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Incorporating Multiple Linear Regression in Analysing Factors Influencing Consumers Purchase Intention for Online Shopping in Malaysia

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ABSTRACT

Online shopping has become a popular method of purchasing goods and services, offering consumers the convenience of shopping from anywhere at any time, especially after the COVID-19 pandemic. Understanding the factors influencing purchase intention in an online shopping context is crucial for businesses to optimize the customer experience and increase sales. Besides, the impact of the changes that will be made by the online business based on the study result will hopefully make it easier for users to make purchasing decisions and enjoy using online services without feeling insecure about various scam activities. Therefore, this study aims to identify the factors that drive consumers' purchase intentions for online shopping in Malaysia. Using a voluntary sampling technique in the survey approach, a total of 158 respondents' data in Malaysia were selected and analyzed using multiple linear regression. Four factors were chosen in relation to purchase intention which are price, perceived usefulness, perceived ease of use, and social media. The output revealed that price, perceived usefulness, perceived ease of use, and social media have a positive significant effect on consumers' purchase intention.

1. Introduction

The Internet is a global network of interconnected computers that allows for communication using established protocols. It has become accessible to people worldwide, enabling various activities like ordering food, sending messages, and saving money online. Online shopping has gained significant popularity, especially in Malaysia, where Malaysians spent $8.17 billion in 2021, a $2.4 billion increase from the previous year. The COVID-19 pandemic has further accelerated the shift towards online shopping, making it convenient for consumers. This has also led to the emergence of successful online entrepreneurs and encouraged many individuals, particularly young people, to pursue business careers. Also, the internet has brought about negative consequences such as data breaches, depression, and social media addiction. According to Bylok [1], online shopping has also been affected by scams, leading to a lack of consumer trust. The COVID-19 pandemic has further

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fueled the shift towards online shopping, changing consumer behavior and increasing the demand for certain products and services. However, the abundance of similar options can make it challenging for consumers to decide. Understanding consumers' purchase intentions is crucial for business growth and cash flow. This study aims to identify the factors influencing consumers' purchase intentions in online shopping in Malaysia to bridge the gap in understanding and facilitate informed purchasing decisions.

2. Related Works

Consumers' purchase intention refers to their choice to buy a product or brand and is influenced by their personalities [2]. Marlien *et al.,* [3] explained it represents their tendency and willingness to purchase a specific brand or product category. According to Lee *et al.,* [4], purchase intention is determined by the likelihood of customers' willingness to buy a product. Factors such as brand influence, marketing presentations, and personal preferences can affect purchase intention explained by Ananda *et al.,* [5]. It reflects consumers' perception, attitude, and belief in the need for a product [6]. Purchase intention is also associated with online shopping and social networking sites by Hussain *et al.,* [7]. It is frequently used in market research to understand consumer behavior regarding to Nasution *et al.,* [8]. To predict consumers' actions accurately, behavior must be measured after the intention, and responders must make deliberate choices [9]. Purchase intention is useful in testing new distribution channels and guiding managers in targeting consumer groups and geographic areas [10]. It is an essential aspect of the corporate sector and measures customers' satisfaction and expectations [11].

2.1 Purchase Intention

Several studies have examined factors influencing purchase intention in online shopping. Sin *et al.,* [12] found that perceived usefulness, perceived ease of use, and subjective norm positively influence purchase intentions while Kian *et al.,* [9] discovered that perceived usefulness, perceived risk, visibility, and social influence impact purchase intentions for online grocery shopping. Dash *et al.,* [13] highlighted the significant influence of brand identity and brand image on customer satisfaction and purchase intention. In research by Lee *et al.,* [4], the factors were identified such as product involvement, price, information, and word-of-mouth as influencing purchase intentions, while product quality had no noticeable effect. Shim *et al.,* [14] found that app usability, healthfulness, and quarantine positively influenced purchase intentions during the COVID-19 pandemic. Nasution *et al.,* [8] emphasized the role of price, usability, and ease of use in influencing customers' online purchase potential while Ali *et al.,* [15] identified online behavioral advertising, trust, and social commerce as strong positive influences on purchase intentions. In a study by Rahman *et al.,* [16], authors demonstrated that cognitive factors, perceived usefulness, and perceived ease of use positively impact e-shopping in Malaysia. Marlien *et al.,* [3] highlighted the significance of brand image, quality, price, and value on purchase intentions. Hussain *et al.,* [7] found positive correlations between psychological contracts and purchase intention and Ananda *et al.,* [5] revealed that trustworthiness, perceived usefulness, and perceived ease of use directly affect purchase intentions. Aji *et al.,* [17] indicated that brand equity positively influences purchase intentions and electronic word of mouth. However, there may be a disconnect between purchase intentions and actual behaviour [10].

2.2 Statistical Method

A probability sample method with 297 respondents, using a questionnaire and conducting multiple linear regression analysis [12]. A survey with a 63% response rate, employing exploratory factor analysis (EFA) and AMOS goodness-of-fit measurements for analysis [13]. Kian *et al.,* [9] gathered data in person with 150 questionnaires, conducting descriptive analysis, reliability analysis, and multiple linear regression using SPSS. Lee *et al.,* [4] conducted a quantitative study with 411 respondents using a questionnaire survey, analyzing demographic characteristics, performing one-way analysis of variance, and employing multiple regression analysis. Shim *et al.,* [14] compensated survey respondents, and conducted exploratory component analysis, correlation matrix analysis, and multiple linear regression analysis while Nasution *et al.,* [8] distributed questionnaires using stratified random sampling, employing descriptive statistics, multiple regression analysis, and Pearson correlation. In a study by Ali *et al.,* [15], the authors used judgmental sampling with a sample size of 384, utilizing structural equation modeling (SEM) for data analysis.

In summary, previous research papers have shown a positive relationship between factors like price, perceived usefulness, perceived ease of use, and purchase intention. Aji *et al.,* [17] introduces social media as an additional factor that may influence purchase intention. Multiple linear regression (MLR) analysis is chosen as the methodology due to its compatibility with the dataset and the ability to analyze the relationship between one dependent variable and multiple independent variables. MLR provides a straightforward workflow for data processing and interpretation compared to structural equation modeling (SEM). Next, the study will show the methodology used to examine the data and construct analysis for the model.

3. Methodology

This study will utilize multiple linear regression (MLR) to examine the relationship between factors influencing consumers' purchase intention. The data requirements include demographic information, response variables, and independent variables related to factors influencing purchase intention. The demographic data includes gender, age, state, highest level of education, and monthly income. The questionnaires consist of 7 questions for each factor studied, providing important insights into consumers' purchase intention and online shopping behaviour. The set of questions is as in Table 1. Previous research found that surveys are the most efficient method for data collection. Google Forms was selected as the survey platform due to its ease of use, availability as a free application, and user-friendly interface [8]. Respondents were asked to rank statements using a four-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). The survey was distributed through social media platforms like WhatsApp and Instagram community from April 13, 2023, to May 5, 2023, using voluntary sampling. A total of 158 respondents participated, and the data was collected in a Microsoft Excel document.

Table 1
List of questions for each factor

Factors	Questions
Purchase Intention	1. I like to shop online. 2. Online shopping is becoming my preferred method of shopping. 3. I often consider buying online. 4. I always purchase online products. 5. I am likely to recommend online shopping to others. 6. I intend to shop online more frequently online in the future. 7. I have a strong intention to purchase online in the future.
Perceived usefulness	1. Online stores improve my performance in search and purchase of products/services. 2. I am able to find products quickly and easily when shopping online. 3. I can get a broader selection of products. 4. Online shopping allows me to compare products across multiple retailers. 5. I can save time in online shopping. 6. Online shopping is a useful way to purchase products. 7. I believe that shopping online improves my life productivity.
Perceived ease to use	1. I think online shopping is not complicated. 2. I think online shopping is simple and straightforward to use. 3. My interaction with online stores is clear and understandable. 4. Interacting with an online store does not require a big mental effort. 5. It is easy for me to find products that I want to buy at online shopping. 6. I find the checkout process easy to follow when shopping online. 7. It is easy for me to make online transactions
Price	1. Online shopping allows me to compare prices across multiple retailers. 2. The price offered at the online store is affordable. 3. The price at the online store is cheaper than in the physical store. 4. Online store provides a lot of vouchers. 5. Online store constantly has promotion. 6. The shipping fee is affordable. 7. I save more money compared to in-store shopping.
Social media	1. Browsing social media helps me to identify the correct product or brand to purchase. 2. Social media platforms inspire me to online shopping. 3. I am easily influenced to buy a certain product reviewed by influencers on social media platforms. 4. I often refer to reviews or testimony on social media platforms before purchasing a product. 5. The reviews from social media often convinced me to buy a certain product. 6. Social media allows me to see how products look or work in real-life situations. 7. I often make online purchases influenced by ads through social media.

To assess questionnaire reliability, Cronbach's alpha was used to identify problematic items and measure internal consistency [16]. Cronbach's alpha can be calculated which provides updated statistical tools for analysis. The formula for Cronbach's alpha reliability test is as follows.

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum V_i}{V_t}\right) \quad (1)$$

where α is Cronbach's alpha, k is the number of items in the scale, V_i is the variance of the th item, and V_t is the variance of the total score. To know that a set of questions fits in a factor, there is an indicator that shows internal consistency. A set of questions with a Cronbach's alpha value >=0.7 was considered acceptable for further analysis. If the Cronbach's alpha value <0.7, it is likely that the set of questions will need to be changed and result in data collection having to be redone as shown in Table 2.

Table 2
Internal consistency of Cronbach's alpha

Cronbach's Alpha	Internal Consistency
α ≥ 0.9	Excellent
0.9 > α ≥ 0.8	Good
0.8 > α ≥ 0.7	Acceptable
0.7 > α ≥ 0.6	Questionable
0.6 > α ≥ 0.5	Poor
0.5 > α	Unacceptable

The factors with a good Cronbach's alpha value will be chosen for the data analysis part using the MLR method.

In general, MLR is a regression model that uses a straight line to calculate the relationship between a quantitative dependent variable and two or more independent variables. The consumers' purchase intention (*y*) is a quantitative variable, and perceived usefulness (x_1), perceived easy to use (x_2), price (x_3), and social media (x_4) are independent variables. Wekeza and Sibanda [2] examined the MLR equation model used in this study as follows:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + x_4 + \varepsilon \beta_3 x_3 + \beta_4 \quad (2)$$

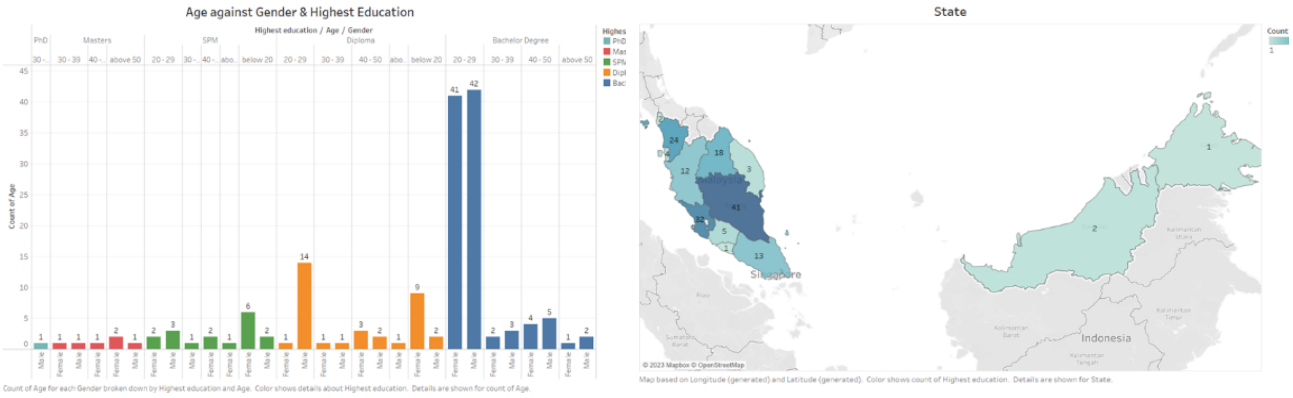
In R Studio, the results include important indicators for interpretation, such as R-squared, adjusted R-squared, *p*-value, and descriptive analysis. R-squared measures the correlation between observed and fitted values, ranging from 0 to 1. Higher values indicate a stronger relationship. Adjusted R-squared helps determine if adding more factors improves the regression model and should be close to 1. *P*-value indicates the probability of observing the same or more extreme outcome under the null hypothesis, with values less than 0.05 suggesting significance. Residual analysis examines the fit of the regression model by analyzing residuals and residual plots. Good datasets have linear relationships, normally distributed variables, and no multicollinearity. Tableau software is used for data visualization due to its interactive graphical features, while R Studio also offers plot and graph creation capabilities.

4. Data Analysis, Result and Discussion

4.1 Data Acquisition

The data shows in Figure 1(a) that the respondents' age was mostly from the age range of 20-29 years, with 105 respondents (64.8%). The second-highest age range was under 20 years, with 20 respondents (12.3%). The age range of 40-50 years had 18 respondents (11.1%), while the age range of 30-39 years had 11 respondents (6.8%). The lowest number of respondents was among the age range over 50 years, with only 8 respondents (4.9%). Besides, the study found that the majority of respondents who answered the survey were from the youth age group. Additionally, the gender distribution of the respondents showed a very small gap between men and women, with only a 5% difference. This indicates that the gender of the respondents is almost equal between the two parties. The study will further investigate the purchase intention of consumers who are more inclined toward online shopping. Some respondents provided 'other' answers such as Asasi and STPM, which will be considered equivalent to a Diploma qualification level for analysis purposes using R studio software. The distribution of respondents' education levels referred is Figure 1(b) shows that the majority have a Bachelor's degree (103), followed by Diploma (34), SPM (18), Master's degree (6), and PhD (1). Data collected for this study includes respondents from all 13 states in Malaysia, with

the highest number of respondents from Pahang (44), followed by Selangor (33), Kedah (24), and other states. The higher number of respondents from Pahang is likely due to the survey's popularity among Universiti Malaysia Pahang Al Sultan Abdullah (UMPSA) students.



(a) (b)

Fig. 1. (a) Age against gender and highest education and (b) distribution by states

There is also an additional question in this survey which asks the respondents whether they have ever had experience of buying and selling via online shopping or not. Figure 2 shows among the 158 respondents with online shopping experience, the majority (72.2%) shop online less than 3 times per month. This indicates a low frequency of online transactions, potentially impacting the e-commerce industry in Malaysia. In terms of estimated monthly spending, 77.2% of respondents (122 people) spend below RM200, suggesting a significant proportion of students without a regular income. The second highest spending range is between RM201 and RM500 (30 respondents), followed by RM501-RM1000 (3 respondents) and RM1000 (3 respondents).

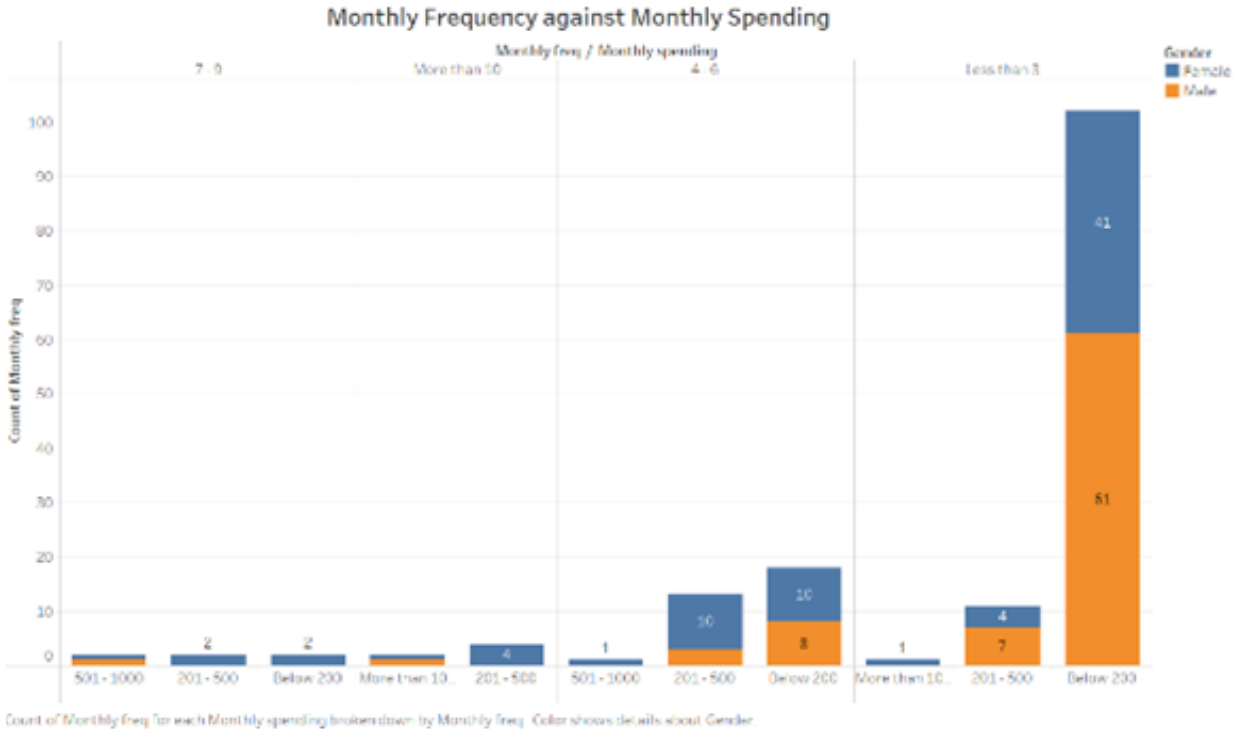


Fig. 2. Monthly frequency against monthly spending

An overview of the frequency of the number of respondents for demographic questions is shown in Table 3.

Table 3
The frequency of the number of respondents for demographic data

Variables	Category	Frequency	Percentage (%)
Gender	Male	85	52.5
	Female	77	47.5
Age (Years old)	< 20	20	12.3
	20 – 29	105	64.8
	30 – 39	11	6.8
	40 – 49	18	11.1
	≥ 50	8	4.9
State	Johor	13	8.0
	Kedah	24	14.8
	Kelantan	18	11.1
	Pahang	44	27.2
	Perak	12	7.4
	Selangor	33	20.4
	Terengganu	3	1.9
	Perlis	2	1.2
	Negeri Sembilan	5	3.1
	Melaka	1	0.6
	Pulau Penang	4	2.5
	Sarawak	2	1.2
	Sabah	1	0.6
Highest level of education	SPM	18	11.1
	Diploma	34	21.0
	Bachelor Degree	103	63.6
	Masters	6	3.7
	PhD	1	0.6
Frequency of online shopping per month	< 3	114	72.2
	4 – 6	32	20.3
	7 – 9	6	3.8
	>10	6	3.8
Monthly Income (RM)	< 200	122	77.2
	201 – 500	30	19.0
	501 – 1000	3	1.9
	> 1000	3	1.9

4.2 Data Preparation

The mean score for a Likert scale survey is obtained by summing up all the answers to a question and dividing it by the total number of respondents. It provides the average satisfaction level for each question. In this study, the mean scores for factors such as purchase intention, perceived usefulness, perceived ease of use, price, and social media were above 3.0. Perceived usefulness had the highest mean score, indicating that respondents found online shopping platforms useful in their daily lives. The data also exhibited high values of Cronbach's alpha, indicating good reliability and validity. Refer to Table 4 for the mean scores and Cronbach's alpha for each question and factor.

Table 4
The Mean Score and Cronbach's Alpha

Factors	Mean Score	Cronbach's Alpha
Purchase Intention	3.15	0.94
Perceived Usefulness	3.36	0.90
Perceived Ease to Use	3.22	0.90
Price	3.32	0.88
Social media	3.16	0.86

4.3 Data Modelling

In this study, Pearson correlation was used to identify the relationship between variables. Figure 3 shows the correlation results between variables. The correlation values range from 0.3288 to 0.4406. None of the variables has a value above 0.5. This does not mean that the variable set in this study does not have a positive relationship with *y*. The low correlation values may be due to various external factors like time spending, Internet, or insufficient budget. The highest correlation value is between variable x_2 (perceived ease of use) and *y* (purchase intention) with a value of 0.4406.

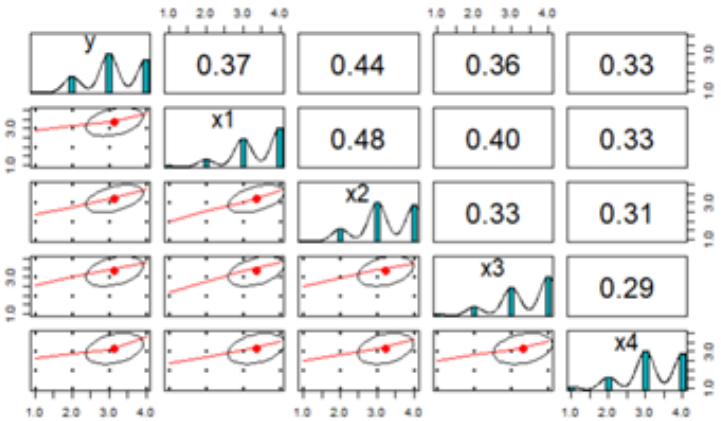


Fig. 3. Correlation Between Variables

4.4 Multiple Linear Regression

Due to the factors studied not being appropriate in matrix form because of multiple variables under factors, the data needs to convert lists to vectors, MLR can produce a model that only includes the factors studied. This makes it less complicated to analyze the significant relationships between the factors. The results of the MLR model can be seen in Table 5.

Table 5
Result of Multiple Linear Regression Model from data modeling

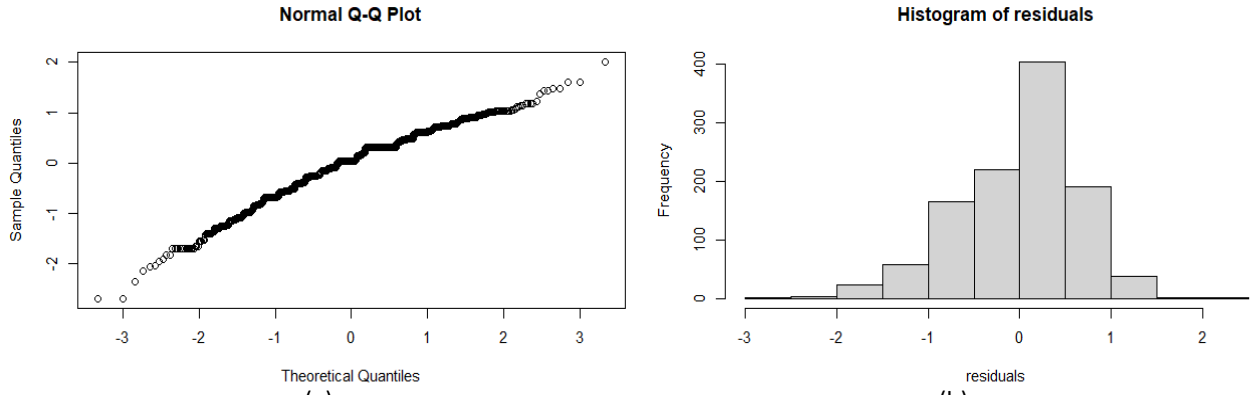
Factors	Coefficient	Standard Error	t-value	P-value	VIF
Perceived Usefulness	0.1134	0.0315	3.5930	0.0003	1.4616
Perceived Ease to Use	0.2892	0.0308	9.4010	<2e-16	1.3683
Price	0.1697	0.0279	6.0810	1.64e-09	1.2637
Social Media	0.1435	0.0261	5.4930	4.91e-08	1.1919

The results of the MLR model show that all the factors studied are significant and have a relationship with purchase intention. This is because all the independent variables have a lower *p*-value than the significance value of 0.05. A *p*-value of less than 0.05 significant level indicates that there is a statistically significant relationship between the independent variable and the dependent

variable. Based on the standard error obtained from the MLR model, the study found that all factors have a small standard error value of less than 0.05. Standard error is important to determine how well the data fits the model. A small standard error value in this MLR model indicates a better fit of the model to the data. Furthermore, The Variance Inflation Factor (VIF) for each independent variable in the MLR model is less than 1.5, indicating that each predictor is moderately or weakly correlated to each other. This is because the model has parameter estimates that are less biased. The standard error based on the results of the MLR model is also very low for each predictor, showing that this model is able to give an accurate value towards y. In addition, Figure 4 shows the residual standard error, r-squared, adjusted r-squared, F-test, and *p*-value for the MLR model.

4.5 Model Adequacy Checking

Model adequacy checking is a method to determine how well the data fits the model. To check the model adequacy checking, the model variables need to be normal distributed, and not multicollinearity in order to adequate the MLR model. The Figure 4 show the normality of the residuals towards model.



(a) (b)

Fig. 4. (a) Normal Q-Q Plot (a) and (b) Histogram of residuals

Based on Figure 4, the residuals are approximately near to the straight line and the histogram is bell-shaped. It indicates the model is normally distributed.

Table 6 shows the residual standard error is 0.6587, representing the estimated standard deviation of the errors. The multiple R-squared is 0.2782, indicating that about 27.82% of the dependent variable's (*y*) variance in the model is explained by the independent variables. The adjusted R-squared is 0.2756, considering the number of independent variables. The *F*-statistic is 106.1, testing the overall significance of the model, with a *p*-value less than 5% significant level, indicating statistical significance. The model moderately explains the dependent variable's variance and fits the data. The Mean Square Error (MSE) is 0.4319, suggesting a moderate fit. MSE indicates there may be a better model for the data, but this model is still considered suitable.

Table 6
Residual standard error, R-squared, Adjusted R-Squared, F Test, and P-value of MLR model

Items	Result
Residual Standard Error	0.6587 on 1101 degrees of freedom
Multiple R-squared	0.2782
Adjusted R-squared	0.2756
F-Statistic	106.1 on 4 and 1101 DF
p-value	<2.2e-16

5. Conclusion and Recommendation

This study has successfully been conducted on the factors that influence consumers' purchase intention towards online shopping. The study also highlights the impact of the COVID-19 pandemic on online consumer purchasing behavior. The results of the study contribute to the literature on purchase intention in the context of online shopping and provide insights for practitioners to enrich their marketing efforts to boost the online business of their products. In summary, this study shows that perceived usefulness, perceived ease of use, price, and social media have a positive and significant effect on consumers' purchase intention. It can be concluded that all factors that affect the consumers' purchase intention are expected to have a positive relationship with purchase intention.

The limitations of this study are in terms of model adequacy checking, such as non-representative respondent demographics and challenges in multiple linear regression analysis. Future research can expand surveys to different states and consider alternative models like structural equation modeling for questionnaire data. Likert scale datasets can be analyzed using multiple linear regression, but there are limitations in analyzing the relationship between questions in depth and ensuring model adequacy. There are several recommendations to solve the problem among entrepreneurs like pricing strategies like discounts, combo products, and up-sale and cross-sale techniques that can increase sales in online shopping. Discounting is widely used and effective for retailers. Findings can be shared with entrepreneurs through a documented business module and tailored marketing strategies can be developed based on customer intentions and behaviors. This study provides opportunities for informed purchasing decisions and entrepreneurial success in the online business landscape.

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