

Determinants Analysis of Ride-Hailing Application Acceptance: SEM - Neural Network Approach

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Informasi Artikel

Abstract

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Research aim : This research aimed to develop a technology acceptance model based on innovation and marketing perspective on ride-hailing services application.

Design/Method/Approach : This research is an explanatory quantitative research that use a primary data which collected from 303 ride-hailing services application users with questionnaire. The methods were used in this research is SEM - neural network methods. SEM is used to analysis the significant of effect of independent variable on dependent variable while neural network is used to identify the most importance independent variable on explaining dependent variable.

Research Finding : First, the SEM analysis result shows that relative advantage, price, promotion and distribution have an impact on user satisfaction. In intention to use variable furthermore, The only influencing variables are user satisfaction and distribution. Second, the results of neural network analysis on user satisfaction model shows that promotion is the most importance variable in explaining user satisfaction with followed by relative advantage, price and distribution. In neural network model of intention to use, user satisfaction is the most importance variable with followed by distribution.

Theoretical contribution/Originality : With the results of this study it can be said that there is an integration of aspects of innovation and marketing in explaining application user acceptance.

Practitioner/Policy implication : This research can be one of the considerations for the management of online transportation services to make a decision related to the service quality development, especially from the aspect of customer-based innovation and marketing.

Research limitation : The limitations in this study are limited to use of neural networks as a machine learning method and conceptual aspects of innovation and marketing in explaining application user acceptance.

Keywords : Diffusion of Innovation, Marketing Mix, Technology Acceptance, PLS-SEM, Neural Network

Abstrak

Tujuan Penelitian : Penelitian ini bertujuan untuk mengembangkan dan menguji model penerimaan teknologi berdasarkan perspektif inovasi dan pemasaran pada aplikasi layanan transportasi online.

Desain/ Metode/ Pendekatan : Penelitian ini berjenis penelitian kuantitatif eksplanatori dengan menggunakan data primer yang dikumpulkan dari 303 pengguna aplikasi layanan transportasi online dengan kuisioner. Metode yang digunakan pada penelitian ini adalah metode SEM – neural network. Metode SEM digunakan untuk menganalisis signifikansi pengaruh variabel independen terhadap dependen sedangkan neural network digunakan untuk mengidentifikasi variabel dependen yang paling penting dalam menjelaskan variabel dependen.

Temuan Penelitian : Pertama, hasil analisis SEM menunjukkan bahwa keunggulan relatif, harga, promosi dan distribusi berpengaruh terhadap kepuasan pengguna. Selanjutnya pada variabel minat penggunaan, variabel yang berpengaruh hanya kepuasan pengguna dan distribusi. Kedua, hasil analisis neural network pada model kepuasan pengguna menunjukkan bahwa promosi menjadi variabel paling penting dalam menjelaskan kepuasan pengguna dengan diikuti oleh keunggulan relatif, harga dan distribusi. Pada model neural network minat penggunaan, kepuasan pengguna menjadi variabel terpenting dengan disusul oleh distribusi.

Kontribusi Teoritis/ Originalitas: Dengan adanya hasil penelitian ini dapat dikatakan bahwa adanya integrasi aspek inovasi dan pemasaran dalam menjelaskan penerimaan pengguna aplikasi

Implikasi Praktis : Penelitian ini dapat menjadi salah satu bahan pertimbangan bagi pihak manajemen layanan transportasi online untuk mengambil keputusan terkait pengembangan kualitas layanan, terutama dari aspek inovasi dan pemasaran yang berbasis pelanggan.

Keterbatasan Penelitian : Keterbatasan pada penelitian ini adalah terbatas pada penggunaan neural network sebagai metode machine learning dan aspek konseptual inovasi dan pemasaran dalam menjelaskan penerimaan pengguna aplikasi.

Kata kunci : Difusi Inovasi, Bauran Pemasaran, Penerimaan Teknologi, PLS-SEM, Neural Network

1. Introduction

Startup companies in Indonesia nowadays experiencing rapid growth in entire business field, including in transportation field. With the presence of ride-hailing application which promoted by startup company, the transportation business model and behavior incrementally modernized and changed. The application make necessary transportation by user can be



ordered anytime anywhere. It imply that the modernized technology is an instance of innovation of novelty efficiency and can solved increases of human activities in the future [1,2]. Furthermore, the modern user behavior which consumptive and instant make digital ride-hailing services innovation compatible. Thus it is crucial to promote the usage of ride-hailing transportation application.

The key role for startup company of ride-hailing is an application as a main product to bridge service processes in for-profit purposes. If application obtain several acceptance in user perspective, it can enhance competitive advantage of startup company [3]. Fundamentally, the acceptance of user caused by the compatibility of user need and service that provided by apps developer. Thus startup company need innovations that respond to the needs of a dynamic society to be transformed into business opportunities. Innovation in startups engaged in the online transportation service sector is crucial because of the pressure to develop products with the latest versions and the competition between competitors [4]. Thus the ability to encourage innovation can create a competitive advantage [5].

In addition to implementing innovation in startups, marketing is also mandatory to increase product knowledge for users. From a user perspective, marketing is one of the company's interfaces in introducing their products. To understand the effectiveness of the online transportation service market, it is necessary to evaluate the role of marketing performance [6]. In the context of this research, the marketing mix is one of the keys to creating and maintaining market effectiveness [7]. When marketing is balanced with excellence operational capabilities, companies will be able to easily gain superior competitive advantages and sustainably increased profits [8]. Thus the startup company needs to balancing innovation and marketing to achieve maximum competitive advantage. For instance, Gojek nowadays is a startup unicorn company and also one of the most populer ride-hailing application which provide several and massive interesting promotion such as discount for each food nor transportaion order. In every years, Gojek implement money burn method which costs more than Rp. 1 Trilion. Thus, it proves that marketing perspective is one of the importance aspect that enhance organization competitive advantage.

The competitive advantage based on Innovation is embedded on the business model that implemented in the application. The innovation representated in the fulfillment of user relevance needs and requirements. The higher relevance and quality of application, the higher user acceptance [9]. Thus it can concluded that innovation has an affect on user acceptance [10–12]. Furthermore, in order to balancing the operational innovation with the enhancement of total of user acceptance, marketing issues must be considered to be one of formulated strategy. In addition to marketing, the aspect of marketing mix indicated has an affect on user acceptance [6,13]. However, balancing the marketing and innovation aspect for startups application product is necessary in order to improve user acceptance and sustainability



business. With the identified gap above, this study aims to analyze the effect of innovation and marketing mix on user intention and satisfaction. In addition, this study also measures the level of importance of each innovation and marketing mix variable on user satisfaction and intention in using the ride-hailing application. Further, this research provide integration of technical and marketing perspective or model in order to support service quality development of ride-hailing applying in improving market acceptance nowadays.

1.1. Statement of Problem

The competitive advantage based on Innovation is embedded on the business model that implemented in the application. The innovation represented in the fulfillment of user relevance needs and requirements. The higher relevance and quality of application, the higher user acceptance [9]. Thus it can concluded that innovation has an affect on user acceptance [10–12]. Furthermore, in order to balancing the operational innovation with the enhancement of total of user acceptance, marketing issues must be considered to be one of formulated strategy. In addition to marketing, the aspect of marketing mix indicated has an affect on user acceptance [6,13]. However, balancing the marketing and innovation aspect for startups application product is necessary in order to improve user acceptance and sustainability business.

1.2. Research Objectives

With the identified gap above, this study aims to analyze the effect of innovation and marketing mix on user intention and satisfaction. In addition, this study also measures the level of importance of each innovation and marketing mix variable on user satisfaction and intention in using the ride-hailing application. Further, this research provide integration of technical and marketing perspective or model in order to support service quality development of ride-hailing applying in improving market acceptance nowadays. In order to provide the logical correlation, we propose related literature review and hypotheses as follows:

A. User Acceptance

User acceptance has been widely measured in information systems theory. For instance, several common theories of information systems that used to measure acceptance are Technology Acceptance Model [14], Unified Theory of Acceptance and Use of Technology [15], DeLone & McLean Information Systems Success Model [16]. Those theory fundamentally focused on measuring of technical aspect of technology adoption. However, information systems theory often uninvolve business and individual environment aspects to examine the user acceptance on certain technology. Therefore, it is crucial to fill the gap of other aspect measurement from information system theory in technology adoption.



The usage of user acceptance measurement is a requirement for development of technology that necessary to evaluate and reconfigure the product in order to fulfill market needs [17]. The main concept of user acceptance can be examined with user satisfaction and user intention to use of the technology [16]. According to that theory, therefore, fundamentally the examination of user acceptance in profit-based technology has a similarity with consumer behavior theory. Thus the examination of business-driven and user satisfaction theory can be integrated into the theory of user acceptance of technology. Further, it also crucial for enterprise with technology product to develop and evaluate the market share in order to enhance financial performance [8].

Several previous research have been conducted examination of user acceptance of certain application using various information systems theory. For instance, Kumar, Adlakaha, & Mukherjee, 2018 in their study consider technical aspects such as trust, security, usefulness and ease of use on acceptance of M-wallets application. The result shows that only security that not has significant affect on user satisfaction while trust, security, usefulness and ease of use has. Further, trust also has a significant affect on user intention to use of M-wallets. Other research by Ho, Ho, & Chung, 2019 consider technical aspects such as information quality, system quality, service quality, ease of use and enjoyment on user satisfaction of nursing process information system. The result shows that all technical aspects variables have significant affect on user satisfaction. However, the previous research only considered technical aspects on the examination of user acceptance whereas other non-technical aspects have a possibility to be a user decision to adopt the application. In the startups application product, technical aspect is not the only one factor that affect user decision. Other aspects such as innovation and marketing of application indicated has a role in enhance user acceptance. It because the innovation provide the encouragement to enhance effectivity of user activities while marketing offer the knowledge and advantages of application.

B. Difusion of Innovation

The innovation theory that related with adoption of technology is diffusion of innovation theory which proposed by Everett Rogers in 1964. The diffusion of innovation is defined as a theory that seeks to explain how, why, and how quickly new ideas and technologies spread [20]. The theory of diffusion of innovation thoroughly discusses the process, development and attributes of innovation. With the diffusion of innovation theory, measuring innovation adoption in society becomes easier because it has strong and clear main attributes. The attributes possessed by the diffusion of innovations are relative advantage, compatibility, complexity, trialability and observability [21]. However, previous studies have shown that the variables of trialability and observability are not consistently confirmed to be relevant in the



topic of technology adoption [22,23]. Thus the considered variables from diffusion of innovation theory in this research are relative advantage, compatibility and complexity.

Complexity. Complexity is defined as the degree to which an innovation is perceived as relatively difficult to understand and use by user perspective [20]. Innovations that tend to be easier to implement and user friendly will be more easily accepted by users [24]. In other words, the more complicated the innovation, the more reluctant users will be to use the innovation (Lin, 2006). Thus it is crucial for an application to notice the complexity of developed product in order to attract user intention to use. Furthermore, previous research shows that complexity has an affect on user satisfaction [26] and intention to use of application [12,27].

Compatibility. Compatibility can be defined as the degree to which the innovation matches the current values, past experiences and needs of potential adopters [20]. In addition, an innovation is also considered compatible if it matches the social expectations of the adopter [28]. The needs of human life that continue to develop are one of the reasons for the importance of application compatibility. Thus the development of application in matching the user compatibility is expected can improve user acceptance. Furthermore, previous research shows that compatibility has an affect on user satisfaction [29] and intention to use of application [10,11].

Relative advantage. Relative advantage can be defined as the degree to which the innovation created is better than the replaced process [20]. Users adopt an innovation because the user believes that the innovation is beneficial, such as increasing the efficiency and effectiveness of the process (Lin & Chen, 2012). In application context, relative advantage measured by the development of user business functionality in application. Thus the application can cover various business aspect in order to gain maximum profit and enhance user acceptance. Furthermore, previous research shows that relative advantage has an affect on user satisfaction [31] and intention to use of application [24,32]. Based on the arguments above, this research propose hypotheses in figure 1. as follows:

H1a-c: Complexity (a), compatibility (b) and relative advantage (c) has significant affect on intention to use

H2a-c: Complexity (a), compatibility (b) and relative advantage (c) has significant affect on user satisfaction

C. Marketing Mix

To evaluate the marketing performance, marketing mix components can be used in order to enhance market effectivity of application promotion. Marketing mix is a set of marketing tools that an enterprise uses to achieve its marketing objectives in the target market [33]. In addition, the correct implementation of the marketing mix can play an important role



in the enterprise's marketing success. It is because the marketing mix can increase strengths and avoid weaknesses and strengthen the enterprise's competitiveness and adaptability [34]. With the influence of digital adaptation, however, the marketing mix with integration of digital aspect is called the digital marketing mix [35]. Fundamentally, marketing mix has 4 components, consist of product, price, place and promotion. In the service enterprise context, however, place can be replaced with distribution variable.

Product. Product can be defined as quality of goods or service which offered in the market in order to noticed, acquisitioned, used and consumed which fulfill consumer necessary [33]. In application context, the product considered as a service business. The application required to have excellent quality and without bugs and understand the growth of user needs in order to enhance user satisfaction and intention to use continually [36]. Furthermore, previous research shows that product has an affect on user satisfaction [19] and intention to use of application [37].

Price. Price can be defined as the amount of money charged for goods or services [33]. Price in consumer behavior perspective is considered as the most crucial in consumer decision [38]. In application context, price is based on traditional service market with adjustment of technology integration. However, the price must also suitable with the given quality. Thus the customer can obtain satisfaction and intended to use application continually. Furthermore, previous research shows that price has an affect on user satisfaction [39] and intention to use of application [40].

Promotion. Promotion can be defined as short-term incentives to encourage the purchase or sale of a product or service [33]. In startups company perspective, promotion is a part of main operation in order to to increase the number of users, market reach and quality of released applications. Hitherto, startups company conduct burn rate method to attract user intention to use the application product. However, this methods is considered as an effective methods to gain more user [41]. It because indirectly, the users obtain the necessary service in low price due to the startups burn rate promotion. Furthermore, previous research shows that promotion has an affect on user satisfaction [42] and intention to use of application [43].

Distribution. Distribution can be defined as a set of organizations involved in the process of delivering the value of goods or services to consumers [44]. In ride-hailing application context, distribution referred to the driver and partner distribution in certain area. With the optimum number of driver and partner, the transportation order using ride-hailing application become swiftly and have many choice. Thus it can affect user satisfaction and make user intended to use the application continuously. Furthermore, previous research shows that promotion has an affect on user satisfaction [45] and intention to use of application [46]. Based on the arguments above, this research propose hypotheses in figure 1. as follows:



H3a-d: Product (a), price (b), promotion (c) and distribution (d) has significant affect on intention to use

H4a-d: Product (a), price (b), promotion (c) and distribution (d) has significant affect on user satisfaction

H5: User satisfaction has significant affect on intention to use

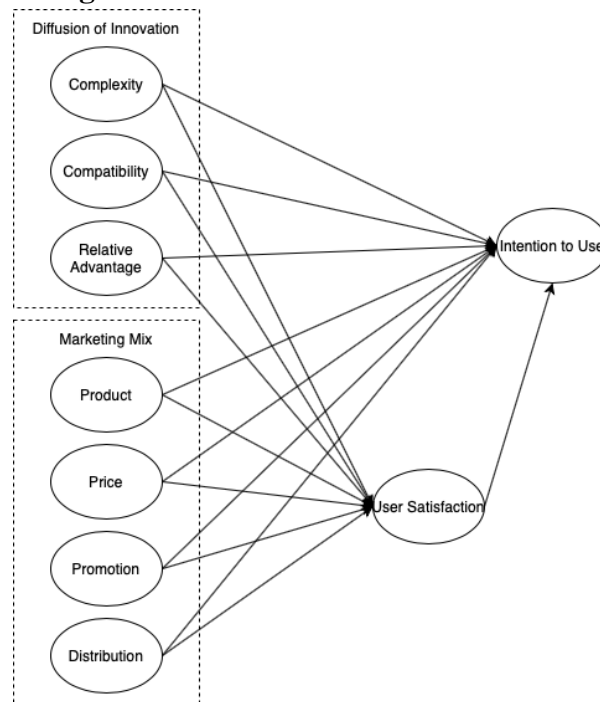


Figure 1 Proposed Conceptual Framework

2. Method

This analysis is based on theory-building exploratory research to identify and rank the relationship between components of innovation and marketing mix that affect on user acceptance of ride-hailing application in Indonesia. This research was based on empirical study and conduct survey questionnaire technique to answer the proposed hypotheses. The collected data from survey questionnaire is a primary data that using 7-point likert scale. Further, the questionnaire that spreaded to respondents is a closed questions concerning the perception of innovation and marketing of ride-hailing application. To obtain the appropriate with research purpose, this research using purposive sampling methods. the criteria that determined in this research is (1) have used an online ride-hailing application and (2) have an online ride-hailing application account in personal name. To represent the answer of population, the sampling calculation to determine sample size based on total of variables and multiplied by 15 until 20



[47]. Therefore, the minimum sample size of this research is based on 9 variables and multiplied by 20, which is 180 minimum respondents.

This research using R Studio 3.6.3 to conduct multi-stage analysis, which combine structural equation modelling – partial least square (SEM-PLS) and backpropagation neural network. Each method has own analysis function that can answer the research purpose. The SEM-PLS in this research is aimed to analyze the affect of independent variable on dependent variable [48] while neural network is aimed to rank the relative importance of independent variables in explaining dependent variable [49]. However, usage of neural network in this research depend on previous SEM-PLS methods. The model that created in neural network is based on the significant path in SEM-PLS, thus only the independent variable with significant affect on dependent variable that will included in neural network model. The neural network model in this research is used as sensitivity analysis to rank the relative importance of independent variable. Furthermore, the sensitivity analysis of this research using Garson Algorithm.

3. Results and Discussion

This research conduct and integrate SEM and neural network techniques. Fundamentally, SEM methods has measurement model and structural model [50]. The measurement model is aimed to examine validity and reliability of the model while structural model is aimed to examine the hypothese testing, R2 and Goodness of Fit. Furthermore, neural network that aimed to analyze the relative importance of each variables in this research consist of preprocessing, modelling, testing and measure the variable relative importance [51].

3.1 Descriptive Data

This research consist of 303 respondenses which use and has own an account of ride-hailing application. Demographic descriptions of respondents in this research divided by gender, age, income, jobs and last education. Based on gender, consisting of women with a proportion of 62.38% and men 37.62%. Further based on age, user with age below 25 dominate the proportion with 77.23% and followed by above 40 and between 25 and 40 with 12.21% and 10.56% from sample proportion. Based on respondents last education, majority of respondent last education is senior high school with 58.75%, followed by graduate and postgraduate respondents with 37.95% and 3.3%. Based on respondents income, the majority of respondents have an income below IDR 4 million. Further, followed by respondents with income between IDR 4 million and IDR 10 million and above IDR 10 million with 17.82% and 3.63%.

3.2 Measurement Model



The measurement model in SEM-PLS is aimed to examine the validity and reliability of each variables and indicators. At the indicator level, the indicator can be indicated to be convergently valid if it has a loading factor value above 0.7 and it can be indicated to be discriminantly valid if the indicator has a cross loading value for the variable in question is greater than the factor loading value for other variables [52]. The factor loading of indicator in this research ranged between 0.700 – 0.962. Furthermore, the indicator of each variable in question also has a factor loading value greater than the factor loading value for other variables. Thus it can be concluded that all indicators in this study are valid.

Furthermore, testing in the outer model stage is a test of validity and reliability at the variable level. Validity testing is measured by convergent and discriminant. In the convergent validity test, the base for measurement is the average variance extracted (AVE) value. If the variable has an AVE value above 0.5, then the variable can be concluded to be convergently valid [53]. In the discriminant validity test, the discriminant validity test was tested with the Fornell Larcker Criterion (HTMT) and the variable can be concluded to be discriminantly valid if the root of AVE value has a higher value than the other variables [54]. In addition, there is a variable reliability test which is indicated by the value of Cronbach's alpha and composite reliability. A variable can be concluded to be reliable if it has Cronbach's alpha and composite reliability values above 0.7 [50]. Table 1 shows that all variables have an AVE value above 0.5 with a range of values between 0.642 – 0.923 and the root AVE value is higher than the correlation value of other variables. In addition, the value of Cronbach's alpha and composite reliability for each variable is above 0.7 or with a distance of 0.761 to 0.960 and 0.862 to 0.974. Thus it can be concluded that all variables in this study are valid and reliable.

Table 1. Construct Validity and Reliability

	<u>AVE</u>	<u>C.R.</u>	<u>alpha</u>	<u>CX</u>	<u>CB</u>	<u>RA</u>	<u>PD</u>	<u>PC</u>	<u>A</u>	<u>D</u>	<u>USF</u>	<u>ITU</u>
<u>CX</u>	0.731	0.862	0.761	0.855								
<u>CB</u>	0.793	0.916	0.862	0.556	0.891							
<u>RA</u>	0.642	0.882	0.831	0.618	0.611	0.801						
<u>PD</u>	0.846	0.911	0.806	0.518	0.546	0.643	0.920					
<u>PC</u>	0.853	0.910	0.802	0.542	0.616	0.527	0.590	0.924				
<u>A</u>	0.747	0.896	0.825	0.511	0.484	0.564	0.636	0.611	0.864			
<u>D</u>	0.742	0.879	0.793	0.596	0.574	0.705	0.675	0.554	0.699	0.861		
<u>USF</u>	0.811	0.926	0.879	0.586	0.606	0.704	0.639	0.661	0.687	0.704	0.901	
<u>ITU</u>	0.923	0.974	0.960	0.510	0.533	0.614	0.527	0.502	0.583	0.675	0.720	0.961

Source: Results of primary data processing, 2022

3.3 Structural Model

The second step of SEM-PLS methods is structural model which consist of R2, model fit measurement with Goodness of Fit (GoF) and estimation of hypotheses testing. First, R2



explain the variance of the total effect of the independent variable on the dependent [55]. The R² value of variable USF and ITU are 0.679 and 0.583. Second, The fit of the model is generally calculated by goodness of fit (GoF) testing. The GoF value can be calculated by taking the root of the average of AVE multiplied by the average of R². Furthermore, result from these calculation shows that the GoF value is 0.698. This indicates that the model in this study is feasible or qualified because it has a value above 0.36 [56]

Further estimation is the estimation of path coefficient to test the hypothesis. The hypotheses can be concluded significant or accepted if the hypotheses has p value below 0.05 and t statistics above 1.96. Table 2 shows the results of hypothesis testing in this study and shows that H2c – relative advantage on user satisfaction ($\beta=0.261$, $t = 4.930$ & $p\text{-value} = 0.000$), H3d – distribution on intention to use ($\beta=0.277$, $t = 4.200$ & $p\text{-value} = 0.000$), H4b – price on user satisfaction ($\beta=0.209$, $t = 4.300$ & $p\text{-value} = 0.007$), H4c – promotion on user satisfaction ($\beta=0.219$, $t = 4.300$ & $p\text{-value} = 0.000$), H4d – distribution on user satisfaction ($\beta=0.153$, $t = 2.690$ & $p\text{-value} = 0.000$) and H5 ($\beta=0.430$, $t = 6.480$ & $p\text{-value} = 0.000$) are accepted or have p value below 0.05. Otherwise, H1a – complexity on intention to use ($\beta=0.020$, $t = 0.389$ & $p\text{-value} = 0.698$), H1b - compatibility ($\beta=0.081$, $t = 1.500$ & $p\text{-value} = 0.134$), H1c – relative advantage on intention to use ($\beta=0.076$, $t = 1.220$ & $p\text{-value} = 0.224$), H2a – complexity on user satisfaction ($\beta=0.044$ $t = 0.963$ & $p\text{-value} = 0.337$), H2b – compatibility on user satisfaction ($\beta=0.077$, $t = 1.630$ & $p\text{-value} = 0.105$), H3a – product on intention to use ($\beta=-0.052$, $t = -0.905$ & $p\text{-value} = 0.366$), H3b – price on intention to use ($\beta=-0.043$, $t = -0.756$ & $p\text{-value} = 0.450$), H3c – promotion on intention to use ($\beta=0.060$, $t = 1.000$ & $p\text{-value} = 0.317$) and H4a – product on user satisfaction ($\beta=0.04$, $t = 0.790$ & $p\text{-value} = 0.430$) are rejected or have p value above 0.05.

Table 2. Hypothesis Testing

<u>Hypotheses</u>	<u>Estimate</u>	<u>T Statistics</u>	<u>P values</u>	<u>Condition</u>
H1a: CX → ITU	0.0204	0.389	0.6980	Rejected
H1b: CB → ITU	0.0818	1.500	0.1340	Rejected
H1c: RA → ITU	0.0767	1.220	0.2240	Rejected
H2a: CX → USF	0.0442	0.963	0.3370	Rejected
H2b: CB → USF	0.0772	1.630	0.1050	Rejected
H2c: RA → USF	0.2610	4.930	0.0000	Accepted
H3a: PD → ITU	-0.0523	-0.905	0.3660	Rejected
H3b: PC → ITU	-0.0433	-0.756	0.4500	Rejected
H3c: A → ITU	0.0601	1.000	0.3170	Rejected
H3d: D → ITU	0.2770	4.200	0.0000	Accepted
H4a: PD → USF	0.0400	0.790	0.4300	Rejected
H4b: PC → USF	0.2090	4.300	0.0000	Accepted

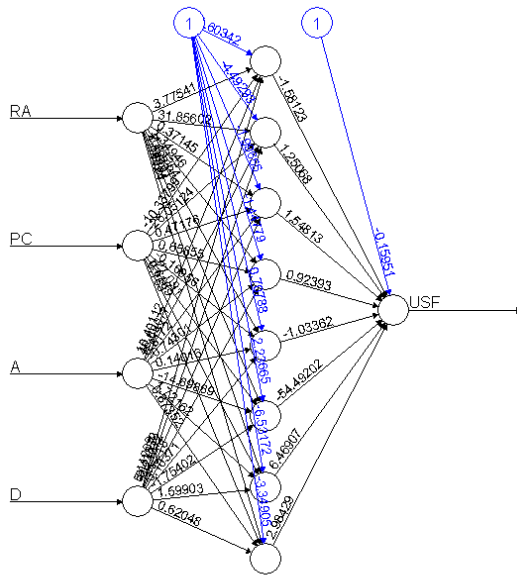


H4c: A → USF	<u>0.2190</u>	<u>4.300</u>	<u>0.0000</u>	<u>Accepted</u>
H4d: D → USF	<u>0.1530</u>	<u>2.690</u>	<u>0.0076</u>	<u>Accepted</u>
H5: USF → ITU	<u>0.4300</u>	<u>6.480</u>	<u>0.0000</u>	<u>Accepted</u>

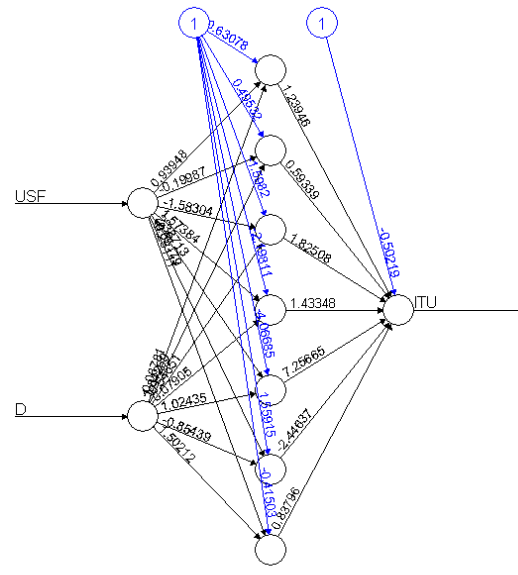
Source: Results of primary data processing, 2022

3.4 Neural Network

Neural network in this research is aimed to determine the relative importance rank of each variable with sensitivity analysis. However, the variable which included in neural network model is a variable that has significant affect on dependent variable in SEM-PLS method. Sensitivity analysis in this study uses the Garson algorithm where the algorithm aims to obtain the results of the analysis of the importance of each independent variable to the optimal dependent variable [57]. According to the previous method, there are two dependent variabls thus neural network methods in this research consist of 2 model. The first model is defined as USF Model that based on user satisfaction variable and second model is defined as ITU Model that based on intention to use variable. USF Model has 4 predictor variables that is relative advantage, price, promotion and distribution while ITU model has 2 predictor variables that is user satisfaction and distribution. The USF and ITU Model visualized in the figure 2 and 3 as follows:



Error: 1.815605 Steps: 1521



Error: 2.439069 Steps: 347

Figure 2. USF neural network model.

Figure 3. ITU neural network model

After modelling steps, further fundamental step of machine learning methods is testing stage. Fundamentally, the main purpose of model testing is to ensure the accuration of



predictionn result of the model. [58]. Testing techniques in this research using K-fold cross validation with K = 10. Thus the data will divided to be 10 part of RMSE testing (90% training: 10% testing). In regression problem, the base accuration measurement is using Root Mean Square Error (RMSE). The smaller the RMSE value, the more it represents the high prediction accuracy of a model [59]. Further the small difference of RSME of training and testing data also indicates the accuration of the model [60]. The table 3 is RMSE result according to the K-fold cross validation and shows that the ITU model has mean RMSE 0.1248 in training data and 0.1269 in testing data while USF model has mean RMSE 0.1113 in training data and 0.1031 in testing data. It indicates that both of the model accurate and reliable in explaining the relationship between predictor variables and output variables. Table 3. RMSE values of ITU and USF model

Table 3. RMSE Values of ITU and USF Model

Fold	ITU Model		USF Model	
	Training	Testing	Training	Testing
1	0.113836952	0.202559151	0.112283901	0.099158798
2	0.123553493	0.141562789	0.110006519	0.120163444
3	0.127614333	0.103722976	0.112956127	0.091948993
4	0.126614026	0.114335662	0.112840825	0.093228391
5	0.128071457	0.098462413	0.108181606	0.134397319
6	0.122108299	0.152547649	0.113353593	0.087384594
7	0.125765981	0.122557391	0.113626277	0.084100148
8	0.127841199	0.101148762	0.114188379	0.07686048
9	0.127766198	0.10200749	0.104245756	0.160221685
10	0.124882838	0.130516965	0.113665791	0.083612825
Mean	0.124805478	0.126942125	0.111534878	0.103107668
St. Dev	0.004121747	0.030684729	0.003004357	0.025391193

Source: Results of primary data processing, 2022

The addition stage of neural network is sensitivity analysis using garson algorithm which in order to rank the relative importance rate of each predictor variable on dependent variable. The results of the sensitivity analysis can be calculated with the normalized importance value of each input variable and compare the results of all the variable importance values with the variable that has the highest importance value [61]. Table 4 shows the result of sensitivity analysis from 2 model. In USF model, promotion is considered as the most importance variable in explaining user satisfaction and followed by relative advantage, price and distribution. In ITU model, user satisfaction is the most importance varibale in explaining user intention to use and followed by distribution.



Table 4. Normalized Variable Relative Importance of ITU and USF Model

Model	Predictor	Importance	Normalized Importance
<u>USF</u>	<u>A</u>	<u>0.3020906</u>	<u>100%</u>
	<u>RA</u>	<u>0.2922522</u>	<u>96,68%</u>
	<u>PC</u>	<u>0.2317891</u>	<u>76,82%</u>
	<u>D</u>	<u>0.1738681</u>	<u>57,61%</u>
<u>ITU</u>	<u>USF</u>	<u>0.5659194</u>	<u>100%</u>
	<u>D</u>	<u>0.4340806</u>	<u>76,67%</u>

Source: Results of primary data processing, 2022

3.5 Discussion

This study examined the innovation and marketing aspects on mobile ride-hailing application acceptance using diffusion of innovation theory and marketing mix components. The involved variables that used to examine the determinants of mobile ride-hailing application acceptance are complexity, compatibility and relative advantage from diffusion of innovation theory and product, price, promotion and quality from marketing mix component.

In innovation perspective, the result of this study shows that only relative advantage that has an affect on user satisfaction. The result that indicate relationship between relative advantage and user satisfaction is inline with the study according to [31]. However, the result of this study is in contrast with several research that identify the relationship of complexity and compatibility on user satisfaction and intention [10,26,27,29]. It indicates that the development of application feature is one of the effective technique to enhance user acceptance of application. Thus the application could expand business case and conduct interoperability between the use case. Furthermore, the application firm or developer not only improve user acceptance and traffic, but also achieve several competitive advantages and enhance financial performance.

The result of this study indicates that although innovation characteristics have not direct relationship on intention to use, innovation characteristics such as relative advantage has a direct affect on user satisfaction. It indicates that the development of business and use case encourage both user and enterprise to obtain competitive advantage. However, the complexity and compatibility have no relationship with user satisfaction and intention to use of ride-hailing application. It imply that the complexity of application nowadays is not being one of user consideration to use technology. It because the majority of user has a digital behavior that makes easier to adopt technology. Furthermore, the insignificant affect of compatibility on user acceptance is indicating that the usage of ride-hailing application not being the primary needs of user. Thus the most crucial aspect to gain competitive advantage and enhance financial performance of application is with business case development and expansion.



In marketing perspective, price, promotion and distribution have a direct affect on user satisfaction while only distribution has a direct affect on user intention to use of application. It is inline with previous research that indicates the direct relationship of price [39], promotion [42] and distribution [45] on user satisfaction. However, only distribution that has a direct affect on user intention to use [46]. The result also shows that user satisfaction has a direct affect on user intention to use of mobile ride-hailing application that have an inline examination with [62]. Furthermore, the neural network sensitivity analysis also shows that promotion is the most crucial aspect to enhance user satisfaction while user satisfaction is the most important variable that explain user intention to use.

The significant relationship of price, promotion and distribution on user satisfaction on user satisfaction is indicating the important of business aspect on application evaluation. Furthermore, promotion being the most important aspect that affect user satisfction where user satisfaction being the most important aspect for user intention to use. It indicates that promotion of application from startups firm needs to enhanced in order to expand user reach and traffic. The shape of startup promotion nowadays often adopt burn rate technique that indirectly decrease the price of using the application for users. Furthermore, the distribution of application also increase expansion user reach and traffic. Thus, the improvement and colaboration of promotion is necessary.

4. Conclusion

This study aims to analyze the effect of innovation and marketing mix on user intention and satisfaction. It also examine the relative importance rate of component of marketing mix and innovation variable in explaining user intention to use and satisfaction. The result of this research shows that relative advantage, price, promotion and distribution has an affect on user satisfaction and distribution and user satisfaction has an affect on user intention to use of ride-hailing application. In addition, the result of sensitivity analysis shows that promotion is the most importance variable that explain user satisfaction while user satisfaction itself is the most importance variable for user intention to use of ride-hailing application. According to the research result, the user satisfaction can be improved by the massive promotion such as provide massive discount event. However, the promotion aspect must also be balanced with product development in order to increase business sustainability. Furthermore, this research model can be adopted to every organization in order to balance the innovation and marketing perspective. However, this research also has limitation that can be recommendation for further resarch. First in data aspect, this research using neural network in machine learning method thus the expected further research compare the other machine learning method in order to obtain advanced insight and novelty of dynamic business environment. Second in conceptual aspect, this research



conduct innovation and marketing based aspect. The expected further research can combine other aspect such as psychology, system design, etc.

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