raffle Entry**	**Buyer Complaints**	**CS center**	**Delivery**	**Membership Registration Errors**
17.05%	**12.49%**	**12.14%**	**10.90%**	**10.51%**	**10.23%**	**9.87%**	**9.16%**	**7.66%**
Inspection	Temporary password	Sneakers	Size	Limited-edition	Crappy	CS center	Delivery period	Password
Kream	Login	Penalty	Style	Enter	Fee	Pushover	Process	ID
Genuine product certification	Expiration	Pass	Improvement	Event	Refund	Automated response	Delivery fee	Find
Luxury	Certification	Standard	Real time	iOS	Imitation	Communication	Service	Account
Trust	Error	Impose	Market price	Jordan	Flaw	Manual	Free	Sign up

In Figure 2, the results of the time series analysis represent that the prevalence of membership and login issues declined over time. However, upward trends in inspection systems, customer service, and transaction fee topics were found. Finally, in Figure 3, the results of topic correlations are illustrated in which node colors represent positive (blue hues) and negative (red hues) perceptions, while the thickness of the edges indicates the strength of the relationships between topics. The topics are divided into three clusters; Cluster 1 consists of platform development and user experience/interface (UX/UI) topics, such as membership registration and automatic login. Cluster 2 represents platform management systems and policies, including inspection, platform fees, seller penalty, and delivery. Cluster 3 reflects raffle entries and suggestions for improvements of the entries.
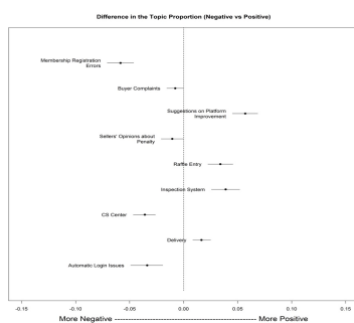
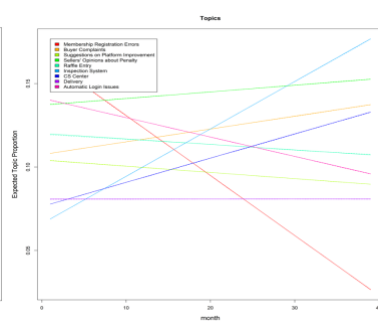

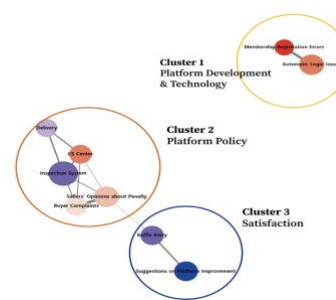**Figure 1 Positive and Negative**　　　　**Figure 2 Time Series Analysis**　　　　**Figure 3 Topic Correlation**

Discussion and Implication: During the initial phases of platform development, app development and UX/UI concerns emerged as prevailing topics. However, in more recent periods, we observed improved system stability and Korean users' increased concerns about the intricacies of platform management, such as inspection procedures, customer service policies, and transaction fees, showing the resale platforms' new challenges in quality control of resale products and CS due to the growing user base with diverse needs and expectations. Further, buyers desired various sizes and styles of the product and were satisfied with the ability to check real-time market prices. The findings of this study provide practical implications for global resale platforms and fashion brands seeking to enter the Korean market.

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