

Application of Conjoint Analysis with Attributes Determined Against the Selection of Expedition Services

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Abstract: This study aims to determine the level, attribute, and stimulus most considered by respondents in choosing expedition services. The method used is conjoint analysis by applying the conjoint analysis full-profile method to design the stimulus. The attributes and levels used are delivery type (ECO, REG, express, and same day), payment methods (cash and online transfers), service promotions (cost discounts and goods pick-up), and service responsiveness (responses to damage or loss of goods and responses to late delivery). The results of research conducted on 150 respondents showed that delivery type is the most preferred attribute with a value of 0,324. The levels with the largest part-worth of each attribute are REG (0.335), online transfers (0.210), cost discounts (0.270), and response to damage or loss of goods (0.250). The most popular stimulus is expedition services with standard shipping (REG), online transfers, cost discounts, and responses to damage or loss of goods.

Keywords: Conjoint Analysis, Expedition Services, Full-Profile Method

1. Introduction

Technological advances, especially the internet, make it easier for people to communicate without being limited by place and time. The increasingly rapid development of information technology supports the development of the concept of online shopping. Using smartphones has made online shopping popular among Indonesians [1]. More and more people are shopping online or sending goods to other areas, causing the development of expedition services. Technological developments make sending goods domestically and abroad easier [2].

Currently, the expedition service business is growing. Each expedition service provider provides various innovations to attract consumer interest, such as shipping cost options, shipping transportation modes, shipping services, estimated delivery time, weight and volume of goods sent which can be selected based on the desires and needs of consumers as senders [3].

Several expedition service companies that are in great demand in Indonesia include JNE, J&T Express, SiCepat, Tiki, Lion Parcel. Each expedition service has several goods delivery features that consumers can consider when choosing a service. Each feature offered by expedition services has advantages and disadvantages, so that customers can determine their choice. When making decisions, customers will be faced with various alternatives to choose from. In the business world, the decision-making process is one of the fundamental and important keys to making decisions to choose the best logistics service provider [4].

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Choosing an expedition service is important so that consumers get maximum service and according to what consumers want. Fulfilling customer desires in a profitable manner requires a company to understand which aspects of its products and services are most valued by customers. The choices made by consumers are known as preferences. Refer to [5] Consumer preferences are defined as the assessments and evaluations that consumers make of the products and services available to them, based on factors such as quality, price, convenience and personal taste. They shape what is demanded, and by extension, what suppliers produce and offer in the market. The study of consumer preferences is a basic research category in consumer behavior models. Conjoint analysis is one method that can be used to model their purchasing decisions [6].

Conjoint analysis was first introduced by Luce and Tukey (1964) in the first issue of the Journal of Mathematical Psychology [7] [8]. According to [9] Conjoint analysis is a technique that assesses the optimal level of features and services that balance customer value and costs for the company and assesses potential demand in a competitive environment. It can be said that conjoint analysis is a very important technique in the marketing industry. With conjoint analysis, entrepreneurs can understand preferences consumers towards the objects studied such as products, ideas or services [10]. Need statements or attributes of new product ideas are recorded in Conjoin analysis. Furthermore, customer needs or requests can be directly transformed into new product ideas [11]

Some of the terms used in conjoint analysis are: 1) attributes are factors of the object being studied, 2) in each attribute there are levels of explanation called levels, 3) stimuli are a combination of several attributes that will be evaluated by respondents, 4) Utility is a value that shows the respondent's preference for an object. Analytics can be applied to evaluate complex products while maintaining a realistic decision context for respondents. Producer or market researcher can assess the importance of attributes and the level of each attribute. Meanwhile, consumers evaluate several product profiles which are a combination of product levels [12].

Research using conjoint analysis to see consumer preferences for a product has often been carried out, including: [12] predicting preferences with conjoint analysis, they recommend that in determining respondents' preferences they need to consider what other people choose or want.

Their rationale is that relying on friends' knowledge will result in improvements, namely that a larger social circle can enable more accurate estimates of utility and better predictions of preferences. Another research conducted by [13] examined how Shopee e-commerce customer market segments were based on respondent characteristics using the k-means algorithm and used conjoint analysis to determine which quality attributes were most important for each cluster. The results of the k-means algorithm formed 2 clusters. Cluster 1 has a majority of women with frequent visits to e-commerce, cluster 2 has a majority of male members who often visit Shopee e-commerce. From the conjoint analysis, it was found that cluster 1 prioritizes full payment when shopping, while cluster 2 prioritizes the start seller type when shopping online.

The large number of expedition services developing in Indonesia requires expedition service providers to carry out continuous marketing innovation, so that their customers remain popular. Therefore, it is very important to know people's preferences for expedition services. This research aims to determine the levels, attributes and stimuli most considered by consumers in choosing expedition services by applying the methodfull-profile in forming combinations of attribute levels.

2. Research Methods

This research is quantitative research with a survey method. Quantitative research is a method that explains a problem or phenomenon through collecting data in numerical form. Quantitative research is divided into: survey research, correctional research, experimental research and comparative causal research [14]. The survey was conducted to obtain information regarding people's preferences in choosing expedition services.

The research population is the people of Denpasar City. The city of Denpasar was chosen as the research location, because the people are heterogeneous and have high mobility. As a sample, 150 respondents were taken spread across four sub-districts in the city of Denpasar. The data used in this research is primary data obtained through distributing questionnaires to 150 respondents. Sampling was carried out randomly *purposive sampling*, namely the existence of special criteria for respondents. The basic idea of purposive sampling is that researchers concentrate on respondents with certain characteristics [15]. The criteria for respondents in this research were Denpasar City residents aged 17–64 years and who had used expedition services at least twice. To make it easier to get respondents who fit the research criteria, we used convenience sampling. Convenience sampling is the selection of respondents who are willing to provide the response desired by the researcher [16]. The number of respondents required per sub-district in Denpasar City is shown in Table 1 below

Table 1. Total Sample Proportion

Subdistrict	Number of Samples
North Denpasar	39
West Denpasar	44
South Denpasar	42
East Denpasar	25
Total	150

Source: Processed data, 2023

The steps taken in this research include:

1. Define attributes and levels

Based on a literature study related to expedition services, four attributes were obtained which were determined at each level as follows.

Table 2. Research Attributes and Levels

Attribute	Level	Information
Delivery Type	1	Economical (ECO)
	2	Standard (REG)
	3	Lightning (<i>Express</i>)
	4	Instant (<i>Same Day</i>)
Payment method	1	cash on delivery
	2	Transfer online
Service Promotion	1	Discount on shipping costs
	2	Pickup of goods
Service Responsiveness	1	Response to damaged/lost goods
	2	Response to delivery delays

2. Form a combination of attribute levels

The stimulus formation in this research uses the method *full-profile*. Based on concepts on methods *full-profile*, Stimulus design is carried out by combining all attribute levels. There is one attribute with four levels and three attributes each have two levels, thus obtaining as many attribute level combinations as possible **32** combination. It is important to reduce the number of stimuli formed so that research can be carried out effectively and efficiently [17]. One method used to reduce the number of stimuli is to use a partial factorial design (*fractional factorial design*) that is *orthogonal design* which is formed by using help *software* SPSS 26.0. *Orthogonal design* can eliminate information about the influence of high-level interactions, but does not

eliminate information about the influence of main factors and low-level interactions which is important information in experiments so that fewer combination results are obtained [18]. Stimulus reduction by using *orthogonal design* produced a total of 8 stimuli which are displayed in Table 3.

Table 3. Stimulus Data

Stimulus	Attribute			
	Delivery Type	Payment method	Service Promotion	Service Responsiveness
Stimulus 1	Economical	Cash	Discount	Damage/loss
Stimulus 2	Economical	Transfer	Pickup	Lateness
Stimulus 3	Instant	Cash	Discount	Lateness
Stimulus 4	Lightning	Cash	Pickup	Damage/loss
Stimulus 5	Standard	Transfer	Discount	Damage/loss
Stimulus 6	Standard	Cash	Pickup	Lateness
Stimulus 7	Instant	Transfer	Pickup	Damage/loss
Stimulus 8	Lightning	Transfer	Discount	Lateness

Source: Processed data, 2023

3. Data collection

Data collection was carried out by distributing questionnaires from 1 December 2022 – 1 January 2023 and 1 February – 1 March 2023. Respondents assessed each stimulus on a scale *likert* from the scorering 1 – 5, with a score of 1 for the least liked stimulus and a score of 5 for the most liked stimulus.

4. Data analysis

The data analysis carried out is as follows.

- a) Carrying out validity and reliability tests.
- b) Determine the characteristics of respondents
- c) Carry out conjoint analysis with the basic model of the equation as follows.

$$IN(X) = \mu + \sum_{i=1}^m \sum_{j=1}^{k_i} \alpha_{ij}x_{ij} \tag{1}$$

Information:

- $IN(X)$ = total utility
- μ = aggregate average of scores by respondents
- m = number of attributes
- k_i = number of levels of the i th attribute
- α_{ij} = *part-worth* or utility value of the i th attribute j level k - j
- x_{ij} = variable *dummy* from the attribute i level k - j

- d) Determine the relative importance value of the attribute which is formulated as follows.

$$IN_i = \frac{I_i}{\sum_{i=1}^m I_i} \tag{2}$$

Information:

- IN_i = relative importance level of the i th attribute

$I_i = [(\alpha_{ij}) - (\alpha_{ij})]$, namely the difference between the level and the value *part-worth* highest and smallest

- e) Interpreting analysis results.
- f) Validate analysis results

3. Results And Discussion

Validity and Reliability Test of Research Instruments

Before data analysis is carried out, validity and reliability testing is first carried out on the data obtained from the respondents' assessments. Validity tests are carried out to determine the extent to which a variable or series of variables can represent a research concept that is free from error or how well a concept can be defined by variables, while reliability tests are carried out to determine the extent to which the observed variables can measure the true value or consistency of variables. Validity test uses Pearson correlation [19].

The correlation values between items are compared with the correlation values in the table *product moment pearson* with samples used as many as 50 and degrees of freedom $df = 48$, so the correlation value between items must be greater than or equal to the value in the table, namely 0.279 with a real level $\alpha = 0.05$. The results of the correlation value between items (*corrected item-total correlation*) The resulting value for each statement is greater than 0.279. This indicates that each statement contained in each stimulus in the questionnaire is valid and provides a precise and accurate measure. Next, a reliability test is carried out to determine the extent to which the observed variables can measure the true value or consistency of the variables. The reliability test uses the Cronbach's Alpha value with the condition that a value of more than 0.600 is considered an acceptable lower limit. Cronbach's Alpha value The result is 0.763. This result is greater than 0.600, which means that the responses obtained to the research variables through the questionnaire are consistent, so the results of this measurement are reliable.

Respondent Characteristics

The valid and reliable questionnaire was then distributed to 150 respondents who met the previously determined criteria. The characteristics of respondents in this study include age range, gender, type of work, highest level of education, monthly income and frequency of use as shown in Table 4.

Table 4. Respondent Characteristics

Respondent Characteristics		Amount
Age Range	17-32 years old	65
	33-48 years old	54
	49-64 years old	31
Gender	Man	62
	Women	88
Work	Private sector employee	31
	Student/Students	40
	Teacher/Lecturer	11
	Self-employed	26
	State Officer	12

Last education	Retired	9
	Other	21
	Middle School Equivalent	12
	SMA/K equivalent	36
	College	102
Income per Month	≤Rp. 5 million	59
	>Rp. 5 – 10 Million	43
	>Rp. 10 – 15 Million	28
	≥Rp. 15 millions	20
Frequency of Use	2-6 times	77
	7-11 times	46
	12-16 times	27

Source: Processed data, 2023

The characteristics of the 150 respondents shown in Table 4 show that the use of expedition services in Denpasar City is dominated by people aged 17-32 years, female, with a tertiary education background, student work, and an income of less than five million rupiah per month. The highest frequency of use of expedition services by people in a month is 2-6 times. From the characteristics of the respondents, it appears that students and private employees shop more often *online* especially women. By shopping *online* they can save time because they don't have to leave the house to shop.

Conjoint analysis

After the validity and reliability test results are carried out, the next step is to determine the value *part-worth*, the relative importance of attributes, and determine the stimulus most preferred by consumers. The research results shown in Table 5 show that the type of delivery is the attribute most prioritized by consumers in choosing an expedition service, with the relative importance value of the resulting attribute being 32.4%. The most popular type of delivery is standard delivery (REG) with part-worth value as big as **0.335**. The attribute that is the second consideration is service promotion, with a relative importance value of the attribute of **25%**. The service promotion most liked by consumers is a promotion in the form of a discount on shipping costs with a part-worth value of **0.270**. The third consideration considered by consumers is service responsiveness, with a relative importance value of attributes of **23.1%**. The service responsiveness most liked by consumers is the response to damaged or lost goods with a part-worth value of **0.250**. The attribute that is the final consideration in choosing an expedition service is the payment method, with a relative importance value of the attribute of **19.5%**. The payment method most preferred by consumers is online payment with part-worth value as big as **0.210**, while cash on delivery is a non-preferred payment method with a part-worth of **-0.210**.

Table 5. Calculation Results of Relative Importance Values of Attributes and Part-Worth Values

Attribute	Attribute Relative Importance Value	Level	Mark	Part-Worth
Delivery Type	32.4%	Economical (ECO)	α_{11}	0.095
		Standard (REG)	α_{12}	0.335
		Lightning (<i>Express</i>)	α_{13}	-0.065
		Instant (<i>Same day</i>)	α_{14}	-0.365
Payment method	19.5%	Cash/ <i>cash on delivery</i>	α_{21}	-0.210
		Transfer <i>online</i>	α_{22}	0.210

Service Promotion	25%	Discount on shipping costs	α_{31}	0.270
		Pickup of goods	α_{32}	-0.270
Service Responsiveness	23.1%	Response to damaged/lost goods	α_{41}	0.250

Source: Processed data, 2023

The conjoint analysis model used to estimate the total utility value is obtained after the value *part-worth* the level of each attribute is obtained. Model The total utility equation in this research is as follows.

$$U(X) = 2,995 + 0,095x_{11} + 0,335x_{12} - 0,065x_{13} - 0,365x_{14} - 0,210x_{21} + 0,210x_{22} + 0,270x_{31} - 0,270x_{32} + 0,250x_{41} - 0,250x_{42} \tag{3}$$

Equation (3) is the equation used to model the level of consumer preference for selecting expedition services. In addition, the conjoint analysis model equation is used to find out the stimuli that consumers like most. Based on the results of calculating the utility of each stimulus, it was found that the 5th stimulus was an expedition service with a standard delivery type (REG), payment method via transfer *online*, promotions in the form of shipping discounts, and responses to damaged or lost goods are the stimuli that consumers like most among the eight stimuli provided.

Validation of the results of conjoint analysis is needed to determine the level of accuracy of predictions between assessments based on estimation results and actual assessments using correlation values *Pearson* and *Kendall's Tau*, with the condition that the significance value has value ≤ 0.05 , then it can be interpreted that there is a strong correlation or relationship between the actual assessment and the assessment based on the estimation results. On the other hand, if the model significance value has value > 0.05 , then it can be said that there is no correlation or strong relationship. [20].

Table 6. Correlation Values *Pearson's R* and *Kendall's Tau*

Correlation	Value	Sig.
<i>Pearson's R</i>	0.966	0.000
<i>Kendall's Tau</i>	0.786	0.003

Source: data processed, 2023

The results obtained from the *Pearson's R* and *Kendall's* correlation values Yes shows that each correlation value has a high value, namely 0.966 and 0.786 and the significance value of both is below 0.05. This shows that the actual assessment and the estimated results have a strong correlation so that it can be said to be able to explain consumer preferences in choosing expedition services

4. Conclusion And Suggestions

The results of aggregate conjoint analysis show that the order of attributes prioritized by respondents in determining an expedition service is type of delivery, service promotion, service responsiveness, and payment method. The combination of attribute levels in expedition services that respondents really liked was expedition services with standard delivery types (REG), payments by online transfer, promotions in the form of discounts, and response to damage/loss of goods.

It is hoped that in future research, we can develop attributes that are relevant to the progress of features in expedition services by using a preliminary survey to see the attributes that people like and using other types of stimulus design methods other than the full-profile method..

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