

# Impacts of Word of Mouth (WOM) on E-Business Online Pricing

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## ABSTRACT

In response to the rising power of electronic word of mouth (eWOM), marketers are gradually placing importance on the effects of their marketing strategies. The main objective of the study is to use both secondary as well as primary data to investigate the relationship and interaction between eWOM and online pricing. This study took BizRate UK, a price comparison website, as the database to investigate 100 mobile phone and tablet products and conducted interviews with online shoppers and managers from online retailers. After applying the test from quantitative methodologies, the result indicated the positive and negative reviews from online shoppers had an effect on pricing performance. Two types of reviews can be sorted out in a specific way as well. Finally, because the subject covers both quantitative (pricing) and qualitative (eWOM) aspects, future studies that are interested in this area should still apply the two methodologies for more accurate investigation.

## KEYWORDS

E-Commerce Environment, eWOM, Online Pricing, Online Shopper

## INTRODUCTION

“A lot of early studies predicted that all firms would be forced to price their goods at cost and prices would be driven down,” according to Michael Baye, a professor of economics at Indiana University’s Kelley School of Business. In addition, online price comparison sites—designed to guide consumers to the lowest prices—were expected to level prices all around, all but evaporating retailers’ profit margins (Festa, 2005).

Comparison engines suffuse online and are increasingly a bind of portal sites. There are many examples. Google launched the Froogle site in 2002. Bertelsmann has a stake in Shopping.com, which made a successful initial public offering. Yahoo purchased Kelkoo, and AOL found its InStore comparison site. Shopzilla, which used to be called BizRate.com, still runs the BizRate.com customer review site (Festa, 2005; Shen et al., 2019).

These sites generally compare prices and the users’ satisfaction and comments, which help the other users’ purchase when they search for goods information on these sites. Thus, online word of mouth (WOM) plays a significant role here, influencing the customers’ behaviors and companies’ online pricing strategies. WOM is a reference to the passing of information from person to person. It now includes any human communication. Further, presently WOM on the internet, also called electronic WOM (eWOM), generates great significance for internet marketing.

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eWOM has shown its power recently. In 2017, despite an ever-expanding array of advertising platforms and sources, consumers worldwide still placed their highest levels of trust in other consumers (Nielsen, 2017). According to the report from Nielsen, it conducted a twice-a-year survey among 26,486 internet users in 47 markets from Europe, Asia Pacific, the Americas, and the Middle East, which most recently quizzed consumers on their attitudes toward thirteen types of advertising—from conventional newspaper and television ads to branded web sites and consumer-generated content. David McCallum, the global managing director for Nielsen’s Customized Research Services, said, “Advertisers around the world can reach consumers across an increasingly diverse range of media platforms” (Nielsen, 2017). This situation explains how eWOM has become a critical factor that triggers customers’ internet shopping.

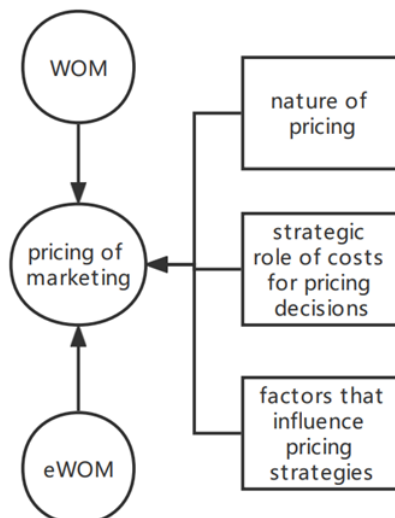
However, for the marketplace, price is always a crucial factor in customers’ buying process. Therefore, for the rising power of eWOM, it is imperative to ask how the effects of eWOM work on the seller’s side. Or, specifically, whether the extant understanding of online retailer pricing strategies is impacted by the price comparison engines, especially eWOM, and can explain the online retailers’ pricing behaviour.

It has been suggested that descriptive research on the determinants of retailer pricing strategies aids managers in profiling their pricing practices and predicting competitors’ behavior (Shankar and Bolton 2004). However, as a retailing channel, the Internet differs significantly from the traditional marketplace. It is characterized by the vastly increased availability of information regarding product attributes, prices, and retailer service quality metrics (Venkatesan et al., 2007). Furthermore, the results from Offline markets studies (Pakes 2003, Betancourt & Gautschi, 1993; Shankar & Bolton 2004; and Chintagunta, 2002) establish that retailers make pricing decisions that not only reflect the internal resources and objectives of the retailer but also point to the fact that retailers pay close attention to the characteristics of the market in which they operate. This point raises whether a similar effect is observed in online markets. If it could be, how does eWOM influence online pricing?

## LITERATURE REVIEW

This section contains three parts: WOM and eWOM, pricing of marketing, and the relationship between eWOM and pricing. Figure 1 shows the conceptual model of this study. There are different focuses

Figure 1. Conceptual model of this study



in this section. The WOM and eWOM parts emphasized the aspects for customers that contain the traditional WOM, eWOM, and the standard features of both. Additionally, the pricing section focuses on the views of companies and management, including the nature of pricing, the strategic role of costs for pricing decisions, and the factors that influence pricing strategies. Finally, the integrated discussion of these factors will be presented, and a brief conclusion will be given.

### **Word of Mouth (WOM)**

Word of mouth (WOM) is believed to be relevant in impacting customer behaviors. Although the usages of WOM in the conventional and electronic senses are related, WOM and eWOM possess notable features that should be redefined and illustrated based on previous research. The following discussion will clarify these distinctions.

Generally speaking, people are willing to heed the advice of strangers, so the anonymity of the WWW is by no means an obstacle to the success of eWOM. Furthermore, consumer opinion Web sites have cropped up on the WWW, providing unprecedented opportunities for consumers to voice their opinions on companies, products, and services in a structured, written format, such as product reviews, complaints, discussion threads, or chats (Pollach, 2005). Regarding eWOM, two features can be explicitly drawn based on previous studies.

First, the eWOM effect is practical for the experience goods rather than the search goods. Past studies provide evidence for the notion that the characteristics of the product (i.e., the subject of WOM) may affect how consumers treat the WOM message (Sundaram and Webster, 1999). Heightened perceived risk along the search-experience product continuum, which results from a lack of knowledge and information, increases the importance of experience (Hsieh et al., 2005). Consumers, especially when they intend to buy experience goods, can reduce their uncertainty after referring to eWOM information, such as online consumer reviews, that contain advice and comments from expert and experienced users. For this reason, the eWOM effect is expected to be greater for experience goods than search goods (Cheol, 2017; Zhang et al., 2022).

In addition, a new issue is how the brand power in marketing and eWOM interacts with customers' buying behaviors? Several studies have focused specifically on the topic. eWOM direction and product type, higher levels of brand familiarity generated through direct or indirect brand-related experiences, are associated with a well-developed knowledge structure about the brand and its attributes (Alba & Hutchinson, 1987). Given that consumers are not likely to change their attitudes toward familiar brands (Hoyer & MacInnis, 1997), exposure of a familiar brand to WOM communications, either positive or negative, is not likely to produce significant changes in consumers' pre-existing brand evaluations (Sundaram and Webster, 1999). Since finding search attributes on the Internet is easier than finding experience attributes, consumers will probably possess a more detailed, rich cognitive structure for searching goods than experience goods.

To sum up, the previous studies about eWOM cover the area of customers' experiential concept and the internet characteristics, which allow customers to enlarge their experience for the products or services they need and share their experience online.

#### ***The Effects of Personalization in eWOM***

Therefore, the question arises: how do consumers determine whether to trust online reviewers and their reviews? Larsen, Diener, and Cropanzana (1987) defined personalization as a cognitive operation by which readers of a review think about and feel as if what the study describes has happened to them.

#### ***The Situation Is Applied in Both Offline and Online WOM***

Murthi and Sarkar (2003) defined personalization as a mental operation initiated by the reader and elicited by external stimuli. Furthermore, research shows that consumers welcome personalized product offerings and that personalized messages enhance responsiveness (Howard & Kerin 2014). Consumers perceive personalized offers as more relevant to their needs and better aligned with their

preferences, enhancing their purchase intentions. A review could be highly relevant if the reviewer fits the same outline as the reader or shares a situation with which the reader is familiar. However, the reader might not experience high levels of cognitive personalization if they do not feel an emotional resonance with the review (Xia, 2018).

According to the studies, it can be proposed that cognitive personalization initiated by the reader is essential in determining the influence of an online review and is a common factor in the influence of the WOM situation. When a customer reads an online review and processes the information in a self-referential manner, they may perceive the message as credible, valid, and trustworthy (Xia, 2018). Therefore, the first hypothesis can be proposed to integrate the studies about WOM and eWOM issues.

**H1:** eWOM affects the online retailer's pricing performance.

## Pricing

According to the definition of price given by Nagle and Holden (2002), the price of a product or service is the number of monetary units a customer must pay to receive one unit of that product or service. For companies, price is an essential competitive weapon against their rivals in business. Therefore, price management aims to determine the optimal price or pricing strategy appropriate to the firm's objectives and implement that strategy (Nagle & Holden 2002). Therefore, price should be considered in a broader price-value-context, to understand the strategic role of price and the pricing tactic. Based on the figure, the following review will focus on the crucial elements for companies' pricing decisions, the influences from customers' behavior which influences pricing determinants, and the other environmental factors that impact the pricing.

Price is one element of the marketing mix. It interacts with the other Four Ps (i.e., price, product, place, and promotion). Thus, considering price decisions should usually be linked to marketing thinking. The pricing decision affects whether a company will sell less of the product at a higher price or more at a lower price which is associated with the cost of the product. One of the important factors for pricing is cost. Costing is one determination of the price of the resources expended in manufacturing and delivering a product or service.

### *The Customers' and Social Perception for Pricing*

Garbarino and Lee (2003) illustrated that dynamic pricing results in unexplained price differentials and decreased trust in the seller. In a study by Grewal et al. (2004), consumers judged an advance purchase discount as fairer and the seller as more trustworthy than a discount targeted to new customers. While these contributions provide useful insights into the judgments of different policies, the underlying dimensions of the policies that drive judgments of fairness and trust remain unclear. Moreover, the recent research that links policy fairness and trust in the seller has treated both of these constructs as one-dimensional. If these constructs are complex and multidimensional, the subtext of the fairness-trust relationship has largely gone unexplored. Thus, there appears to be a need for a comprehensive understanding of the relationships among pricing policy characteristics, judgments of fairness, and fairness consequences, such as trust.

By combining the conclusions of the trust and pricing studies that demonstrate different pricing strategies, it is evident that the trust sellers receive from customers in various ways influences their pricing strategies. If eWOM can be regarded as a trust-building context, positive and negative opinions from eWOM interact to build customers' trust for their sellers and trigger customers' buying process.

For the discussion about opinions from eWOM, a significant finding in impression formation literature is the negativity effect, namely that people place more weight on negative than on positive information in forming overall evaluations (Skowronski and Carlston, 1989). Evidence suggests that negative information is generally more attention-grabbing and admits greater inspection than positive information (Homer and Yoon, 1992). Previous research suggests that the WOM influence appears

to be asymmetrical in that negative WOM has a stronger impact on customers' brand evaluations (Arndt, 1967; Mizerski, 1982; Richins, 1983; Wright).

**H2:** The effect of negative eWOM information is greater than positive eWOM information on pricing.

### The Linkage Between eWOM and Pricing

Although few studies have discussed the relationship between eWOM and pricing, the related research can provide an essential direction for the analysis of this paper. Varian (2000) said two classes of retailers would emerge in the future—low service and high service and high price. Another study found that service quality can give retailers more flexibility and space in price differentiation (Pan et al., 2002). Wolfenbarger and Gilly (2003) said that service quality had become an important indicator that can significantly impact customers' buying behavior. In addition, one research stated that retailers provide services to reduce the customer's total cost of consumption.

According to Cohen (2000), the consumers' selection is based on risk aversion, mainly when the price of a product is high. This would lead them to prefer retailers with high service quality, who benefit from the consumers' risk aversion (or willingness to pay higher for service quality) by charging higher prices. Empirical evidence indicates that price dispersion increases with the average price level of the product (Pratt, Wise, & Zeckhauser 1979). The increase in dispersion could stem from the consumers' willingness to pay higher prices to retailers who can reduce the perceived risk by inducing trust (Ba & Pavlou 2002). Therefore, retailers with better service quality are afforded scope for price differentiation in product markets at higher price levels and may charge relatively higher (Venkatesan et al., 2017). Though for all products, the retailers with high service quality will charge higher prices than retailers with low service quality, the difference between their prices would increase with the price level of a product (Betancourt & Gautschi, 1993; Dai, 2022).

Based on the studies of WOM and eWOM, customer service can be an element of WOM and eWOM, influencing customers' opinions to deliver positive or negative reviews. To conclude, these arguments offer a rationale for the third hypothesis, which can be divided into two parts (Liu et al., 2021).

**H3a:** Pricing is influenced by the product's price.

**H3b:** Pricing is influenced by the volume of eWOM.

## RESEARCH METHODOLOGY

A quantitative study is a systematic investigation of phenomena and quantitative properties as well as the relationships that link them. Commonly, a quantitative study has been associated with mathematical formulas and equations, and so this type of research design usually uses or applies statistical formulae to investigate or carry out a scientific study that focuses on natural phenomena. Morris (2003) showed that a quantitative study could break down, compare, and analyse various variables systematically and scientifically using formulae. Probably the most common application of quantitative study is in the field of economics, especially in marketing-related issues, wherein research studies focus on breaking down variables or factors that might affect the market and influence the consumer. The succeeding portions present the current study's approach to investigating the study. The research approach, method, sampling, procedure, and method of data analysis are expounded on in this chapter.

Despite the disadvantages, the quantitative method is still a scientific approach that can provide a valuable outcome. Thus, this section applies basic regression analysis to the research methodology. Three sections are focused on this part, which is expected to test the hypothesis.

First, the price index scatter diagrams of each retailer in two categories are presented to identify the relationship between the pricing strategy and the product price from the retailers and to introduce the performance of pricing strategies from them. In addition, in both categories, the discussion of

the price index for the retailer is divided into two areas, rating, and non-rating retailer, which helps explain the differences in the influence of eWOM (Feng & Chen, 2022; Feng et al., 2021).

Furthermore, the correlation coefficients among the price index and products are investigated to enhance the confidence of the scatter diagram. Here the product price and the price index are viewed as independent and dependent variables, respectively, to help explain the relationship. Finally, simple and multiple linear regressions are applied to examine the deterministic and statistical relationship between the retailers, rating and non-rating, and their online pricing, in the hope that this will verify the relationship among retailers with ratings or without and the pricing strategies.

## DATA COLLECTION

Three criteria will be used for identifying the data to collect from the BizRate UK website:

1. Collecting two sorts of product categories that include non-differentiable products to avoid price variation because of product differentiation.
2. Investigate all the products shown on the web page in both categories to indicate substantial product penetration in the online retail market.
3. Collecting the products provided by the retailers with customers' ratings and reviewing them to examine the effects of eWOM.

Two product categories were selected from the BizRate UK website based on these criteria, mobile phones and tablets. With the help of the users' reviews and ratings, the two categories help achieve this study's objective. On the other hand, for each retailer, the study collected data for the overall ratings of each comparable product from BizRate UK. The retailer's transaction channels were coded based on inspection of retailer websites cross-verified with their description at BizRate UK. For the analysis, only the prices quoted for items in which users in each category ranked are used. The collection also compares the retailers without reviews and user ratings in the research design. To cover all the criteria above, Table 1 shows the general integrated information about the price of various types of products in the two categories.

One of the main objectives of this study is to measure the influence of service quality on retailer prices. To account for differences in price levels across different products within a category, this paper indexes the price charged by a retailer for a product. The price index, as in the following equation, is calculated as the ratio of the difference between the price charged by a retailer and the minimum price for the product to the minimum price for the product:where:

$PIND_{i,j}$  = Price index for retailer  $i$  for product market  $j$

$MinPrice_j$  = Minimum price charged by any retailer for product market  $j$

The information about the price index of the retailers for a single product which can be compared with others at different prices, based on the equation, is illustrated in Appendices 1 and 2. In addition, this study uses customers' feedback from BizRate UK as the standard to measure the eWOM online. There are some features about the feedback of BizRate as follows.

**Table 1. The Samples of retailers, products, and price ranges in the study**

Product Category	Retailers	Products Volume	Price Range (BGP)
Mobile phone	13	100	260.83 – 2,407.33
Tablet	14	100	93.99 – 5,611.62

According to the explanation of BizRate UK, the eWOM from BizRate UK consists of combined consumer feedback from two different sources to create the most comprehensive and reliable store ratings available anywhere. Many retailers have agreed to allow BizRate UK to collect feedback directly from their customers as they purchase. To do this, BizRate UK sits at the receipt page of tens of millions of transactions monthly and invites real customers to share their experiences and give feedback immediately after purchase. A transaction is incomplete until a customer receives his or her goods, so a follow-up e-mail is sent to ensure that the store delivers the goods as promised. This continuous process ensures that BizRate UK can collect timely, detailed, and accurate feedback about the ordering and fulfillment process of every BizRate UK Certified store (BizRate UK, 2017). It is important to have ratings for every store, not just those participating in the BizRate UK Certification program. For this consideration, BizRate UK has assembled a panel of active online shoppers who have volunteered to provide store ratings and reviews. Their reviews, combined with the reviews written by visitors to the BizRate UK website, allow BizRate UK to have up-to-date ratings for stores that do not participate in the program. In this research, BizRate UK has collected the primary data for our further analysis. Nevertheless, these data must be classified and sorted to match the research requirements.

To organize the information which has been collected, the summary of the market for the study can be described as follows:

1. **Retailer:** The study focuses on the retailers supplying products with comparison data. Fourteen and 13 retailers specializing in tablets and mobile phones, respectively, and satisfy the condition and provide the condition for the investigation because of the close number. In addition, the classification of rating and non-rating retailers will help clarify the WOM influence over price in the analysis.
2. **Price:** Tablets show a larger price range than mobile phones. Notably, for the retailers of both categories, the Price Index dispersion varies from 0% to 80%. The information about each retailer's Price Index can be reviewed in Table 4 in the Appendix.

In addition, BizRate UK provides consumers with 14 measures of a retailer. These are single-item measures on a scale of 1 to 10, where 1 is very poor, and 10 is outstanding. Ten of these items measure the level of service quality of a retailer and include the following: Ease of Finding a Product, Product Selection, Clarity of Product Information, Look and Design of the website, Shipping Options, Charges Stated Clearly, Product Availability, Order Tracking, On-time Delivery, and Customer Support. Such a simple composite measure of individual items that measure different aspects of a construct has been used widely in research measuring the market orientation of an organization (Jaworski & Kohli 1993), and the service orientation of a retailer (Homburg et al. 2002). The measure conducted a principal component factor analysis with the ten items and found that all the ten items were loaded into one factor that explained approximately 90% of the variance. Qualitative information can be transformed into quantitative data and support scientific investigation. The data will be employed in the measurement of eWOM later.

## Scatter Diagram

The X-axis shows the product from 1 to 100 in the mobile phone category to encode the products investigated at low to high prices. Thirteen retailers, which were included in the scatter diagrams, can be divided into two parts, rating, and non-rating. The scatter diagram, therefore, about the two sorts of retailers, is illustrated in Figures 1 and 2.

Although the price index range of rating retailers is between 0 and 0.41, the main area in which the price index is located is between 0 and 0.15. Based on Figure 3, the rating retailers' pricing performance can be explained briefly. Retailers Caboodle and Misco.co.uk showed complete information about the price index among 100 products. However, the price index of retailers Misco.co.uk and Caboodle

Figure 2. The scatter diagram of rating retailers in the online mobile phone market (Source: BizRate UK, <http://www.bizrate.co.uk/>)

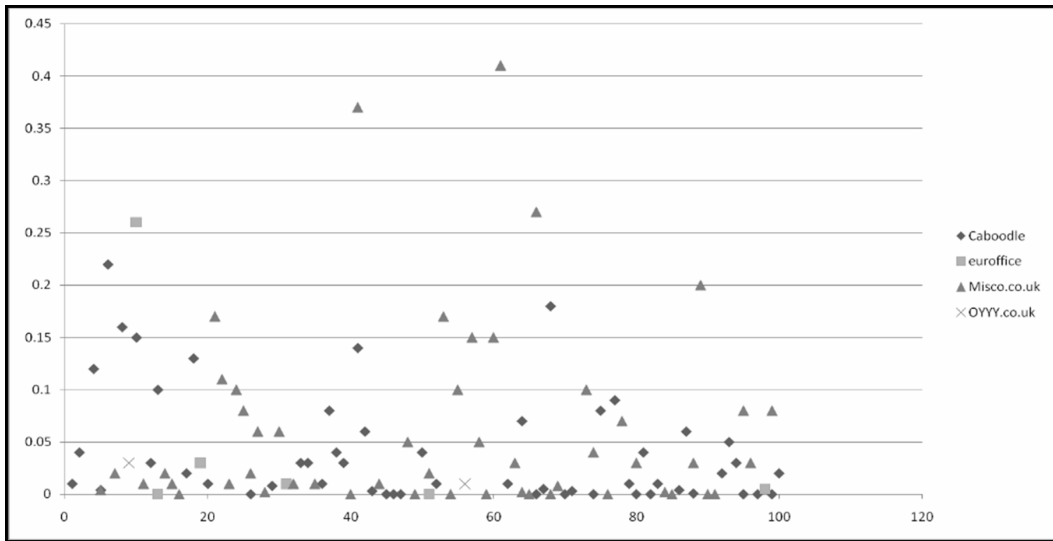
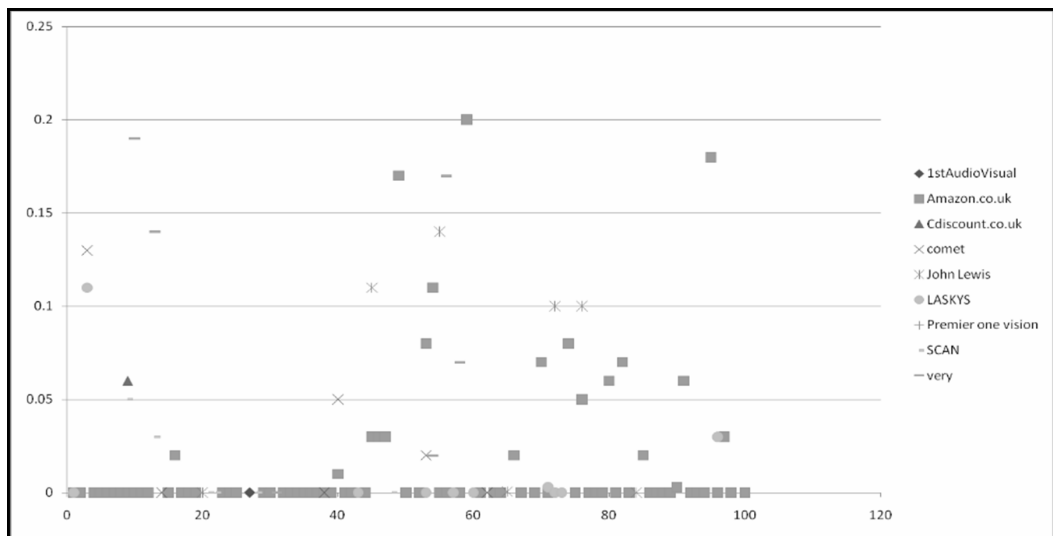


Figure 3. The scatter diagram of non-rating retailers in the online mobile phone market (Source: BizRate UK, <http://www.bizrate.co.uk/>)



among the products is dispersed. For retailers Eurooffice and OYYY.co.uk, the samples of the price index are too few to show the pricing condition among these products.

In addition, Figure 4 shows the distribution of the non-rating retailers' price index between 0 and 0.2, which is more centralized than the rating retailers'. The main area in which the price index is located is between 0 and 0.02. Generally, the retailers consist of 1stAudioVisual, Cdiscount.co.uk, comet, John Lewis, Laskys, Premier one vision, and SCAN, and provide fewer than six samples in the scatter diagram, which makes the analysis for their pricing strategies among the chosen products difficult. Furthermore, in the figure, the retailer Amazon.co.uk is the only one that provided enough



information for analysis. Notably, the pricing performance of retailer Amazon.co.uk among 100 products showed the lowest prices in the market (Song & Hua, 2022).

To sum up, the distribution of the price index in Figure 3 and Figure 4 is nearly random. The performances of the price index in the two types of retailers are those of dispersal. We can observe that the price index of rating retailers presented more dispersion in the scatter diagram than the non-rating retailer. The rating influence may impact the retailers on online pricing strategies. However, the relationship between the mobile phone product and the price index of the scatter diagram is not linear, which shows little evidence of the relationship and means we cannot summarize meaningful findings.

On the other hand, Figures 4 and 5 show the scatter diagram for tablet retailers.

For all the rating retailers in the online tablet market, the highest location of the price index is 0.91. Retailer Jessops showed complete information about the price index among 100 products. The situation in tablets was similar to that of mobile phones in that retailers Caboodle and Jessops showed dispersed distribution. For retailers Eurooffice and Photoglossy, the samples of price index are too few to show the product pricing condition.

Figure 5 shows the distribution of the non-rating retailers' price index range between 0 and 0.77. The main area in which the price index is located is between 0 and 0.2. Additionally, with the exceptions of retailers Amazon.co.uk and John Lewis, the other retailers provide an insufficient sample size for analysis. Over 70 samples of retailer Amazon.co.uk showed the lowest price index among the 100 products, which can provide a meaningful comparison with rating retailers.

The price index distribution is also nearly random. The performances of the price index in the two types of retailers were still those of dispersal. Meanwhile, the price index of rating retailers presented more dispersion in the scatter diagram than the non-rating retailer. From this view, the rating system may cause influence the retailers' online pricing strategies. Nevertheless, sufficient evidence was lacking to support the statement, and the relationship between the tablet product and the price index of the scatter diagram is not linear either.

To sum up, the price index performances of online retailers in two product categories, mobile phones, and tablets, were similar. They both showed that the rating retailers serve a more varied range in pricing than the non-rating retailers. However, because of the dispersal distribution in the scatter diagram analysis, the other meaningful results about the relationship between the rating system and

Figure 4. The scatter diagram of rating retailers in the online tablet market (Source: BizRate UK, <http://www.bizrate.co.uk/>)

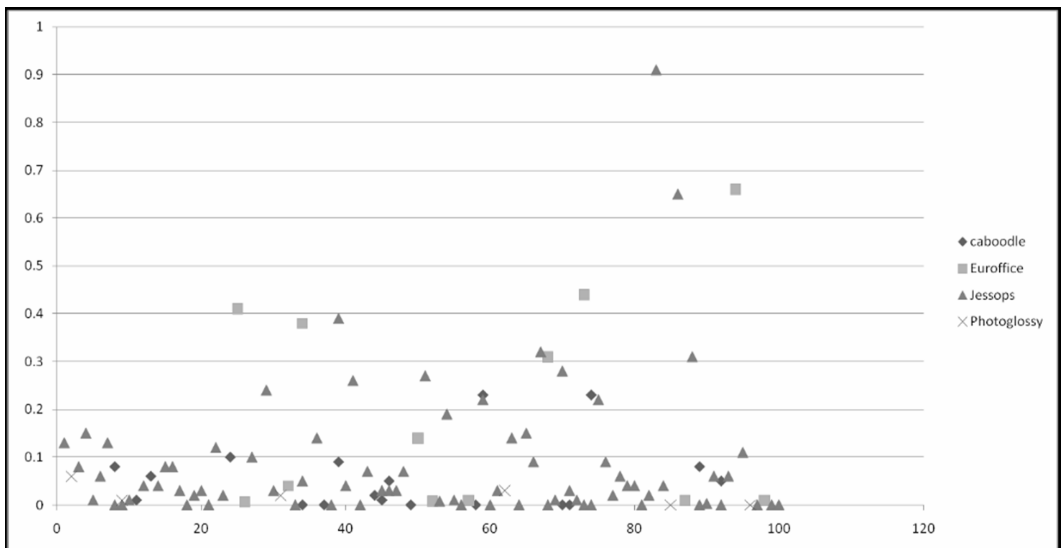
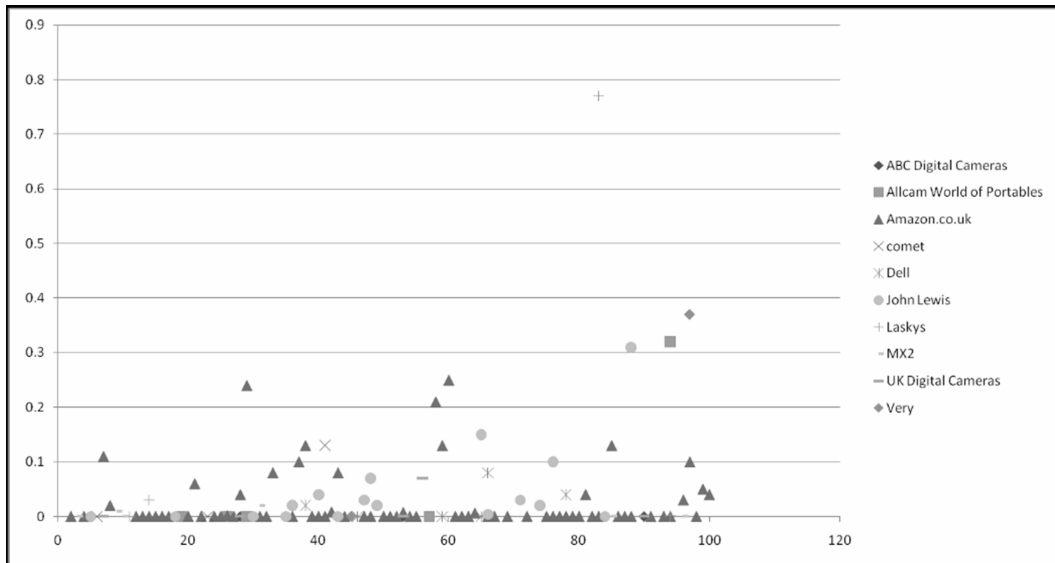


Figure 5. The scatter diagram of non-rating retailers in the online tablet market (Source: BizRate UK, <http://www.bizrate.co.uk/>)



the pricing strategies in the two product categories are hardly generated. Thus the hypothesis “eWOM affects the retailers” pricing strategies among the different products in the same category cannot be strongly proven in this analysis. Another method is required to generate more meaningful results.

## RESEARCH ANALYSIS

In statistics, correlation (often measured as a correlation coefficient,  $\rho$ ) shows the strength and direction of a linear relationship between two random variables (Cohen, 2003). The following analysis will proceed according to the formulas above, and the purpose is to investigate the correlation between the lowest market price and retailers’ price index. Based on the data collection and the scatter diagrams, the retailers with sufficient samples were selected to analyze the correlation coefficients in the investigation (Yuan et al., 2022).

### Mobile Phone Retailers

Because of the sufficient samples, the rating retailer Caboodle was selected for comparison with non-rating retailer Amazon.co.uk. There are 46 comparable products between the two retailers in this analysis. According to the correlation coefficient equation, two coefficients are found after calculating. The coefficient between the products’ lowest market price and retailer Caboodle is -0.38822. This statistic means that when the market product prices become higher, the price index of Caboodle would become lower. The number shows that the related level between both is about 39%.

On the other hand, the coefficient between the products’ lowest market price and the retailer Amazon.co.uk is 0.319974. This result means that when the market products’ prices increase, the price index of Amazon.co.uk will increase. The number shows that the related level between both is approximately 32%.

### Tablet Retailers

Because of the sufficient samples, the rating retailer Jessops was selected for comparison with non-rating retailer Amazon.co.uk. Fifty-two products are comparable between the two retailers in this

analysis. After calculating, two correlation coefficients are found. First, the coefficient between products' lowest market price and retailer Jessops is -0.12866. This figure means that when the products' market prices become higher, the price index of Caboodle will become lower. The number shows that the related level between both was approximately 13%.

On the other hand, the coefficient between the products' lowest market price and the retailer Amazon.co.uk is 0.100501. Therefore, when the products' market prices increase, the price index of Amazon.co.uk will increase. The number shows that the related level between both is about 10%.

Generally, the results of the correlation coefficient test are consistent. The rating retailers, in mobile phones and tablets, lower their pricing when the prices of other makers' products rise higher and higher. Contrarily, the non-rating retailer enhances the pricing when the prices of products increase. Therefore, there is a higher correlation between pricing and the market for online mobile phones than tablets. The result provides evidence in support of H2a that —Pricing is influenced by products' price. However, the coefficients were all lower than 0.5 and -0.5, meaning the related levels among these variables may be insignificant.

A further method should be adopted to investigate the effects between pricing and eWOM specifically. Therefore, in the next analysis, applied liner regression is taken as the major practice to research the issue.

## Linear Regression

This section applies linear regression to analyze the relationship between different variables. For this purpose, multiple linear regression is selected to help the research. Multiple linear regression attempts to model the relationship between two or more explanatory variables and a response variable by fitting a linear equation to the observed data. According to the method, the following table shows the related variables, including the total volume of reviews for particular products, the volume of positive reviews for particular products, and the volume of negative reviews for particular products. The standards regarding positive or negative reviews were from the overall rating of a particular retailer that online shoppers rated. Notably, because of the insufficient volume of reviews, this occurs only when the rating retailers are included in the investigation.

The price index is presented as a list of pricing for each product from retailers. Size, positive and negative reviews, service quality, and service quality index are presented as the components of eWOM, which help quantify eWOM in the test. Competitive intensity and price level are other factors that may impact the market's pricing. Since  $xi_0$  is the sum of  $xi_1$  and  $xi_2$ , these variables will be divided into two groups to avoid the interaction in linear analysis.  $xi_1$  and  $xi_2$  will test H3. Then  $xi_0$ ,  $xi_3$ , and  $xi_4$  will be tested in the linear regression model to confirm the relationship between pricing and the concept of eWOM. These data were pre-encoded in Excel and then transferred to the Statistical Package for the Social Sciences (SPSS) version 16.0 for statistical analysis. The results show in the following illustration.

The p-value for variables  $xi_1$  and  $xi_2$  are 0.000 and 0.326, respectively, meaning that each positive review will enhance 4.559E-5 in the price index of products for the mobile phone rating retailers. However, for  $xi_2$ , the null hypothesis cannot be rejected. On the other hand, the result for mobile phone rating retailers is insignificant. However, the p-value showed 0.053 and 0.078, which means the result for tablet rating retailers was more significant than mobile phone retailers and can explain the hypothesis. As a general explanation, each positive review for the tablet rating retailer will enhance 2.056E-5 in the product's price index. Contrarily, each negative review will reduce -5.091E-5 in the price index of the product.

The p-values for variables  $xi_0$ ,  $xi_1$ ,  $xi_4$ ,  $xi_5$ , and  $xi_6$  are 0.583, 0.000, 0.000, 0.002, and 0.002. This means that, except for  $xi_0$ , all the variables in the mobile phone market investigation influence  $y_i$  significantly. Whether positive or negative, each customer's review will enhance the price index in the retailers' price index. Additionally, the higher rating rank in Bizrate UK will enhance the price index. Besides, a higher service quality rating will enhance the price index, but higher service quality

index will reduce the price index. Finally, more competitors who provide the identical product in the market will reduce the price index.

On the other hand, the tablet market results are similar to the mobile phone market. However, it shows the p values for variables xi0, xi1, xi4, xi5, and xi6 are 0.424, 0.575, 0.064, 0.140, and 0.001. This means the results for xi0, xi1, xi4, and xi5 are insignificant. To be compared, the variable xi0, was found to be insignificant in both markets, and may be a reason which impacts the other factors in this test. Therefore, after abandoning xi0, the following tables show the updated results.

It is found that the p-value of xi1 and xi5 is reduced and, for xi5, is down to about 0.1, which is nearly significant for null hypothesis rejection.

## Summary

The Research Variables and Data Collection List is shown in Table 2. The results of the quantitative test are described in Table 3.

**Table 2. Research variables and data collection list**

Variables	Construct	Data Collected	Source
yi	Price Index (pricing)	The ratio of the difference between the price charged by a retailer and the minimum price for the product to the minimum price for the product	BizRate UK
xi0	Price level Index	The ratio of the difference between the average posted price for a product and the minimum posted price for a product to the minimum posted price for a product	BizRate UK
xi1	Size (reviews)	The volume of total reviews for the retailers in the BizRate UK website	BizRate UK
xi2	Positive reviews	The volume of positive reviews for the retailers in the BizRate UK website	BizRate UK
xi3	Negative Reviews	The volume of negative reviews for the retailers in the BizRate UK website	BizRate UK
xi4	Service quality	Survey rating obtained by BizRate UK from online consumers over 10 items on a 10-point scale	BizRate UK
xi5	Service quality Index	The ratio of the difference between the service quality rating by online shoppers and the minimum service quality ranking for the retailers to the minimum service quality ranking for the product	BizRate UK
xi6	Competitive intensity	Number of retailers from the BizRate UK and PriceRunner websites offering an identical product	BizRate UK and PriceRunner

**Table 3. List of test result for mobiles phone**

Variable	Construct (per Unit)	Price Index (yi) in the Mobile Phone market	Price Index (yi) in the Tablet Market
xi0	Price Level Index	0.039	-0.204
xi1	Size	1.609E-5***	-5.612E-7
xi2	Positive Reviews	4.559E-5***	2.056E-5
xi3	Negative Reviews	0.000	-5.091E-5
xi4	Service Quality	0.684***	0.879*
xi5	Service Quality Index	-4.084**	-5.123
xi6	Competitive Intensity	-0.006**	-0.020**

The possible reason for the insignificant result regarding negative  $\xi_2$  in the mobile phone market and  $\xi_0$  in the tablet market could be 1) the tiny influence from negative reviews on the market, which are insufficient to generate an effect, and 2) the imbalance in the volume of reviews, 22094, from retailer Jessops which may cause incorrect measurement.

On the other hand, to ignore the influence of the price level index, the results from Table 4 show more identification and evidence for the hypotheses. This result means the price level index may be unstable in this test.

To sum up, the quantitative method was applied in this section to test the hypotheses generated from literature reviews. The results are presented in the following discussion.

First, based on the illustration of the scatter diagram, the price index from the rating retailers is shown to be more active than the non-rating retailers in two categories, mobile phones and tablets. This result might partly explain that the rating system provided by BizRate UK may influence the pricing process of the retailers and partly provide a response to H1. Second, the multiple linear regression analysis shows that the negative review reduced the price index, and positive reviews enhanced the price index in both the online mobile phone and tablet markets, which proves H2. Third, for H3a, the correlation coefficient showed products' prices influenced the price indexes. The results from the multiple linear regression support that eWOM (size, service quality, and service quality index) and market power (competitive intensity) influence the online pricing (price index), which proves H3b.

Because of some insignificant results in Tables 3 and 4, support by H1, H2, H3a, and H3b can only be partly proven. Additionally, the quantitative method's limitation may reduce the research confidence level. Therefore, the qualitative method is applied in the next chapter for further tests and more accurate results to achieve more research goals.

## RESULTS AND DISCUSSION

The rating and non-rating retailers' price index distributions in the two categories are nearly random, meaning the pricing performance in the two types of retailers was by dispersal. Meanwhile, the pricing performance of the rating retailers presented more dispersion than the non-rating retailer. Although it was concluded that the rating system hardly influenced the retailers' online pricing strategies and lacked sufficient evidence to support the linear relationship between the products' categories and pricing, it still showed that the more reviews obtained by retailers would provide more flexibility in pricing. Plus, the pricing performances of online retailers in two product categories, mobile phones and tablets, were similar. This situation was more evident in the linear regression analysis. In addition, in multiple linear regression analysis, eWOM was defined by several quantitative indicators for the test. It was found that the content of customers' reviews, either positive or negative, impacts the increase or reduction of the price index.

Furthermore, in the interviews, the managers from online retailers stated that their pricing decision were usually generated from marketing goals, cost, departments' needs, or profitable target. Therefore, the interviews showed that online pricing has many and varied factors, and the customers' opinion is likely to play an insignificant role as one of the factors. Additionally, although all the interviewees said they do not believe their opinion can have an impact on products' price and most of them usually gave their online reviews and opinions without the price issue, however, they have already transferred the concept of price comparison and information searching to their internal know-how before their buying behavior. Therefore, to summarize, the customers' power and opinions influence pricing in different forms and aspects.

In correlation coefficient analysis, rating retailers Caboodle and Jessops were selected as samples for the comparison with non-rating retailer Amazon.co.uk. The result from the quantitative method indicated that rating retailers lower their pricing when the prices of products rise higher and higher. Contrarily, non-rating retailers enhance the pricing when the prices of products increase. This outcome showed the price range of products could impact the retailers' pricing. However, the coefficients in

the analysis were all lower than 0.5 and -0.5, meaning the related levels among these variables are common and may be insignificant. Furthermore, other elements of eWOM, such as service quality and market power, as well as the competitor, were involved in the multiple linear regression analysis, contributing to more understanding of the interaction between pricing and eWOM. It was found that effects on pricing come not only from the volume of customers' reviews and service quality, but also from the number of competitors.

Overall, to briefly illustrate all the findings from data statistics and interviews, the observing results explained the following three hypotheses from literature reviews. First, online customers' opinions affect retailers' online mobile phone and tablet pricing strategies. This pricing strategy may influence other electronic equipment, but this finding still needs further testing and more data for analysis. Second, negative and positive eWOM information affects the pricing of the online mobile phone and tablet market. Negative reviews reduce pricing, and positive ones enhance it. However, the influence of each review is very slight. Third, the influence of market power and customers' online reviews (eWOM) on pricing is significant. The factors include the number of visitors (size), service quality, and the number of competitors (competition intensity).

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## APPENDIX

Table 4. List of test result for tablets

Variable	Construct (per Unit)	Price Index (yi) in the Mobile Phone Market	Price Index (yi) in the Tablet Market
xi1	Size	1.614E-5***	-5.821E-7
xi2	Positive Reviews	4.559E-5***	2.056E-5*
xi3	Negative Reviews	0.000	-5.091E-5*
xi4	Service Quality	0.689***	0.920*
xi5	Service Quality Index	-4.117**	-5.443
xi6	Competitive Intensity	-0.006**	-0.020**