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Uncovering Mobile Payment Service Aspects in Vietnam: A Comparative Analysis

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Abstract

Mobile payment applications have become an important channel for everyday financial transactions, particularly in rapidly digitalizing economies such as Vietnam. Prior mobile payment research has relied largely on predefined theoretical constructs to explain adoption and continuance and offers less insight into the service aspects that users raise spontaneously from their own experience. This study applies Latent Dirichlet Allocation (LDA) to 2,938 Google Play reviews of MoMo and VNPAY in Vietnam. The analysis identifies 12 service-related topics spanning financial transactions, application functionality, authentication and access, technical performance, promotional mechanisms, and customer support. App interface and feature functionality was the most prevalent topic overall, followed by bank account and fund transfer issues and by customer support and complaint resolution. Topic prevalence differed significantly between the two applications: VNPAY reviews placed greater emphasis on app interface and feature functionality, whereas MoMo reviews placed greater emphasis on customer support and complaint resolution, app speed and stability, device access and connectivity, recurring-payment deductions, and purchase and login problems. Google Play star ratings were combined with review-level topic probabilities to give a star-weighted prominence score for each topic. Bootstrap comparisons showed significantly higher scores for VNPAY on app interface and feature functionality and on bank account and fund transfer issues, and for MoMo on device access and connectivity, app speed and stability, and customer support and complaint resolution. The findings show that post-adoption experiences of mobile payment users are multidimensional and vary across competing providers, and they offer practical evidence for identifying platform-specific service priorities.

Keywords: Mobile Payment; App Store Review; Latent Dirichlet Allocation; Topic Modeling; Service Quality; Vietnam

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1. Introduction

Mobile payment applications have become an important component of contemporary financial service ecosystems, enabling consumers to conduct transactions and access related financial services through mobile devices. Their widespread adoption has generated substantial scholarly interest in consumers' acceptance and use of mobile payment services. Much of this literature has drawn on technology acceptance perspectives and has examined perceived usefulness, ease of use, trust, security, and related factors as determinants of adoption intention [1–3]. As mobile payment services have become more established, however, scholarly attention has extended beyond initial adoption toward continued use and post-adoption evaluation. This development reflects the recognition that the factors motivating initial adoption may not fully explain how consumers evaluate a service after repeated use or whether they continue using it over time.

Research on mobile payment continuance has consequently placed greater emphasis on consumers' evaluations following adoption. Humbani and Wiese [4], for example, integrated the Technology Readiness Index with the extended Expectation-Confirmation Model and identified satisfaction as an important determinant of continuance intention. Talwar et al. [5] further showed that information and service quality contributed to initial trust, which was subsequently associated with confirmation, perceived usefulness, and continuance intention. This stream of research has broadened the understanding of mobile payment behavior by showing that continued use is shaped not only by perceptions of the technology itself but also by consumers' evaluations of their experiences with the service.

A similar progression can be observed in Vietnam. Early research focused primarily on explaining mobile payment adoption. Nguyen et al. [6], for instance, surveyed 489 Vietnamese consumers and found perceived trust to be the strongest predictor of mobile payment intention, alongside perceived ease of use, enjoyment, perceived behavioral control, usefulness, and subjective norm. Subsequent studies have increasingly considered continued usage and post-adoption evaluations. Phuong et al. [7] found that application quality and familiarity influenced perceived ease of use and usefulness, whereas security and feedback mechanisms contributed to trust; satisfaction and trust were subsequently associated with continuance intention. More recently, Rahman et al. [8] integrated technology continuation theory with gamification and trust and showed that technology-continuation factors and gamification contributed to users' evaluations and continuance intentions. Collectively, this literature has generated substantial knowledge about the technological, service-related, and psychological factors associated with mobile payment adoption and continued use in Vietnam.

Despite this progress, understanding of users' post-adoption experiences in Vietnam remains largely derived from deductive, survey-based research. The dimensions examined in these studies are generally specified a priori on the basis of established theories and measured through structured questionnaires. This approach is well suited to testing relationships among theoretically defined constructs and has provided valuable evidence concerning usefulness, ease of use, trust, security, satisfaction, and application quality. Reliance on predefined constructs, however, gives less opportunity to identify the service aspects that users themselves regard as salient when describing their actual experiences. Consequently, considerably less is known about which aspects of mobile payment services Vietnamese consumers discuss spontaneously.

App store reviews offer a complementary source of evidence for examining such experiences. Unlike structured questionnaires, reviews allow consumers to describe their experiences in their own words and to determine which aspects of a service are salient enough to mention. These naturally occurring evaluations can therefore reveal recurring concerns and service attributes that may extend beyond those incorporated into established theoretical frameworks. The growing volume of app store reviews has also made it possible to analyze such experiences systematically using computational text-analysis techniques.

Recent studies demonstrate the potential of this approach in the mobile payment domain. Verkijika and Neneh [9] applied Latent Dirichlet Allocation (LDA) to 5,955 Google Play reviews from 16 mobile payment applications and identified 13 themes, including convenience, security, reliability, transaction speed, customer support, usability, usefulness, and trust. Perea-Khalifi et al. [10] similarly analyzed 16,048 Google Play reviews of three peer-to-peer payment applications in Spain using text mining and sentiment analysis and identified aspects associated with ease of use, usefulness, perceived value, performance expectancy, perceived quality, and user experience. More recently, Yi et al. [11] analyzed 230,940 reviews of nine mobile payment applications from the US Apple App Store using LDA and sentence-level sentiment analysis. Their analysis identified four major quality dimensions (payment convenience, security, customer service, and application design) and further examined their relationships with application market performance. These studies establish the value of consumer-generated reviews for identifying service aspects that emerge from users' actual evaluations of mobile payment applications.

These studies do not, however, provide a focused comparative analysis of leading mobile payment applications in the Vietnamese context. In particular, little attention has been given to how the relative prevalence of post-adoption service aspects differs across competing Vietnamese mobile payment providers. It therefore remains unclear which service aspects emerge from Vietnamese users' own descriptions of their mobile payment experiences and how these aspects correspond to, or extend beyond, those emphasized in the existing literature. A further limitation concerns the extent to which users' service concerns vary across competing applications. Existing review-based studies have identified multiple aspects of mobile payment experience, including convenience, security, reliability, customer support, and application design [9–11]. Yet identifying a common set of aspects does not establish that they receive comparable attention across individual applications, and their relative prominence may differ considerably among providers. Evidence on how the relative prevalence of service aspects varies across competing mobile payment applications in Vietnam remains limited.

Against this background, the present study examines app store reviews of major mobile payment applications in Vietnam using LDA, which identifies latent service aspects from the recurring patterns in users' textual feedback. This data-driven approach captures the aspects that Vietnamese users themselves emphasize in their post-adoption evaluations. To allow comparison across providers, the prevalence of each identified topic and its star-weighted prominence score are compared across applications to examine whether the same service aspects receive different levels of attention among users of competing providers.

Accordingly, the study addresses the following research questions:

RQ1. What service aspects emerge from users' app store reviews of mobile payment applications in Vietnam?

RQ2. How do the prevalence of these service aspects and their star-weighted prominence scores vary across competing mobile payment applications in Vietnam?

This study makes three main contributions. First, it extends app-review-based mobile payment research to the Vietnamese context, where relatively little evidence is available on post-adoption user experiences. Second, it applies Vietnamese-specific preprocessing and LDA to identify latent service aspects from user-generated reviews. Third, it moves beyond aggregate topic identification by comparing review-level topic prevalence and star-weighted prominence scores between MoMo and VNPAY, thereby revealing application-specific patterns in user discussions.

2. Methods

The method has three stages: data collection, data preprocessing, and topic identification with comparative analysis.

2.1. Study Context and Data Collection

This study focuses on MoMo and VNPAY, two prominent mobile payment applications in Vietnam that represent different approaches to digital payment service provision. MoMo operates primarily as a consumer-oriented digital wallet and financial super-app, integrating peer-to-peer transfers, retail payments, bill payments, and other financial services within a single application. VNPAY, by contrast, has developed a payment infrastructure centered on its QR-based payment network and partnerships with commercial banks and merchants. Its services are integrated into the mobile banking applications of multiple partner banks, allowing consumers to access QR payment functionality through existing banking channels. The two applications therefore differ in their service architecture and modes of user interaction: MoMo emphasizes direct engagement through its own application, whereas VNPAY relies more extensively on an interconnected network of banks and merchants. These characteristics make MoMo and VNPAY relevant cases for examining whether users of competing mobile payment platforms within the same national market emphasize different aspects of their service experiences.

User reviews were collected from the publicly accessible Google Play review pages of MoMo and VNPAY between February 1 and August 1, 2026, using the google-play-scraper Python package. The scraper was configured with Vietnam as the country setting and Vietnamese as the language setting. Reviews were retrieved using the newest-first sorting option, and pagination was continued until no further reviews within the study period were returned. The initial dataset comprised 6,201 reviews: 3,142 MoMo reviews and 3,059 VNPAY reviews.

2.2. Data Preprocessing

The review corpus was preprocessed before topic modeling to improve the semantic quality and interpretability of the extracted topics. Reviews with missing or empty text were removed, and exact duplicate reviews within the same application were eliminated to reduce redundancy in the corpus.

The remaining reviews were normalized to reduce orthographic and formatting variation. All text was converted to lowercase and normalized using Unicode NFC encoding to ensure consistent representation of Vietnamese characters. URLs, email addresses, HTML elements, numerical characters, punctuation, and other non-alphabetic symbols were removed. Excessively repeated characters were also normalized to reduce spelling variations common in online reviews. Frequently occurring Vietnamese abbreviations and informal expressions were standardized using a manually constructed abbreviation dictionary. The complete abbreviation dictionary and the customized stopword list described below are available in the Figshare repository associated with this study.

Vietnamese word segmentation was then performed using VnCoreNLP version 1.2 [12]. This step is particularly important because Vietnamese lexical units frequently consist of multiple syllables separated by spaces. Word segmentation allows multi-syllabic expressions to be treated as unified lexical units, preserving their meaning during subsequent topic modeling.

Stopword removal was performed after word segmentation. In addition to the words on a standard Vietnamese stopword list, generic application- and review-related terms, application names, conversational fillers, informal slang, non-informative abbreviations, and sentiment-related expressions were removed because they provide little information for identifying substantive service-related topics. After stopword removal, reviews containing fewer than two usable tokens were excluded because they provide insufficient lexical information for reliable topic estimation. A dictionary was then constructed from the remaining documents. Terms appearing in fewer than 10 reviews were removed because extremely rare terms are likely to reflect idiosyncratic expressions, typographical variation, or isolated events and contribute little to stable topic estimation. Conversely, terms appearing in more than 60% of documents were excluded because very common terms provide little discriminatory information across latent topics. These thresholds were selected to balance vocabulary coverage, topic distinctiveness, and model interpretability. Finally, each review was represented as a bag of words based on token frequencies, and the resulting document-term corpus served as the input for LDA topic modeling.

Removing 387 empty and duplicate entries left 5,814 reviews, comprising 3,002 MoMo reviews and 2,812 VNPAY reviews. The short-review filter described above then removed a further 1,267 MoMo reviews and 1,609 VNPAY reviews. The final corpus used for LDA therefore comprised 2,938 reviews: 1,735 MoMo reviews and 1,203 VNPAY reviews. Table 1 summarizes the review-retention process from the initial dataset to the final analytical corpus.

Table 1: Number of reviews retained at each stage of data cleaning.

Application	Collected	After initial cleaning	Final corpus
MoMo	3,142	3,002	1,735
VNPAY	3,059	2,812	1,203
Total	6,201	5,814	2,938

2.3. Topic Identification and Comparative Analysis

LDA was used to identify latent service-related topics in the preprocessed review corpus. LDA is a probabilistic generative topic model that represents each document as a mixture of latent topics and each topic as a probability distribution over words. A review may therefore contain several topics in different proportions rather than being assigned exclusively to one topic. This property suits app store reviews, because a single review may refer to several aspects of the mobile payment experience at once, such as transactions, account management, authentication, promotional activities, customer support, and technical performance. LDA was selected because the objective of this study is not only to identify latent service aspects but also to quantify and compare their prevalence across applications. Its mixed-membership structure provides an explicit document-topic probability distribution, so that each review contributes proportionally to several topics and review-level and application-level topic prevalence can be calculated, as Equations (1) and (2) require. Although embedding-based topic models such as BERTopic, ETM, and Top2Vec may provide stronger semantic representations for short texts, their clustering-based outputs are not directly equivalent to the probabilistic topic proportions required for the present prevalence analysis.

The LDA model was estimated using the bag-of-words representation generated during preprocessing. For a corpus containing K latent topics, each review d is characterized by a document-topic distribution $\boldsymbol{\theta}_d = (\theta_{d1}, \theta_{d2}, \ldots, \theta_{dK})$, where θ_{dk} denotes the estimated proportion of topic k in review d and $\sum_{k=1}^{K} \theta_{dk} = 1$. To determine an appropriate number of topics, alternative LDA specifications were estimated across a predefined range of K. Model selection was informed by the topic coherence score, which assesses the semantic relatedness of the highly ranked words within each topic; higher coherence values generally indicate greater semantic consistency among the words that make up a topic. The final topic solution was selected by considering both coherence and substantive interpretability.

To interpret the identified topics, the reviews with the highest posterior probability for each topic were examined manually. Two researchers independently reviewed the representative keywords and the 20 highest-loading reviews for each of the 12 topics and assigned descriptive labels based on their dominant semantic content. Disagreements were discussed until consensus was reached. The final labels therefore reflect both the LDA keyword distributions and the substantive content of representative user reviews.

After topic identification, topic prevalence was computed to quantify the relative prominence of each service aspect in the review corpus and to allow comparison across mobile payment applications. Rather than relying solely on the number of reviews in which a topic is dominant, prevalence was derived from the complete document-topic probability distribution produced by LDA. This approach preserves the mixed-membership structure of the model and allows each review to contribute proportionally to several topics.

For the complete corpus D containing N reviews, the overall prevalence of topic k was calculated as the mean posterior topic proportion across all reviews:

$$P_k = \frac{1}{N} \sum_{d=1}^{N} \theta_{dk}. \tag{1}$$

For ease of interpretation, the value is expressed as a percentage. It represents the relative share of topical content associated with topic k across the corpus. Because the topic proportions within each review sum to one, the prevalence estimates across all K topics also sum to 100%. A higher prevalence value indicates that the corresponding service aspect occupies a greater share of the content discussed by users.

To address differences across competing mobile payment applications, topic prevalence was also calculated separately for each application. For application a, let D_a denote the corpus containing N_a reviews. The prevalence of topic k in application a is

$$P_{ak} = \frac{1}{N_a} \sum_{d \in D_a} \theta_{dk}. \tag{2}$$

Application-level prevalence therefore represents the average share of review content attributable to a particular topic within each application, which shows whether users of competing applications emphasize different aspects of their service experiences. To assess differences in topic prevalence between MoMo and VNPAY, review-level posterior topic proportions were compared using bootstrap resampling. For each topic, 95% confidence intervals were estimated from 10,000 bootstrap samples. To account for the 12 simultaneous topic comparisons, p-values were adjusted using the Holm correction.

To place the identified topics alongside users' ratings, reviews were also grouped by their Google Play star ratings: reviews rated 1 or 2 stars were classified as low-rated, 3-star reviews as neutral, and reviews rated 4 or 5 stars as high-rated. The star rating of each review was then combined with its topic proportions to give a star-weighted prominence score for each topic and application:

$$S_{ak} = \frac{1}{N_a} \sum_{d \in D_a} \theta_{dk} \, S_d, \tag{3}$$

where S_{ak} denotes the star-weighted prominence score of topic k for application a, and S_d denotes the Google Play star rating of review d, from 1 to 5. Because S_{ak} increases both with the share of review content devoted to topic k and with the ratings attached to the reviews that discuss it, it is read as a measure of prominence weighted by rating, not as a measure of user satisfaction. Differences in S_{ak} between MoMo and VNPAY were tested with the same bootstrap and Holm procedure.

3. Results

3.1. Identified Topics

To determine the number of topics, LDA models were estimated for K from 4 to 15 in Python 3.13.14 using Gensim 4.4.0 with a fixed random seed of 42. Topic coherence, which measures the semantic consistency of the words within each topic, was computed following the approach of Röder et al. [13]. As shown in Figure 1, the model with $K = 12$ achieved the highest coherence score (0.701) and was selected for the subsequent analysis. For the final 12-topic model, the learned document-topic prior (α) ranged from 0.093 to 0.223 (mean = 0.127), and the learned topic-word prior (η) ranged from 0.063 to 0.847 (mean = 0.075).

To assess stability, the models were re-estimated with five further random seeds (10, 20, 30, 40, and 50). Across these seeds the coherence score of the 12-topic model ranged from 0.694 to 0.706 (mean = 0.701, SD = 0.005), so the solution was stable across initializations (Table A2). Topic separation was evaluated with the pairwise Jensen-Shannon distance between topic-word distributions, where larger values indicate greater semantic separation; the mean distance of 0.63 suggests adequate separation among the identified topics. Model perplexity was calculated as a supplementary measure of fit. The final model yielded a log perplexity of -7.42, but log perplexity improved steadily as K increased and therefore did not single out $K = 12$. The 12-topic solution was chosen because it achieved the highest coherence score, together with good interpretability and stability across random seeds. Coherence scores and log perplexity for every value of K are given in Table A1.

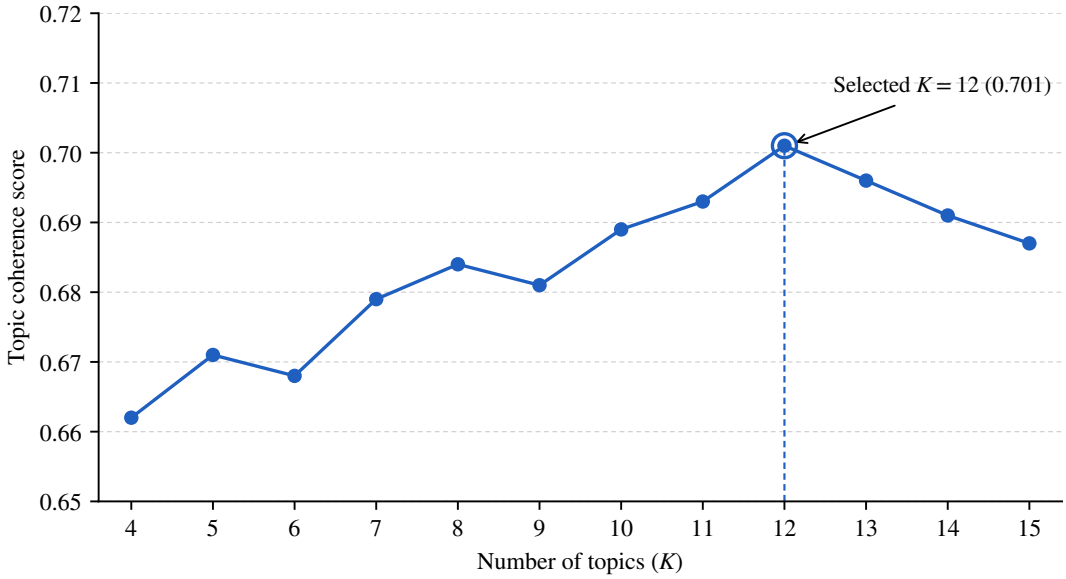

Figure 1: Topic coherence score of the LDA models for $K = 4$ to 15 topics. The 12-topic model has the highest coherence (0.701) and was selected; values are listed in Table A1.

The identified topics, their keywords, and representative reviews are presented in Table 2. The topics are coded C1 to C12. The results reveal a multidimensional structure of users' mobile payment experiences, encompassing financial transactions, application functionality, authentication and access, system performance, promotional mechanisms, and customer support.

Several topics relate directly to the execution and management of financial transactions. Payment system and loan issues (C1) captures concerns about payment functions, billing, loans, debt, installments, and system errors. Bank account and fund transfer issues (C3) reflects experiences involving account linkage, transfers, deductions, refunds, withdrawals, top-ups, and transaction failures. Wallet funding, balance, and digital-service transactions (C6) concerns wallet funding, withdrawals, balances, transaction limits, and associated fees. A more specific financial concern emerges in recurring payments and third-party subscription deductions (C10), encompassing automatic deductions, subscription packages, renewals, cancellations, transaction histories, and refund requests. Collectively, these topics indicate that transaction reliability and transparency are prominent aspects of users' mobile payment experiences.

Technical performance also emerges as an important dimension. App interface and feature functionality (C2) captures users' experiences with interface design, application updates, installation, vouchers, advertisements, events, and application crashes. App speed, stability, and maintenance (C9) reflects concerns about loading, lag, maintenance, waiting time, and system responsiveness. Device access, connectivity, and reward-related features (C8) captures issues involving network connectivity, device compatibility, rooted devices, emulators, and reward systems. These topics indicate that users evaluate mobile payment applications not only through their financial functions but also through the technical quality and accessibility of those functions.

Authentication and access problems form another distinct area of user concern. Identity and facial verification failures (C7) captures difficulties involving facial recognition, citizen identification, NFC, image capture, and identity verification. QR payments and account linking (C5) reflects experiences with QR-code scanning, bank linkage, OTP verification, registration, and account locking. Purchase and login problems (C11) captures difficulties with account access and transaction completion, including passwords, incorrect codes, application lag, discounts, and purchases. Together, these topics indicate that authentication-related experiences extend across several stages of use, from identity verification and account linkage to login and transaction completion.

Table 2: Identified topics, with representative keywords (Vietnamese term in parentheses) and review excerpts (English gloss, then the Vietnamese original in parentheses).

Topic	Keywords	Representative review excerpts
Payment system and loan issues (C1)	payment (thanh toán), error (lỗi), loan (vay), notification (báo), bill (hóa đơn), feature (tính năng), update (cập nhật), limit/due date (hạn), debt (nợ), frozen/stuck (treo), citizen ID (căn cước), installment (góp)	"loan amount keeps increasing before the due date" (chưa đến hạn mà vẫn độn số tiền lên); "loan repayment became much higher" (vay 20 triệu… trả khoảng 33 triệu)
App interface and feature functionality (C2)	phone (điện thoại), update (cập nhật), login (đăng nhập), voucher (voucher), interface (giao diện), crash (văng), game (game), verification (xác minh), advertisement (quảng cáo), event (sự kiện), button (nút), registration (đăng kí), inconvenient (bất tiện), install (cài), uninstall (gỡ)	"too many unnecessary features" (xóa bớt các tính năng không cần thiết); "no dark mode" (chưa có dark mode)
Bank account and fund transfer issues (C3)	money (tiền), bank (ngân hàng), account (tài khoản), linking (liên kết), deduction (trừ), refund (hoàn), successful (thành công), withdrawal (rút tiền), top-up (nạp), error (lỗi), transaction (giao dịch), card (thẻ), bank transfer (chuyển khoản)	"transfer stuck in processing" (lệnh chuyển kẹt ở trạng thái đang xử lý); "money deducted but recipient did not receive it" (bị trừ tiền… người nhận vẫn chưa nhận được)
Promotions, rewards, and fees (C4)	fee (phí), offer (ưu đãi), gift (quà), transaction (giao dịch), program (chương trình), promotion (khuyến mãi), charge (thu), gift/reward (tặng), savings (tiết kiệm), money (tiền), referral (giới thiệu), free (free), reward (thưởng), bank (bank), code (mã)	"referral reward not received" (giới thiệu bạn bè… không có đồng nào); "promotion was advertised but unavailable" (thông báo… ưu đãi… vào không thấy có)
QR payments and account linking (C5)	account (tài khoản), code (mã), download (tải), scan (quét), bank (ngân hàng), bank transfer (chuyển khoản), lock (khóa), QR code (QR), delete (xóa), linking (liên kết), OTP (OTP), registration (đăng ký), information (thông tin), cancel (hủy), VNeID (VNeID), procedure (thủ tục)	"cannot scan QR payment code" (không quét được mã QR thanh toán); "QR scanning keeps loading" (quét QR cứ hiện loading)
Wallet funding, balance, and digital-service transactions (C6)	top-up (nạp), wallet (ví), money (tiền), card (thẻ), balance (số dư), withdrawal (rút), phone (điện thoại), game (game), payment (thanh toán), electronic/digital (điện tử), fee (phí), free/no fee (miễn phí), transaction limit (hạn mức), confirmation (xác nhận), limit (giới hạn)	"withdrawal keeps failing" (rút thì toàn báo lỗi); "transaction limit is too low" (hạn mức giao dịch… mong nâng hạn mức)
Identity and facial verification failures (C7)	verification (xác thực), face (khuôn mặt), citizen ID (CCCD), error (lỗi), photo capture (chụp), scan (quét), face (mặt), NFC (NFC), identification (định danh), notification (báo), frozen (đơ), blurry (mờ), screen (màn hình), fix (fix), waiting (đợi)	"face verification does not match" (xác thực gương mặt… không trùng khớp); "cannot verify without NFC" (không có thiết bị NFC thì làm sao)
Device access, connectivity, and reward-related features (C8)	reward coins (xu), exchange (đổi), network (mạng), phone (điện thoại), error (lỗi), earn (kiếm), connection (kết nối), fix (sửa), device (thiết bị), support (hỗ trợ), emulator (giả lập), financial (tài chính), gift (quà), management (quản lý), root (root), login (đăng nhập), system (hệ thống)	"device incorrectly identified as emulator" (báo không hỗ trợ thiết bị giả lập); "phone incorrectly identified as rooted" (điện thoại bị coi là đã root)
App speed, stability, and maintenance (C9)	notification (thông báo), slow (chậm), display (hiện), maintenance (bảo trì), approval (duyệt), lag (lag), loading (load), transfer (chuyển khoản), improve (cải thiện), wait (đợi), approval process (xét duyệt), explanation (giải thích), screen (màn hình), fix (khắc phục)	"app keeps loading despite normal internet" (internet… bình thường… Momo cứ xoay mãi); "app is increasingly slow and laggy" (app càng lúc càng chậm)
Recurring payments and third-party subscription deductions (C10)	money (tiền), deduction (trừ), automatic (tự động), transaction (giao dịch), payment (thanh toán), refund (hoàn), package/subscription (gói), purchase (mua), confirmation (xác nhận), notification (thông báo), history (lịch sử), Google Play (Play), Google (Google), cancel (hủy), renewal (gia hạn), registration (đăng ký), failure (thất bại), check (kiểm tra)	"charged after subscription cancellation" (hủy gói… hôm sau vẫn bị trừ tiền); "Google Play payment deducted automatically" (liên kết với CH Play… tự trừ tiền)
Purchase and login problems (C11)	purchase (mua), password (mật khẩu), lag (lag), enter/input (nhập), code (mã), discount (giảm giá), ticket (vé), incorrect (sai), fix (khắc phục), movie (phim), operation (thao tác), item/product (đồ), login (đăng nhập), frozen (đơ), exit/log out (thoát)	"login repeatedly fails" (đăng nhập toàn bị lỗi); "game card purchase returned an error" (mua card… nạp vào game bị lỗi thẻ)
Customer support and complaint resolution (C12)	customer (khách hàng), support (hỗ trợ), call (gọi), send (gửi), customer care (chăm sóc), resolve (giải quyết), money (tiền), call center (tổng đài), staff (nhân viên), contact (liên hệ), wait (chờ), response (phản hồi), reply (trả lời), work (làm việc), message (nhắn), information (thông tin), transaction (giao dịch), handling (xử lí)	"customer support provides no help" (CSKH… chả hỗ trợ được cái gì); "support request remained unresolved for days" (gửi đơn 3 ngày vẫn chưa giải quyết)

Finally, the results identify service aspects beyond transaction execution and technical performance. Promotions, rewards, and fees (C4) captures offers, gifts, rewards, referral incentives, savings, and transaction charges, reflecting the economic benefits and costs of mobile payment use. Customer support and complaint resolution (C12) encompasses interactions with call centers, service staff, messages, responses, and problem-resolution processes. Its emergence as a separate topic shows the importance users place on service recovery when transactional or technical problems occur.

3.2. Topic Prevalence and Star-Weighted Prominence Scores

After topic identification, Equation (1) was applied to estimate overall topic prevalence, and Equation (2) to estimate application-specific prevalence from the review-level topic proportions of the final corpus. As shown in Table 3, app interface and feature functionality (C2) was the most prevalent topic overall, followed by bank account and fund transfer issues (C3) and customer support and complaint resolution (C12). Users' discussions were therefore centered primarily on application functionality, financial transaction processes, and service support. Topic prevalence represents the relative attention devoted to each service aspect, not the degree of user dissatisfaction.

The application-level comparison reveals distinct patterns between MoMo and VNPAY. VNPAY reviews were substantially more concentrated on app interface and feature functionality (C2), whereas MoMo reviews devoted comparatively more attention to customer support and complaint resolution (C12), app speed, stability, and maintenance (C9), and several other operational and access-related concerns. Statistical comparisons confirmed significant differences between the two applications for six topics. The largest difference occurred for app interface and feature functionality (C2), which was significantly more prevalent in VNPAY, while customer support and complaint resolution (C12) and app speed, stability, and maintenance (C9) were significantly more prevalent in MoMo. Significant differences were also observed for device access, connectivity, and reward-related features (C8), purchase and login problems (C11), and recurring payments and third-party subscription deductions (C10), all of which received more attention in MoMo reviews. No statistically significant differences were observed for the remaining topics. VNPAY-related discussion is thus more strongly oriented toward interface and feature functionality, whereas MoMo-related discussion is spread across service recovery, technical performance, access, and transaction-related concerns.

Table 3: Topic prevalence overall and by application, with the bootstrap comparison of MoMo and VNPAY.

Topic	Overall	MoMo	VNPAY	Difference	95% CI for difference	Holm-adjusted p
C1	4.80%	5.30%	4.09%	+1.20	[−0.17, 2.51]	0.297
C2	44.42%	36.25%	56.21%	−19.96	[−23.23, −16.66]	< 0.001
C3	13.64%	12.99%	14.58%	−1.59	[−3.83, 0.60]	0.482
C4	6.27%	6.18%	6.40%	−0.22	[−1.77, 1.33]	1.000
C5	1.36%	1.39%	1.33%	+0.06	[−0.59, 0.67]	1.000
C6	1.94%	2.30%	1.44%	+0.86	[0.11, 1.62]	0.112
C7	5.04%	5.77%	3.98%	+1.80	[0.39, 3.16]	0.070
C8	2.52%	3.26%	1.46%	+1.80	[1.02, 2.62]	< 0.001
C9	6.80%	8.72%	4.03%	+4.68	[3.25, 6.11]	< 0.001
C10	1.88%	2.38%	1.16%	+1.22	[0.49, 1.97]	0.010
C11	2.86%	3.41%	2.07%	+1.33	[0.39, 2.27]	0.046
C12	8.47%	12.08%	3.26%	+8.81	[7.21, 10.42]	< 0.001

Topic codes as in Table 2. Difference is MoMo minus VNPAY, in percentage points; confidence intervals from 10,000 bootstrap samples; p-values Holm-adjusted across the 12 topics.

Table 4 shows the rating distribution of each application. Low-rated reviews (1 or 2 stars) made up a substantially larger share of MoMo reviews (40.92%) than of VNPAY reviews (19.62%), whereas high-rated reviews (4 or 5 stars) were substantially more common for VNPAY (51.87%) than for MoMo (26.46%). Neutral 3-star reviews accounted for similar shares on both platforms (32.62% for MoMo and 28.51% for VNPAY).

Table 4: Rating distribution by application.

Rating group	MoMo, n (%)	VNPAY, n (%)
1 or 2 stars (low)	710 (40.92%)	236 (19.62%)
3 stars (neutral)	566 (32.62%)	343 (28.51%)
4 or 5 stars (high)	459 (26.46%)	624 (51.87%)
Total	1,735 (100%)	1,203 (100%)

The star-weighted prominence score of each topic was then calculated with Equation (3) from the star rating of each review. The resulting scores for MoMo and VNPAY are presented in Table 5. A bootstrap analysis was conducted to examine whether these scores differed significantly between MoMo and VNPAY. The results showed statistically significant differences for five of the twelve topics after the Holm adjustment for multiple comparisons. VNPAY had significantly higher scores for C2 (difference = −0.950, 95% CI [−1.091, −0.810], adjusted $p < 0.001$) and C3 (difference = −0.088, 95% CI [−0.149, −0.028], adjusted $p = 0.028$). MoMo had significantly higher scores for C8 (difference = 0.045, 95% CI [0.024, 0.068], adjusted $p < 0.001$), C9 (difference = 0.089, 95% CI [0.056, 0.123], adjusted $p < 0.001$), and C12 (difference = 0.177, 95% CI [0.141, 0.214], adjusted $p < 0.001$). Although C7 and C10 showed significant differences on the unadjusted p-values, these differences did not remain significant after the Holm correction (adjusted $p = 0.051$ and 0.076, respectively). No significant differences were observed for C1, C4, C5, C6, or C11. C2 showed the largest difference between the two applications, with a substantially higher score for VNPAY, whereas C12 showed the largest difference in favor of MoMo. Because the score rises with a topic's share of review content as well as with the ratings attached to it, a higher score for one application indicates greater rating-weighted attention to that topic, not greater satisfaction with it.

Table 5: Star-weighted prominence scores by topic.

Topic	MoMo	VNPAY	Difference	95% bootstrap CI	Holm-adjusted p
C1	0.151	0.135	0.016	[−0.028, 0.059]	0.947
C2	1.331	2.281	−0.950	[−1.091, −0.810]	< 0.001
C3	0.305	0.393	−0.088	[−0.149, −0.028]	0.028
C4	0.178	0.217	−0.039	[−0.092, 0.013]	0.424
C5	0.032	0.036	−0.004	[−0.020, 0.012]	0.947
C6	0.057	0.039	0.018	[−0.002, 0.038]	0.294
C7	0.149	0.099	0.050	[0.014, 0.086]	0.051
C8	0.085	0.039	0.045	[0.024, 0.068]	< 0.001
C9	0.192	0.103	0.089	[0.056, 0.123]	< 0.001
C10	0.051	0.029	0.022	[0.005, 0.038]	0.076
C11	0.074	0.052	0.022	[−0.001, 0.045]	0.294
C12	0.253	0.076	0.177	[0.141, 0.214]	< 0.001

Scores from Equation (3). Difference is MoMo minus VNPAY; confidence intervals from 10,000 bootstrap samples; p-values Holm-adjusted across the 12 topics.

4. Discussion

To give a more systematic theoretical interpretation of the identified service aspects, the 12 topics were mapped conceptually to the E-S-QUAL and E-RecS-QUAL frameworks proposed by Parasuraman et al. [14], as shown in Table 6. E-S-QUAL conceptualizes electronic service quality through efficiency, system availability, fulfillment, and privacy, whereas E-RecS-QUAL extends the framework to service-recovery situations through responsiveness, compensation, and contact. These dimensions provide a useful structure for interpreting the post-adoption experiences expressed in mobile payment reviews. Because the topics were derived inductively from user-generated reviews rather than predetermined by the service-quality framework, however, not all topics correspond directly to a single E-S-QUAL or E-RecS-QUAL dimension.

The mapping in Table 6 shows that the identified topics cover several established dimensions of electronic service quality. Efficiency is reflected particularly in app interface and feature functionality (C2), QR payments and account linking (C5), identity verification (C7), and purchase and login experiences (C11). These topics concern the ease with which users can access and complete service-related tasks.

System availability is represented most clearly by app speed, stability, and maintenance (C9); device access, connectivity, and reward-related features (C8); identity-verification access (C7); and login problems (C11). Reviews concerning lag, loading failures, maintenance, rooted-device restrictions, or inability to access the application indicate that technical availability remains an important component of the post-adoption mobile payment experience.

Fulfillment is reflected in payment-system operations, bank transfers, wallet funding, withdrawals, QR payments, and recurring-payment transactions. These topics concern whether transactions are completed successfully and whether the financial service produces the outcome users expect. In particular, the bank account and fund transfer topic captures experiences involving transaction completion, recipient receipt, refunds, and withdrawals.

Privacy is particularly relevant to identity and facial verification and to recurring-payment authorization. These topics involve the management of sensitive identity and payment information and users' control over authentication and transaction authorization. The present topic model identifies what users discuss rather than directly measuring perceived privacy or security, so the framework mapping should be interpreted as conceptual correspondence rather than direct measurement of the E-S-QUAL dimensions. E-RecS-QUAL is particularly relevant to the customer support and complaint resolution topic. Reviews concerning response delays, contact with support personnel, call centers, and unresolved complaints correspond closely to responsiveness and contact. Refund and reimbursement discussions appearing in several transaction-related topics may also relate to compensation when they occur in a service-recovery context.

Table 6: Mapping of the identified mobile payment topics to E-S-QUAL and E-RecS-QUAL dimensions.

Topic	Relevant framework dimension	Interpretation
C1	Fulfillment / outside core framework	Payment execution relates to fulfillment, whereas loan conditions and repayment experiences extend beyond conventional electronic service-quality dimensions.
C2	Efficiency	Interface usability, navigation, feature accessibility, and ease of completing tasks correspond to the efficiency of electronic service delivery.
C3	Fulfillment	Successful transfers, bank linking, refunds, withdrawals, and transaction completion concern whether the service delivers the promised transaction outcome.
C4	Outside core framework / compensation	Rewards and promotional benefits are not central E-S-QUAL dimensions; compensation becomes relevant when users discuss refunds or recovery benefits.
C5	Efficiency / fulfillment	QR scanning and account linking concern the ease of performing transactions and the successful completion of payment-related activities.
C6	Fulfillment / outside core framework	Top-ups, withdrawals, balances, and transaction limits relate to service fulfillment, while game and digital-service transactions extend beyond the core framework.
C7	Efficiency / system availability / privacy	Verification procedures affect ease of access, availability of transaction functions, and the handling of sensitive identity information.
C8	System availability / outside core framework	Device access and connectivity correspond to system availability, while reward-coin activities fall outside the core service-quality dimensions.
C9	System availability / efficiency	Slow loading, maintenance, crashes, and system interruptions directly reflect the technical availability and operating efficiency of the application.
C10	Fulfillment / privacy	Automatic or recurring payments concern correct transaction execution and user control over payment authorization and account information.
C11	Efficiency / system availability	Login, password, purchase, and transaction-access difficulties affect both ease of service use and technical availability.
C12	Responsiveness / contact	Response speed, accessibility of support staff, complaint handling, and communication correspond directly to E-RecS-QUAL responsiveness and contact.

4.1. Theoretical Implications

First, the study extends the predominantly construct-driven understanding of mobile payment post-adoption behavior by providing an inductive account of how service quality appears in users' actual experiences. This contribution matters because a recent systematic review of two decades of mobile payment research concludes that the literature has concentrated heavily on consumer adoption, while post-adoption behavior and broader stakeholder perspectives remain comparatively underdeveloped [15]. The present findings show that post-adoption evaluation encompasses a wider range of operational experiences than conventional adoption constructs alone can represent.

Second, the findings provide a more granular interpretation of mobile payment service quality. Reliability appears in failed transfers, balance management, application stability, and transaction processing. Security extends to third-party subscription deductions and identity verification, while responsiveness becomes visible through complaint handling and service recovery. Topic modeling therefore provides a bridge between abstract service-quality constructs and the specific service encounters through which consumers experience them.

Third, the cross-application differences introduce provider-level heterogeneity into the understanding of post-adoption mobile payment experience. Existing research generally seeks to identify factors that explain continuance across users. Chaw et al. [16], for example, combined qualitative and quantitative methods to examine users' needs and continuance intention among mobile payment users in Malaysia. The present study shows that the relative importance of those needs may depend on the platform being used. A service aspect can therefore be important to the mobile payment category while being substantially more salient for one provider than another. This finding supports greater attention to application-level variation in future post-adoption models.

The observed differences between MoMo and VNPAY should not be interpreted as evidence of underlying causal mechanisms. Although recurring payments and third-party subscription deductions are more prevalent in MoMo reviews, the review data do not establish whether these experiences originate from MoMo's own payment processes, linked third-party services, Google Play subscription billing, user authorization settings, or other factors. Similarly, identity and facial verification failures (C7) account for a larger share of MoMo reviews than of VNPAY reviews (5.77% against 3.98%, not significant after the Holm correction), and the available review data do not identify the technical, procedural, or user-specific causes of these difficulties. The present study therefore identifies differences in the prominence of user-reported service experiences across applications but does not determine their root causes. Establishing such causes would require additional evidence, such as system logs, transaction records, authentication failure data, or interviews with service providers and users.

4.2. Practical Implications

The findings carry several practical implications for mobile payment service providers. These implications are derived from the service aspects identified in users' app store reviews and should be interpreted as areas receiving substantial user attention rather than as direct measures of internal operational performance.

First, app interface and feature functionality emerged as the most prevalent topic in the overall corpus and was substantially more prominent in VNPAY reviews. This finding highlights the importance of interface usability, feature accessibility, navigation, application updates, and the overall organization of mobile payment functions. Service providers should therefore evaluate continuously whether new features improve the user experience or introduce unnecessary complexity. For VNPAY in particular, managers may benefit from systematically monitoring feedback on interface design, feature accessibility, and application updates to identify the elements that users frequently notice or evaluate. Because this topic also recorded a significantly higher star-weighted prominence score for VNPAY, maintaining the usability and functionality of the application should remain an important managerial priority.

Second, bank account and fund transfer issues remain an important aspect of users' mobile payment experiences. Reviews within this topic refer to account linkage, transfers, deductions, refunds, withdrawals, and transaction failures. Providers should therefore improve the transparency of transaction status and ensure that users receive clear information when transactions are pending, unsuccessful, reversed, or awaiting refunds. Transaction histories and notifications should state clearly whether funds have been transferred, remain in processing, or require further action. The significantly higher star-weighted prominence score for this topic in VNPAY further suggests that transaction-related experiences carry different weight in the rated reviews of the two applications. The review data do not, however, identify the technical causes of individual transaction failures, so these implications should be interpreted as priorities for managerial investigation rather than evidence of specific operational deficiencies.

Third, customer support and complaint resolution require particular managerial attention at MoMo. This topic was substantially more prevalent in MoMo reviews than in VNPAY reviews and also recorded a significantly higher star-weighted prominence score for MoMo, which reflects the greater attention the topic receives in MoMo reviews rather than more favorable ratings. Reviews frequently refer to interactions with customer-service personnel, call centers, delayed responses, unresolved complaints, and repeated attempts to obtain assistance. Managers should therefore examine the accessibility, responsiveness, and effectiveness of customer-support channels, particularly for transaction-related problems. Clearer complaint-tracking mechanisms, escalation procedures, expected response times, and follow-up communication may help users understand the status of their requests. App store reviews can also be used to identify recurring complaint categories and to determine which service problems generate repeated contacts with customer support.

Fourth, technical performance and service accessibility represent another important area for managerial attention, particularly at MoMo. MoMo reviews show significantly greater prevalence of app speed, stability, and maintenance, and of device access, connectivity, and reward-related features, and the star-weighted prominence scores for these topics are also significantly higher for MoMo, in line with their greater prevalence. Managers should therefore monitor loading times, system stability, maintenance-related interruptions, device compatibility, network connectivity, and access restrictions associated with rooted devices or emulators. When access is restricted for security or technical reasons, users should receive clear and actionable explanations rather than generic error messages. Monitoring review content after application updates may also give early warning of technical problems affecting particular devices or user groups.

Fifth, recurring payments and third-party subscription deductions represent a further service aspect that deserves managerial attention, especially at MoMo. Reviews within this topic refer to automatic deductions, subscription renewals, cancellations, transaction histories, refund requests, and payments associated with Google Play or other third-party services. Service providers should therefore provide clearer information on recurring-payment authorization, renewal schedules, active subscriptions, cancellation status, and refund procedures. Users should also be able to tell whether a payment originates directly from the mobile payment provider or from an external merchant or subscription service. Improving the visibility of active payment authorizations and recurring transactions may reduce confusion and help resolve disputed deductions. The review evidence should not be interpreted as showing that MoMo itself initiated these transactions, because some reviews explicitly refer to third-party or app store billing.

Sixth, the star-weighted prominence scores add a further basis for managerial prioritization by showing that the rating-weighted attention given to each service aspect differs between the two applications. VNPAY recorded significantly higher scores for app interface and feature functionality and for bank account and fund transfer issues, whereas MoMo recorded significantly higher scores for device access, connectivity, and reward-related features; app speed, stability, and maintenance; and customer support and complaint resolution. These differences suggest that service providers should avoid adopting a uniform improvement strategy across competing applications. Managers should instead identify the service aspects that are particularly salient to their own users and allocate improvement resources accordingly. Reading topic prevalence together with the star ratings attached to each topic gives a more informative basis for setting priorities than prevalence alone.

Finally, service providers should not assume that industry-wide service priorities necessarily correspond to the concerns most salient to their own users. Topic prevalence can be monitored periodically to detect emerging service issues and to compare patterns across competing applications. For example, an increase in discussion of application stability may signal the need to examine technical performance after an update, whereas growing discussion of transaction failures, refunds, or customer support may indicate areas requiring operational investigation. In this way, app store reviews can be turned from a passive feedback channel into a source of continuous service intelligence. Recent research similarly shows that post-adoption evaluations extracted from mobile payment reviews are associated with application market performance, which supports the strategic value of systematically monitoring consumer-generated feedback [11].

5. Conclusions

This study applied LDA topic modeling to Google Play reviews of MoMo and VNPAY in Vietnam and identified 12 service aspects reflecting users' post-adoption mobile payment experiences. The findings show that users' evaluations extend beyond broad service-quality dimensions and encompass specific experiences related to application functionality, financial transactions, authentication and access, technical performance, promotional mechanisms, and customer support. App interface and feature functionality emerged as the most prevalent topic overall, followed by bank account and fund transfer issues and by customer support and complaint resolution. The relative prevalence of these service aspects differed across the two applications, indicating that users of competing mobile payment platforms do not necessarily emphasize the same aspects of their service experiences.

The comparative analysis revealed distinct application-specific patterns. VNPAY reviews were substantially more concentrated on app interface and feature functionality, whereas MoMo reviews devoted more attention to customer support and complaint resolution; app speed, stability, and maintenance; device access and connectivity; recurring-payment deductions; and purchase and login problems. The star-weighted prominence scores, which weight each topic by the ratings of the reviews that discuss it, were significantly higher for VNPAY on app interface and feature functionality and on bank account and fund transfer issues, and significantly higher for MoMo on device access and connectivity, app speed and stability, and customer support and complaint resolution. Together, these findings show that the prominence of service aspects, and the ratings attached to the reviews that discuss them, vary across competing providers.

The study contributes to mobile payment research in several ways. First, it provides an inductive perspective on post-adoption mobile payment experiences by drawing on unsolicited user-generated feedback rather than relying solely on predefined theoretical constructs. Second, it shows how broad service-quality dimensions can be decomposed into more specific service experiences that users discuss spontaneously. Third, by comparing topic prevalence and star-weighted prominence scores across competing applications, the study brings out provider-level heterogeneity that may be obscured in studies examining mobile payment services at the aggregate level.

From a managerial perspective, the findings suggest that service providers should avoid applying uniform improvement strategies across competing applications. Managers can instead use app store review analytics to identify the service aspects that attract the most attention among their own users and to examine how those aspects relate to the ratings users give. For VNPAY, maintaining interface usability, feature accessibility, and transaction transparency appears particularly important, whereas MoMo may benefit from greater managerial attention to technical performance, device accessibility, and customer-support processes. More broadly, systematic monitoring of app store reviews can provide an ongoing source of service intelligence for detecting emerging concerns, benchmarking platform-specific priorities, and supporting more targeted resource allocation.

These findings should be interpreted within the boundaries of the study design. First, the dataset was collected exclusively from Google Play. Experiences reported on other distribution platforms, such as Apple's App Store, may differ because of variations in user populations, device ecosystems, application versions, and review behavior, so the findings should not be taken as representative of all mobile payment users across platforms. Second, the analysis covers reviews collected between February 1 and August 1, 2026. The identified topic structure and relative topic prevalence may therefore reflect application updates, promotional campaigns, service incidents, regulatory changes, or other conditions specific to this period. Future research could use longitudinal designs to examine whether service concerns and their relative prominence remain stable or change over time. Third, Google Play reviewers are a self-selected group of users. Individuals who choose to post public reviews may differ systematically from those who do not and may be particularly motivated by strongly positive or negative experiences. The observed topic prevalence and star-based patterns should therefore not be interpreted as population-level estimates of service problems, satisfaction, or user sentiment among all mobile payment users.

Fourth, the study focuses on two prominent Vietnamese mobile payment applications, MoMo and VNPAY. Although this comparative design allows application-specific patterns to be identified, the findings cannot be generalized directly to other Vietnamese payment applications or to mobile payment markets in other countries. Future studies could include a broader range of providers and national contexts to examine the generalizability of the identified service aspects and comparative patterns. Fifth, the topic-modeling approach identifies the content and relative prominence of user discussions but does not establish causal relationships, technical root causes, or actual operational performance. Differences in topic prevalence indicate what users discuss more frequently, but they do not explain why those differences occur. Future research could therefore combine app-review analysis with user surveys, interviews, transaction records, system logs, authentication-failure data, or other operational indicators to investigate the mechanisms underlying the observed service experiences. Finally, the study relies on LDA and does not compare its topic structure with embedding-based approaches such as BERTopic, ETM, or Top2Vec. Although LDA suits the present analysis because it provides review-level probabilistic topic distributions that support prevalence comparisons, embedding-based methods may capture semantic relationships in short reviews differently. Future research could compare several topic-modeling approaches to assess how consistent the identified service aspects are across methods.

Appendix A. Model Selection Diagnostics

Table A1: Coherence scores and log perplexity of the LDA models by number of topics.

K	Coherence	Log perplexity
4	0.662	−7.68
5	0.671	−7.61
6	0.668	−7.57
7	0.679	−7.53
8	0.684	−7.50
9	0.681	−7.47
10	0.689	−7.45
11	0.693	−7.43
12	0.701	−7.42
13	0.696	−7.41
14	0.691	−7.40
15	0.687	−7.39

Table A2: Coherence scores of the 12-topic model across random seeds.

Seed	Coherence
10	0.698
20	0.706
30	0.694
40	0.703
50	0.704
Mean	0.701

Author Contributions

Thanh Tuong Vo: Conceptualization, Methodology, Investigation, Writing – Original Draft. **Thi My Linh Cao:** Data Curation, Writing – Original Draft. **Hsi-Hua Chen:** Software, Formal Analysis, Visualization, Writing – Review and Editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that support the findings of this study, including the review corpus, the preprocessed corpus, the document-topic proportion matrix, the abbreviation dictionary, and the stopword list, are openly available in Figshare at https://doi.org/10.6084/m9.figshare.33314121, reference number 33314121.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT in order to check grammar and edit language. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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