Understanding Online Customer Touchpoints: A Deep Learning Approach to Enhancing Customer Experience in Digital Retail

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Abstract— **This study investigates the main touchpoints that customers value most when shopping online and their attitudes towards them, using Ocado's customer reviews as a case study. Employing machine learning and deep learning methods, such as word2vec, CNN-based sentiment models, and embedding-based topic models, the analysis identified seven critical touchpoints across pre-purchase and post-purchase stages. Recommendations were provided regarding promotional opportunities, technology utilization, and customer experience creation, highlighting the need for different strategies based on customer stages in their journey. The findings offer valuable insights for retail companies transitioning to digital platforms, emphasizing the importance of understanding customer needs and prioritizing touchpoints. Future research could explore additional retail companies with various channels and incorporate different types of customer views to provide a broader perspective on touchpoints.**

Keywords—Digital customer journey, Digital Touchpoints, Sentiments Analysis, Topics modeling

I. INTRODUCTION

Customer experience has emerged as a crucial differentiator in competitive markets, with customers increasingly prioritizing satisfying and memorable experiences over the purchased goods themselves [1-3]. The rapid development of information technology presents both opportunities and challenges for the retail industry to devise digital strategies that enhance customer experience. Digital retail has several advantages over traditional retail, including 24/7 availability, flexible payment options, home delivery, and increased customer interaction through online reviews and social media [4]. Moreover, online retailing can offer personalized recommendations by utilizing customer data, further improving the overall experience.

E-commerce sales have been steadily increasing, with projections suggesting that online retail sales will account for 22% of total global retail sales by 2023 [5]. As more customers and marketers engage in online channels, enhancing customer experience becomes essential for maintaining competitiveness. This research aims to identify key factors for marketers to improve customer experience in the rapidly evolving digital retail industry. With customers driving interactions, effective customer experience management serves as an optimal approach to refine customer relationship management [6] and therefore help the marketers win in the digital transformation stage.

Current research emphasizes the development of principles and strategies to enhance digital customer experiences in the retail industry [7]. Various models and marketing tools have been proposed to help marketers meet customers' elevated expectations [8, 9]. As digital technology shifts power from marketers to customers [10], understanding customer perspectives becomes increasingly important. Studies have examined the customer decision journey from their viewpoint [2, 11], with customer reviews being a valuable source of information on customer satisfaction, particularly in the hospitality sector [12, 13]. Building on this insight, this research adopts a customer-centric approach, utilizing customer reviews to identify key touchpoints and enable targeted improvements to the retail customer experience.

This paper is organized as follows: Section 2 provides a comprehensive literature review of the relevant theories and techniques. Section 3 outlines the research methodology, detailing the data collection, pre-processing, and feature engineering. Section 4 introduces the findings of sentiment classification and topic modeling. Section 5 presents the discussion of the findings. Lastly, Section 6 concludes the paper and provides suggestions for future research directions.

II. LITERATURE REVIEW

A. Digital Customer Experience

Customer experience encompasses the interactions between customers and a firm, with customer reviews serving as feedback on the expectations of these interactions. High satisfaction results from experiences exceeding expectations, moderate satisfaction from meeting expectations, and negative feelings from unmet expectations [14]. Retail websites offer customers the opportunity to post reviews, defined as 'peer-generated product evaluations' on company or third-party websites [15]. Customer reviews on each touchpoint provide an intuitive, cost-effective method for understanding customers compared to surveys. Voluntary, open-ended feedback enables marketers to gain specific insights into each consumer interaction [16, 17]. Customer reviews offer the advantages of accessibility, organization, and diversity. They are completer and more accurate as customers provide unbiased opinions [14]. Yoo and Gretzel [18] suggest that customers' motivation to help others through altruism makes the data more trustworthy. Customer reviews complement other information provided by marketers, such as product descriptions and recommendations [15], and can influence demand, sales, or financial performance [16].

The rapid technological revolution presents both opportunities and challenges for marketers to adapt and keep pace with customer expectations. Digital technology enables marketers to make informed decisions regarding customer

experience design and management [19], fulfilling customers' hedonic and utilitarian needs [4], and providing personalized promotions and recommendations through data analysis [20]. As information exchange becomes easier in the digital world, customer experience demands become multichannel. Unlike the offline world, where customer experiences are influenced by service staff, other customers, and customer communities [21], digital technology connects customers to a broader social environment, such as online reviews, communities, advertisements, and key opinion leaders [7]. Marketers must seize this opportunity to shape customers' digital environments [22].

Praise [23] defined the 'crisis of immediacy' as consumers' need for real-time, personalized content, expertise, and solutions during their shopping experiences. Leggett's [24] research showed that over 50% of consumers abandon purchases without timely responses to their queries, highlighting the importance of real-time, context-specific expertise across multiple channels for effective CRM and CEM management.

Zhang et al. [25] adapted the stimulus-organism-response (S-O-R) model to examine how digital technology can enhance customer experiences. Originally used in environmental psychology, this model posits that environmental stimuli (S) impact individuals' internal states (O), which in turn determine their behavioral responses (R). In the digital retail omnichannel context [23], stimuli correspond to online features such as personalization and interactivity, organisms refer to emotional and cognitive states like experiences, and responses encompass customer behaviors such as satisfaction, learning, retention, engagement, purchasing, and online communication.
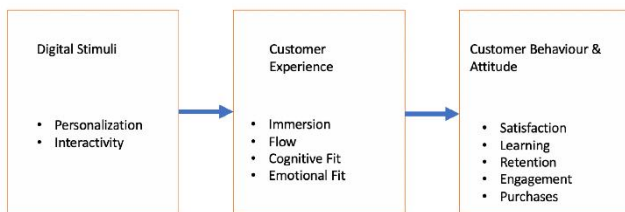

Fig. 1. S-O-R Model [23]

B. Customer Journey

Schmitt [26] asserted that marketers can learn about customers through the "customer decision-making process." To comprehend customer experiences, two perspectives exist: provider-centric and customer-centric. Service blueprinting, based on the provider-centric perspective, utilizes flowcharts to display service processes and customer interactions [27]. In contrast, the customer journey, an essential complement to experience management, is a dynamic process consisting of pre-purchase, purchase, and post-purchase stages [2]. Emerging technologies have transformed customer-firm relationships, for instance, Edelman and Singer [10] suggested that digital tools empower shoppers by allowing easy product comparisons and convenient services. Marketers can leverage technology to enhance customer loyalty throughout the customer journey. To adapt to changing customer behavior, understanding customers from their perspective is crucial [2].

Various researchers have proposed decision-making phases. Barry and Howard [28] employed the "hierarchy of effects" model to illustrate the fixed order of consumer

responses to marketing information: cognitive thinking, affective feeling, and conative action. The well-known AIDA model, proposed by E. St. Elmo Lewis in 1898, consists of awareness, interest, desire, and action. Elzinga et al. [11] presented a five-step model representing the customer decision journey: awareness, familiarity, consideration, purchase, and loyalty. This model identifies primary stages as potential battlegrounds for marketers and highlights the loyalty stage as a trigger for the next moment of change.

C. Digital Touchpoints

Neslin et al. [29] defined a touchpoint as a contact point or interaction medium between the customer and the firm, requiring both parties to be actively involved. Elzinga et al. [11] argued that customers, with the proliferation of product markets and channels, now demand more than just bilateral involvement. Consequently, Baxendale et al. [30] expanded the touchpoint definition to include one-way interactions that do not directly involve the firm, encompassing interactions between customers and broader stakeholders such as brand owners, retailers, and independent third parties. As digital technology advances, these stakeholders can create additional touchpoints to facilitate customer purchase decisions.

Traditionally, customer decision journeys and touchpoints began in retail stores. Now, customers can access various resources, allowing them to search, inquire, interact, buy, and review a company at any time [31]. Multiple touchpoints constitute the entire customer experience process [32], so companies must consider all potential touchpoints to engage customers effectively.

Baxendale et al. [30] emphasized the importance of understanding each touchpoint and identifying when each interaction should occur. Additionally, it is crucial for marketers to collect customer feedback and emotions from each touchpoint to enhance customer experience.

III. METHODOLOGY

In this inductive research, a case study is strategy was selected to explore the digital touchpoints of an online grocery store in the UK as described below. This study investigates the relationship between customer experience and digital channels, focusing on customer experiences and touchpoints primarily through digital channels. The approach allows for an examination of the phenomenon and understanding of its nature and complexity through 'how' and 'why' questions.

A. Ocado Case Study

Ocado, a UK-based online grocery retailer with no offline outlets, is chosen as the case study subject due to its focus on technology and expertise in shaping the future of the retail industry. As an online-only retailer, Ocado aims to enhance customer digital experiences. Brian Parkin, Operational Recruitment Manager of Ocado, stated that improving customer experience is key to shifting consumers online for grocery shopping. By examining Ocado's online reviews, the study aims to gain insight into customers' expectations from a digital retail company. The case study design comprises single-case designs with an embedded study, which is suitable given Ocado's unique online channel. Embedded studies identify several sub-units (e.g., delivery and food), which are individually examined and synthesized to provide an overall picture [33]. The study aims to explore customer journey mapping across multiple units by analyzing collected reviews.

B. Customer Review as a Data Set

After conducting an exhaustive web crawling process and evaluating various sources, we managed to acquire a dataset containing 3,769 customer reviews, spanning a period of nine years (2010-2019). These reviews provide a substantial foundation for deriving meaningful insights related to the services offered by a UK-based online supermarket. In order to thoroughly analyze the dataset and ensure its reliability for further investigation, the first step was to scrutinize and enhance the data quality. This was achieved by implementing a comprehensive preprocessing procedure. The said procedure comprised three primary stages: data preprocessing, which aimed at refining and structuring the raw data; data exploration, which involved delving into the dataset to identify underlying patterns, trends, and relationships; and finally, feature selection, where the most relevant and informative attributes were chosen for subsequent analysis. By adopting this systematic approach, a more academically rigorous examination of the dataset was facilitated.

C. Analysis Methods and Stages

- Feature engineering: Upon completing the data cleansing process, the subsequent stage involves selecting a suitable feature engineering technique to transform the text corpus, or individual sentences within the corpus, into the required input format for the models. We use one-hoy code to encode each word and then use multi-hot code to encode sentences as input to Word2Vec. The Word2Vec model returns a unique 300-dimensional vector representation for each word. This step is important to effectively utilize the information contained within the text for subsequent analysis and model implementation.

- Sentiment classification: Numerous non-parametric and parametric methods have achieved good results in addressing this issue. Non-parametric approaches, such as score-based methods that count positive and negative words in a sentence to determine its sentiment, have evident limitations. They are unable to comprehend the semantic meaning of sentences or capture the contextual relationships between words. In recent years, various machine learning and deep learning techniques have emerged. In this paper, we choose a Convolutional Neural Network (CNN) based approach to tackle the sentiment classification task.

- Topic modelling: Topic modeling aims to extract key topics from a corpus of sentences. In this paper, we employ the Latent Dirichlet Allocation (LDA) model and its variants to determine the primary aspects customers are either satisfied or dissatisfied with. a variation of LDA called embedded topic models (ETM) was used in this research. Compared to the traditional LDA model, the ETM processes both words and topics in an embedding vector space, achieving better results. 85% of the data is used to generate topics, while the remaining portion serves as a validation dataset for assessing model performance during training. Figure 2 depict the analysis process
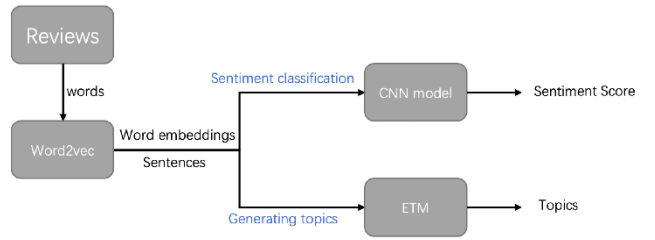

Fig. 2. Data Analysis Process

D. Time Series representation

Finally, the study aims to assess if touchpoints have improved over time by categorizing data based on sentiment. The dataset spans from 2010 to 2020 and includes five topics extracted from the collected sentences. A time series representation will be made to assess the change in customer sentiments over time.

IV. FINDINGS

From the 29,620 sentences that collected we started analyzing the customers' review by identifying the most popular words/expressions. The result of the automated extraction process was the identification of 5,000 unique concepts. Five topics were generated using the ETM model, and the optimal number of topics was determined through hyperparameter testing with 3, 8, and 10 topics. t-SNE was employed for visualization, revealing that selecting five topics yielded superior results compared to other configurations. The aforementioned methods were implemented using the sklearn and Pytorch libraries. The five topics are generated from the customer reviews which are the items, the online service, the quality of food, the delivery slot and the driver and the words that exists most in each topic are:

TABLE I.   THE IDENTIFIED TOPICS

Topic No.	Most Popular Words	Topic
1	'items', 'stock', 'missing', 'order', 'delivery', 'bags', 'substitutions', 'dont', 'ordered', 'money', 'things', 'refund', 'back', 'item'	Items
2	'ocado', 'service', 'years', 'customer', 'shopping', 'online', 'ive', 'shop', 'supermarket', 'im', 'happy', 'problem', 'experience', 'weekly'	Online Service
3	'drivers', 'good', 'delivery', 'time', 'great', 'service', 'products', 'helpful', 'quality', 'easy', 'food', 'polite', 'friendly', 'website'	Quality of food
4	'customers', 'ocado', 'slots', 'delivery', 'slot', 'weeks', 'regular', 'times', 'lockdown', 'customer', 'difficult', 'pass', 'people', 'deliveries'	Delivery slot
5	'order', 'delivery', 'driver', 'ocado', 'time', 'email', 'told', 'day', 'late', 'didnt', 'received', 'delivered', 'customer', 'deliver'	Driver

From an analysis of the clustered reviews, it becomes evident that customers prioritize aspects such as the items in the order, online service, food quality, delivery slot, and the driver. Based on the categorized topics, the data reveals the quantity of positive and negative statements associated with each touchpoint. As depicted in Figure 3, the prevalence of positive reviews surpasses that of negative ones.
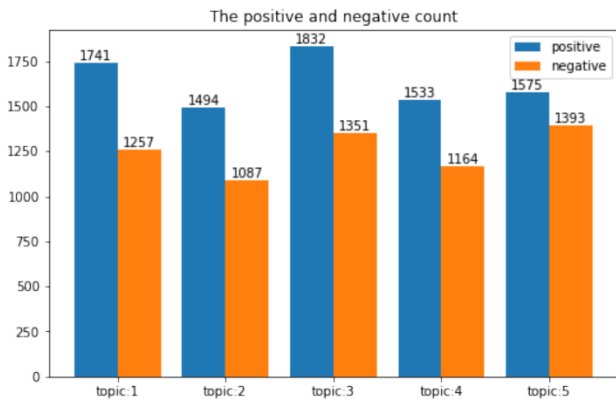
Fig. 3. The count of feedback Positive vs Negative

A. Items

The collected data consists of 1,741 positive and 1,257 negative reviews. A primary concern for customers is the items received. Top words extracted from reviews suggest issues with missing items and subsequent refunds or substitutions. Positive reviews praise timely deliveries with rare substitutions or missing items, while negative reviews express dissatisfaction with late deliveries and missing items, especially in crucial situations.

The topic of 'bags' also emerges, with both positive and negative reviewers appreciating aspects like durability, color-coding for organization, and recyclability. Overall, customers seem satisfied with Ocado's packaging and bags.

B. Online Service

Customers also discuss online service, with 1,494 positive and 1,087 negative reviews. Frequent words like 'years' and 'weekly' suggest that many are loyal online shoppers. Positive reviews highlight convenience, excellent customer service, and affordability for healthy eating. However, some customers express dissatisfaction with unhelpful customer service representatives and unresponsive insurance interactions. Despite a generally positive shopping experience, the online service aspect leaves room for improvement.

C. Quality of Food

Food quality is a crucial factor, with 1,832 positive and 1,851 negative comments in the collected data. Words like "quality," "products," and "food" are prevalent in this topic. Positive comments emphasize the consistently high quality of products, fresh produce, and competitive prices. Some customers express concerns about the shelf life and condition of certain items. As a partner of reputable retail stores, Ocado is expected to provide better quality and longer shelf life than competing brands.

D. Delivery Slot

The chart (Figure 3) reveals that topic 4, the delivery slot, has the most comments. As the first offline digital touchpoint between customers and Ocado, delivery slots primarily receive positive feedback. Customers appreciate the ease of finding available slots, receiving timely notifications, and punctual deliveries. However, some negative reviews mention unexpected errors, such as a lack of notifications or unavailable delivery slots for smart pass holders. Customer experience depends on slot availability, accuracy, and punctual deliveries.

E. Driver

Drivers are often the only staff customers interact with, impacting their experience. With 1,575 positive and 1,393 negative comments, drivers' punctuality and attitude are key factors. Positive reviews highlight timely deliveries and friendly, helpful drivers who assist customers. Negative reviews primarily focus on late deliveries, emphasizing the importance of punctuality for those with busy schedules. Some customers also express dissatisfaction with drivers' lack of knowledge or empathy regarding missing items.

F. Other Touchpoints

Some topics, such as the website, app, and vouchers, appear less frequently but still contribute to the customer experience. About 2,102 customers discuss Ocado's website and app, mostly complimenting their ease of use and functionality. However, some suggest improvements, like reducing distractions during the checkout process.

Vouchers play a crucial role in attracting customers, with 740 comments mentioning terms like "voucher," "coupon," "promotion," "discount," and "special offer." Many customers appreciate the promotional deals, but some express dissatisfaction with the availability and restrictions of these offers. Vouchers are also considered a suitable compensation method for addressing customer grievances, with some customers expecting this form of resolution.

G. Time Series Data

Figure 4 demonstrates that positive reviews constitute more than 50% each year, with recent years showing improvement. In 2010 and 2020, positive reviews accounted for over 60% of total reviews, indicating relative stability during this period, with 2014 and 2018 being exceptions.
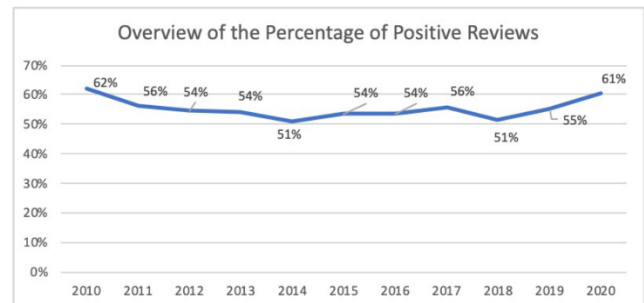

Fig. 4. Time series data of the overall performance (positive feedback)

Figure 5 presents the percentage of positive reviews for each touchpoint from 2010 to 2020. Items delivered, food quality, and drivers provided better experiences for consumers. However, online service and delivery slots experienced a decline in recent years, necessitating improvements to enhance customer experience. These two touchpoints exhibit greater fluctuations in positive review percentages, sometimes dropping below 50%. As customers tend to discuss their concerns more frequently, these fluctuations suggest that further improvements are needed to better engage customers.
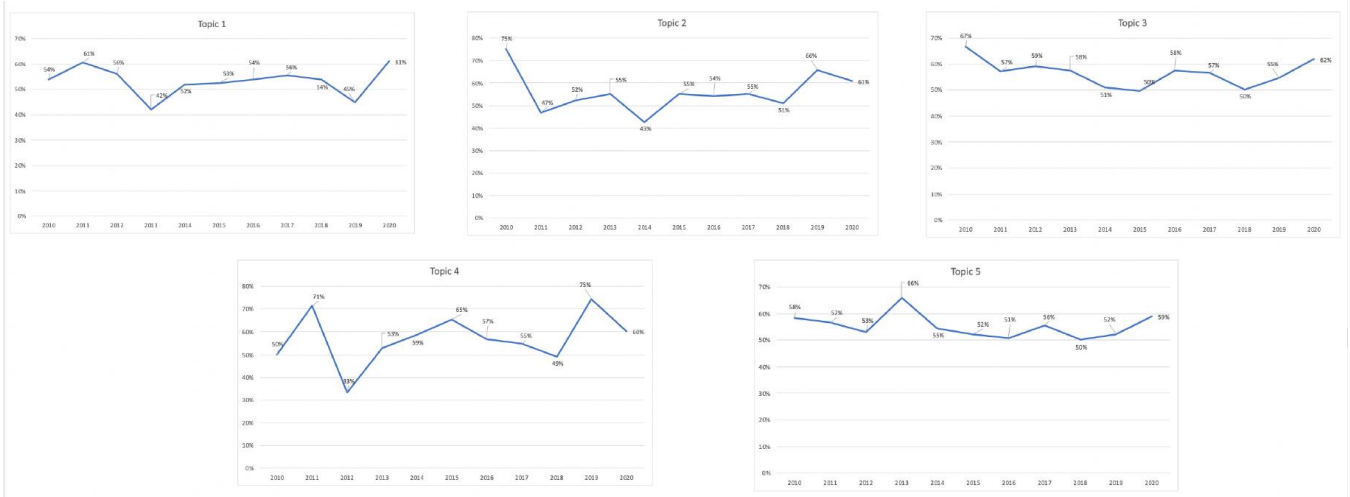
Fig. 5. The percentage of positive reviews by topic

V. DISCUSSION

A. Pre and During Purchasing Phase

The pre-purchase phase encompasses all interactions prior to a customer's purchase decision and consists of three critical customer decision stages: awareness, familiarity, and consideration. Within this phase, two touchpoints have been identified as particularly influential: promotions and online purchase channels. These touchpoints hold considerable significance for customer decision-making as they facilitate product evaluation based on individual goals and comparisons with internal benchmarks.

An analysis of customer reviews reveals that many customers opted for Ocado due to the vouchers offered, providing a perception of obtaining the same goods at a reduced cost. As a company that supplies luxury groceries and possesses technology-based distribution systems, Ocado can afford to offer substantial vouchers without incurring losses. This strategy effectively attracts new customers or re-engages inactive ones. However, if the voucher is deemed unusable, customers may choose competitors with accessible vouchers instead. Moreover, the usability of purchasing channels is crucial, as it enables companies to convert users into customers. In the context of an online grocery store, Ocado's website and app serve as vital components in motivating customers to finalize purchases. Several customers commended Ocado for its user-friendly channels, contributing to an increased conversion rate. In summary, the pre-purchase phase is instrumental in determining customer choice, while the purchase phase involves both new and existing customers. New customers' actions predominantly stem from pre-purchase experiences, whereas existing customers' actions are primarily influenced by their post-purchase experiences.

B. Post Purchasing Phase

The post-purchase phase encompasses usage, engagement, and service, with five main topics identified from customer reviews as crucial for a positive experience. This stage leaves a lasting impression on customers, necessitating a focus on satisfaction for both new and existing clientele.

1) Firstly, the delivery slot determines availability and accuracy of delivery times. Fluctuations in positive reviews indicate concerns about punctuality and reliability. Ocado must enhance this critical touchpoint in experience creation.

2) Secondly, drivers serve as the primary contact and face of the Ocado brand. Improvements have been noted in recent reviews, but there remains room for enhancement, particularly regarding punctuality.

3) Thirdly, the items customers receive present a unique challenge for online grocery stores. Minimizing errors, such as missing or substituted items, is essential for maintaining a high standard of service.

4) Fourthly, customers expect high-quality products from Ocado, even at higher price points. Ensuring consistent quality can help retain loyal customers and persuade others to shift from in-store to online shopping.

5) Finally, online customer service plays a pivotal role in overall satisfaction. Addressing concerns efficiently and offering compensation, such as vouchers, may mitigate dissatisfaction and improve the customer experience.

C. Practical recommendations

In order to maximize the efficacy of voucher distribution, several strategies can be implemented. Providing substantial vouchers to new clientele is advantageous, but extending the redemption time frame is crucial to mitigate the risk of losing potential patrons. Distributing smaller vouchers to inactive existing clients may encourage re-engagement, while utilizing vouchers as incentives for subscription services can also prove fruitful. Capitalizing on technology is of paramount importance for online retailers. Utilizing customer data to develop personalized recommendation algorithms can greatly enhance the user experience. Moreover, continuous updates to user interfaces based on client feedback can minimize system errors. Implementing a well-organized supply chain management system will decrease stockouts and maintain optimal food quality through the First-in-first-out (FIFO) method. Efficient temporal and route planning for delivery personnel is essential in addressing concerns surrounding delivery slots and punctuality, resulting in improved customer satisfaction. Attention to details, such as innovative and eco-friendly packaging, contributes to a positive customer experience. Though seemingly inconsequential, these aspects can set a company apart and create memorable interactions for clientele.

VI. CONCLUSION

This study aims to identify the main touchpoints that customers value most when shopping online and assess their attitudes towards them. Ocado's customer reviews were used to analyze customer evaluations and their feelings towards each touchpoint. Seven touchpoints were identified, with the pre-purchase stage being crucial for attracting new customers and the post-purchase stage garnering more attention in customer reviews. Recommendations were provided regarding promotions, technology utilization, and customer experience creation. Different strategies should be implemented for customers at various stages of their journey, focusing on pre-purchase touchpoints for new customers and service improvements for existing ones.

The findings offer insights for retail companies transitioning to digital platforms, emphasizing the importance of understanding customer needs and utilizing promotional opportunities, technology, and creativity in the process. Different touchpoints should be prioritized based on customer stages in the journey. This study employs improved algorithms, machine learning, and deep learning methods to analyze customer reviews from a customer-centric perspective. The chosen methods, such as word2vec, CNN-based sentiment model, and embedding-based topic model, address limitations of traditional approaches like LDA.

Limitations include dataset choice for sentiment classification and focusing solely on one online-only retail company. Future research could explore additional retail companies with various channels and incorporate different types of customer views to provide a broader perspective on touchpoints.

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