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A Trip Intensity Model on Shopping Travel to the Traditional Market in Makassar City

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ABSTRACT

The present study aims to analyze the travel behaviors of traditional market's visitors in Makassar City, Indonesia, such as the visitor characteristics, trip chain, and the travel attributes of the visitors. In further, the present study models the trip intensity of the traditional market visitors using the multiple linear regression approach. The study carried out an interview survey on the visitors of *Niaga Daya* traditional market, one of the biggest traditional markets in the city. The interview survey based on a questionnaire sheet was conducted during the operation time of the market for two days, one day of weekday and one day of weekend. The analysis results show that the majority of the traditional market's visitors are women and their profession as housewife. In addition, the trip chain of the visitors is dominated by the home-market-home pattern, and most of the visitors used a motorcycle. Furthermore, the results of the visitor intensity model to the traditional market show that the multiple linear regression model used is enough significant in the acceptance of the model. The model analysis revealed that the occupation, the household income, the travel distance, and the travel cost of the visitors have influenced significantly the visitor's intensity in conducting the shopping travel to the traditional market. The study results provide an expectation in order to develop the continued travel behavior models such as the arrival time choice and the travel mode choice models of the visitors in further studies.

Keywords: Trip intensity, shopping travel, traditional market, Makassar.

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1. INTRODUCTION

In recently years, researches on travel behavior have more focused on shopping travel in urban area, due to some reasons, i.e.: the shopping travel has contributed in large proportion to urban trips, particularly in peak periods; the non-work trip has more temporal flexibility of individual than the work trip [1]; and it provides more congestion and some environmental problems in CBD of a city [2, 3, 4, 5, 6, 7, 8]. Particularly on shopping travel to traditional markets, nowadays, the shopping travels have contributed on urban transportation congestion in the urban road network in many cities in developing countries such in Makassar, Indonesia [9].

Regarding the insight of travel demand management (TDM) in the urban transportation planning, some important aspects have found out interests by scholars in the research field in order to overcome the problem. The aspects involve trip generation and attraction, trip distribution, trip assignment, and mode split, departure time choice, travel pattern, trip frequency or intensity, etc. Particularly in the trip intensity, travelers on shopping trip may face some factors in order to consider their trip frequency to malls or traditional markets, such as certain or similar shopping place, shopping purpose, etc. [10].

Travel intensity is an important aspect in understanding shopping travel behaviors. Some scholars have studied related the research issue. They provide some insights for understanding the traveller behavior, particularly in the relationship between shopping frequency and some individual factors of the shoppers, such as demographic characteristics, the possibility to combine shopping trip with other trips, and shopping motivations [11, 12, 13]. In addition, Chen et al. [14] have studied

the relationship between shopping frequency and travel distance for daily shopping. Furthermore, Chen et al. [14] found that the different discrimination ability and attitude of travellers have been considered even for the same condition of travel mode and or travel distance.

In the other hand, the existence of traditional markets in Indonesia as one of the public infrastructure for basic needs and shopping activities daily needs, recently received threats by increasing the establishment of modern markets such as supermarket, minimart, indomart, and others, in addition to the supermarkets that have a similar function in shopping malls [15] . For example, some traditional markets in Makassar City gradually began to exclude along with the rise of the mini market development and other modern shopping centers [16, 17]. In this case, the Ministry of Trade [18] has been and still continuing to make efforts to empower the traditional market.

In order to manage and improve the performance of the traditional markets' services to remain competitive with the modern markets, some previous studies have attempted to describe it. Among others, [15] who has reviewed the traditional market competition and supermarket shopping behavior based on observations in Bandung City. [17] have conducted a study of the implementation of policies on management efforts of traditional markets in Makassar city. On the other side, [16] have identified the influence of social class, family, life style, and motivation factors of the consumer's decision to shop at a modern market, especially in the case of ALFA MART on Panakukang District in Makassar.

Previous studies have not been focused on the travel behaviors of individuals within conduct shopping activity in traditional markets. Whereas, today it still looks that shopping travels to traditional markets in big cities in Indonesia, including in

Makassar still cause a variety of impacts on the surrounding environment systems, such as transportation system congestion impact.

Regarding to the aspects of a shopping travel to shopping centers, particularly on the influenced factors of individuals in deciding a trip frequency to a shopping place, the authors have conducted previous research with a case study in Makassar City [19]. Specifically, the authors have also conducted research on influencing factors in the frequency of individual travel to a traditional market with a case study of travel is from a residential to a traditional market (Pa'baeng-Baeng Market) in Makassar [20]. Focus on visitor characteristics and trip chain, the recent studies of the authors [21, 22, 23, 10] have found that the arrival time distribution of the traditional market's visitors has two peak period distribution, i.e. the morning and afternoon periods [10, 21], where the pattern is likely to follow a polynomial model [23], and the dominant trip chain of visitors is home - market – hom [23]e, as well as the number of visitors pull significantly correlated to the number of utility on a traditional market [10, 22]. In the author's current study, the relationship model between the travel time and the travel distance to the traditional market have been successfully modeled using a single linear regression approach [9].

To continue the previous studies in order to contribute to the travel demand management issues and the empowerment of traditional markets, this study aims to analyze the travel behaviors of the traditional market's visitors, including the socio-economic-demographic characteristics, the trip chain and the shopping travel attributes of the visitors. Specifically, the present study also aims to model the travel intensity of the visitors in traveling to the traditional market by using a multiple linear regression model approach.

The rest of the present paper is organized as follows. The paper begins with an introduction that explain the background and a literature review of the related previous studies, also the objective of the paper. Then, we present the study methods such data collection, the multiple linear regression model construction, and the identified variables into the model. Next, the paper provides a description data, and the model estimation results. Finally, the paper concludes the important finding of the study.

2. THE STUDY METHOD

A. Data Collection

The present study conducted the data collection on the Niaga Daya Market, one of the biggest traditional markets in Makassar City, into two steps survey. Firstly, we observed the utility characteristics of the tradtional market i.e., types and number of tenants in the market, and the number of the market's visitor during in the morning period until in the evening period for weekday and weekend. Regarding the observation using a video camera, there were 23,182 visitors and 27,659 visitors for weekday and weekend, respectively. Secondly, we collected the primary data of the study based on an interview survey to the visitors of the market using a questionnaire sheet. The questionnaire sheet involves questions in order to describe the individual characteristics (i.e. socio-economy-demography) of the market's visitors, the attributes of the shopping travel (i.e. trip chain, arrival times, travel time, travel cost, and travel mode), and the characteristics of the shopping activity (i.e. the shooping duration, and the amount of the spent money). Based on the number of the visitor population, the present study obtained that the number of respondent or sample are 699 and 697 respondents for weekday and weekend, respectively. The selection technique of the respondents from the population number was carried out randomly according to the order of arrival of the visitors in the traditional market. In the second survey, the interview survey activity was carried out directly in the traditional markets to the visitors as respondent target. The surveyors record and describe the respondent's answers on the questionnaire there.

B. The Modelling Construction

The present study deals with modeling and analysis of the intensity of the traditional markets visitors. In this regard, there are nineteen variables of the individuals charactristics such as age, sex, income, occupation, family size, etc.; shopping travel attributtes such travel time, travel cost, travel distance, etc.; and shopping activity attributes of the visitors such as shopping duration, and spent money, that consiedered as independent variables. The study applied the multiple linear regression model approach in order to develop the intensity model of the visitors to traditional market. The valueof the coefficient determinant of the model (R^2) is a key indicator in determining the best model. The equation of the multiple regression model is presented in equation (1), where Y is the dependent variable, X is the independent variable, and ß1parameter of the model (Damayanti et al., 2008).

$$Y = {}_0 + {}_1X_1 + {}_2X_2 + ... + {}_nX_n \qquad (1)$$

Regarding the general model of the multiple linear regression model, we construct the intensity model as equation (1), where there are nineteen independent variables and the dependent variable is the intensity of the visitors to the traditional market. All variable considered into the model is shown in Table 1.

In order to estimate the values of the model variables, we applied the maximum likelihood algorithm by using the SPSS 20.0 as a computanional tool.

Table 1. The variables of the intensity model

Symbol	Names of Variables	Units
X_1	Age	Year olds
X_2	Sex	-
X_3	Family Size	Person
X_4	Worker number in household	Person
X_5	Student number in household	Person
X_6	Occupation	-
X_7	Household Income	IDR 1×10^6
X_8	Car ownership	Unit
X_9	Motorcycle ownership	Unit
X_{10}	Car's driving license ownership	
X_{11}	Motorcycle's driving license ownership	
X_{12}	Mode choice	
X_{13}	Travel distance	meters
X_{14}	Person number of the shopping trip	person
X_{15}	Travel cost	IDR 1×10^3
X_{16}	Travel time	minutes
X_{17}	Shopping objective	goods
X_{18}	Shopping bill	IDR 1×10^3
X_{19}	Shopping duration	minutes
Y	Trip intensity	Times

3. RESULT AND DISCUSSION

A. Trip Chains of the Traditional Market's Visitors

Regarding the data tabulation, the trip chains of the visitor can be described into two types of their travel pattern, one is based on their origin place to the traditional market, and one is based on their destination place from the market. Both travel patterns is shown in Figure 1a and Figure 1b for the origin and destination place, respectively.

Figure 1 shows that the dominant pattern of the visitor's trip chain is Home - Market - Home (H-M-H). Regarding the result, the visitors have trip chain H-M-H and they will be elaborated and modeled.

B. Dominant Attributes Variables of Research

Based on the results of the data compilation and extraction for the data categories of H-M-H trip chain, we described and obtained the dominant

attributes of each variable which has been identified in Table 1, as presented in Table 2. Table 2 shows that the dominant gender who conducting shopping travel to the traditional market is female even on the weekends and on the weekdays. This phenomenon further strengthened by the proportional data of female to male who travel to shop in the traditional market as presented in Figure 2. Furthermore, Figure 3 presents an overview of the dominant travel mode used by visitors to the traditional markets regarding the motorcycle ownership categories of the visitors. Figure 3 shows that the motorcycle mode became a popular mode used by visitors to the traditional market.
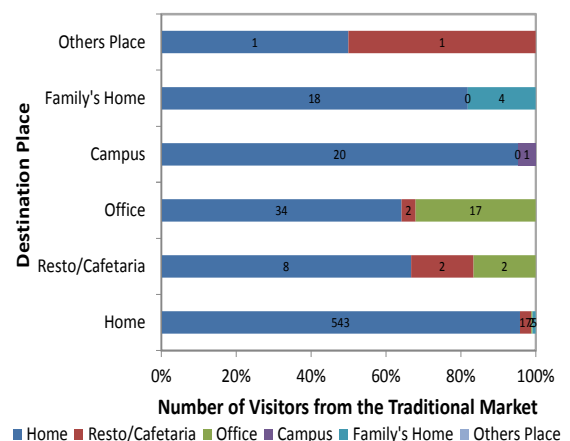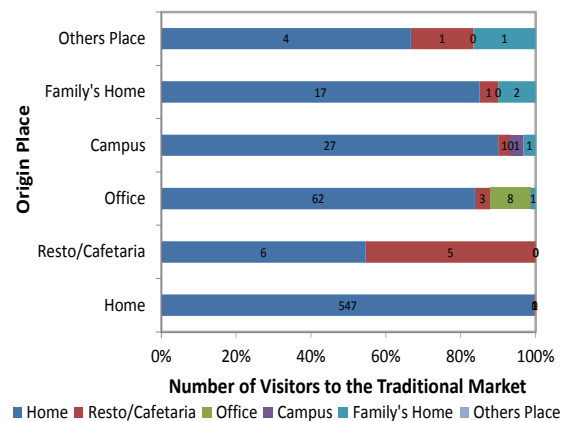

Figure 1. Trip Chain of the Traditional Market's Visitors, a. Based on Origin Place b. Based on Destination Place
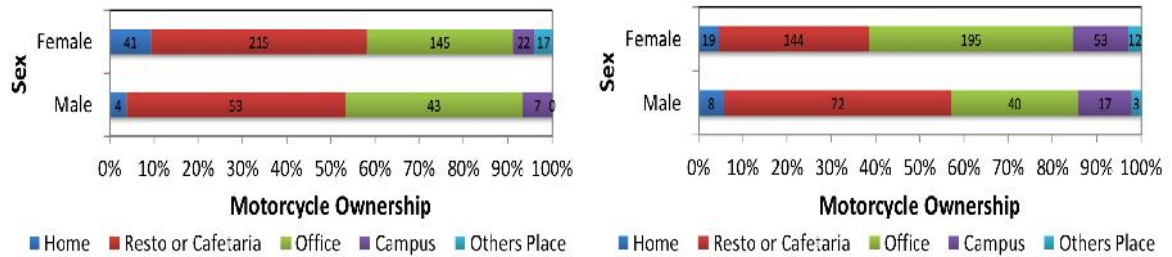
Figure 2. Dominant Attributes Variables of Research

Regarding the data distribution based on the gender and motorcycle ownership categories as shown in Table 2, Figure 2, and Figure 3, then the later stage of modeling, the model will be categorized into the category of Home-Market-Home (H-M-H) of females who have one motorcycle with the number of samples respectively 215 respondents for weekend and 144 respondents for the weekdays, and who have more than one motorcycle with the number of samples are 184 respondents for weekend and 260 respondents for

Table 2. Dominant Attributes Variables of Research

| Symbol	Variable	Workdays		Holydays Weekend	
		Dominant Attributes	%	Dominant Attributes	%
X_1	Age	30	7,10	43	6,22
X_2	Gender	woman	75,13	woman	80,44
X_3	Number of People at Home	4 person	27,53	4 person	26,14
X_4	Number of People Working at Home	2 person	42,63	1 person	44,06
X_5	Number of People Schooling at Home	2 person	36,41	1 person	38,57
X_6	Respondents Work	Wirausaha	36,77	Wirausaha	53,20
X_7	Household Income	IDR. 2.25 million	19,36	IDR. 2.75 million	26,69
X_8	Car ownership	0 car	68,92	0 car	79,16
X_9	Motocycle ownership	2 motorcycle	41,74	1 motorcycle	48,99
X_{10}	Driving Car License ownership	No	78,69	No	87,02
X_{11}	Driving Motorcycle License ownership	Yes	57,19	Yes	63,62
X_{12}	Mode of Transportation Used	motorcycle	60,39	motorcycle	57,95
X_{13}	Distance Home to the Market	3000 meters	37,66	750 meters	26,87
X_{14}	Number of People to Market	Alone	51,87	Alone	47,90
X_{15}	Transportation Costs to Market	IDR 0	45,47	IDR 0	50,64
X_{16}	Time Travel	7,5 minutes	35,35	7,5 minutes	32,18
X_{17}	Destination Shopping	1 shopping	33,04	1 shopping	33,27
X_{18}	Shopping Fee	IDR 65,000	16,16	IDR. 55,000,-	17,00
X_{19}	Shopping Time	37,5 minutes	35,17	22,5 minutes	29,80
Y	Intensity To Markat	1 day	45,65	1 day	50,82
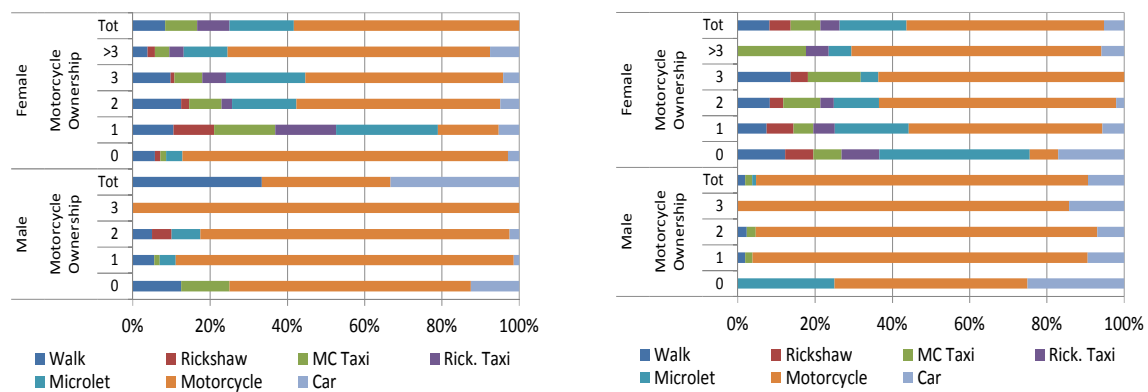
Figure 3. The Composition of Travel Modes Used by Visitors Based on Sex & Motorcycle Ownership Categories

weekdays.

C. The Statistical Indicators of the Normality Data Distribution

The statistical indicators of normality data distribution such mean, median, mode, and standard deviation of each variables of the female visitors based on the motorcycle ownership are shown in Table 3 and Table 4 for the motorcycle ownership = 1 category and the motorcycle ownership > 1

category, respectively. Table 3 and Table 4 show that only some independent variables are identified that meet the requirements of normality (values of standard deviation ± 1).

Regarding the normality data as shown in Table 3 and Table 4, we only included the independent variables into the regression modeling stage, i.e. Family Size (X3); Work Family Size (X4); Occupation (X6); Household Income (X7);

Table 3. The Statistical Indicators of each Variables Based on the Motorcycle Ownership = 1

Variables	Weekdays (144 Respondents)				Weekend (215 Respondents)			
	Mean	Median	Mode	Std. deviation	Mean	Median	Mode	Std. deviation
Y	2.33	2	1	1.278	1.721	1	1	1.048
X1	33.79	32.5	28	9.261	35.019	34	30	9.849
X2	2.00	2	2	0	2.000	2	2	0
X3	4.48	4.5	5	1.234	3.688	3	3	1.235
X4	1.76	2	1	1.612	1.642	1	1	1.008
X5	1.94	2	1	1.892	2.047	2	1	1.635
X6	4.48	5	5	1.103	2.902	3	3	0.862
X7	4.23	4	3	1.296	3.772	4	5	1.194
X8	1.39	1	1	0.57	1.251	1	1	0.514
X9	2.00	2	2	0	2.000	2	2	0
X10	1.84	2	2	0.368	1.870	2	2	0.337
X11	1.48	1	1	0.501	1.381	1	1	0.487
X12	6.32	8	8	2.483	6.433	8	8	2.258
X13	3.29	3	4	1.283	2.870	3	3	1.28
X14	1.57	1	1	0.763	1.586	1	1	0.656
X15	2.19	2	1	1.411	2.512	3	1	1.54
X16	2.58	2	2	1.001	3.344	3	2	1.208
X17	2.00	2	1	0.939	2.349	2	2	1.133
X18	6.20	6	6	1.289	6.335	6	7	1.109
X19	3.19	3	3	1.084	3.126	3	3	1.38

Travel Distance (X13); Travel Time (X16); Shopping Objectives (X17); Spent Money for the Shopping (X18); and Shopping Duration (X19), for the weekend category of the traditional market's visitor which have motorcycle ownership is one unit. Similarly, for the data category of weekday, except the variable Work Family Size (X4) was not considered in the next modeling stage. For the data category of motorcycle ownership more than one units either on a weekend or on a weekday, the variables that may be considered in the next stage of the modeling are presented in the category of motorcycle ownership = 1 unit to the condition of the weekend.

D. Frequency Model of Travel Visitors to the Traditional Markets

The results of multiple linear regression modeling based on step-wise models using the SPSS software, for four categories of the models, are presented in Table 5.

Table 5 shows that the model results of the four model categories have a sufficient level of significance to be acceptable, where the existing models have a coefficient of determination more than 0.5. Furthermore, the rationality of the model parameters values for the four models are dominant rational enough to be accepted.

Table 5 also shows that some of the independent variables considered in the modeling stage do not significantly affect the level of intensity of all visitors to the traditional markets in the four existing models. In this case, the model of motorcycle ownership equals 1 for the weekend category has the independent variables that significantly affect are Occupation (X6), Household Income (X7), Travel Distance (X13), and Travel Time (X16). While on weekdays, besides the four variables, the variable Spent Money for the Shopping (X18) also has a significant influence. For the model category of motorcycle ownership more than one unit on the weekend, the independent variables that significantly influenced are Occupation (X6), Household Income (X7), Travel Distance (X13), Shopping Objectives (X17), and

Table 4. The Statistical Indicators of each Variables Based on the Motorcycle Ownership > 1

Variables	Weekdays (260 Respondents)				Weekend (184 Respondents)			
	Mean	Median	Mode	Std. deviation	Mean	Median	Mode	Std. deviation
Y	2.27	2	1	1.308	2.163	2	1	1.222
X1	35.12	35	30	11.415	36.255	37	37	10.025
X2	2.00	2	2	0	2.000	2	2	0
X3	4.57	4.5	4	1.188	4.000	4	4	1.263
X4	2.10	2	2	0.884	2.087	2	2	1.015
X5	2.11	2	2	1.567	1.913	2	2	0.883
X6	4.37	4	4	1.826	2.842	3	3	0.791
X7	5.02	5	5	1.021	5.016	5	5	1.245
X8	1.35	1	1	0.63	1.158	1	1	0.394
X9	3.30	3	3	0.549	3.304	3	3	0.631
X10	1.81	2	2	0.395	1.908	2	2	0.29
X11	1.49	1	1	0.501	1.429	1	1	0.496
X12	6.59	8	8	2.196	6.549	8	8	2.28
X13	3.21	3	4	1.577	2.913	3	2	1.202
X14	1.60	1	1	0.821	1.728	2	2	0.476
X15	2.28	2	1	1.501	2.168	1	1	1.522
X16	2.72	3	2	1.03	2.853	3	2	1.692
X17	2.39	2	3	1.001	2.609	2	2	1.154
X18	6.39	6	6	1.278	6.375	6	6	1.042
X19	3.06	3	3	1.055	2.728	2	2	1.174

Table 5. The parameters values of the regression models

| Variables Model | Parameters | Motorcycle ownership = 1 | | | | Motorcycle ownership > 1 | | | |
| | | Weekend | | Weekdays | | Weekend | | Weekdays | |
		Value	Sig.	Value	Sig.	Value	Sig.	Value	Sig.
Constanta	β_0	1.838	0.000	1.702	0.000	1.167	0.000	1.482	0.000
Number of People at Home, X_3	β_3	-	-	-	-	-	-	0.206	0.000
Number of People Working at Home, X_4	β_4	-	-	-	-	-	-	-0.312	0.000
Respondents Work, X_6	β_6	0.212	0.000	0.109	0.000	0.423	0.000	-0.329	0.000
Household Income, X_7	β_7	0.156	0.000	0.203	0.000	0.155	0.000	0.191	0.000
Distance, X_{13}	β_{13}	-0.280	0.000	-0.260	0.000	-0.221	0.000	-	-
Time Travel, X_{16}	β_{16}	-0.167	0.000	-0.292	0.000	-	-	-	-
Destnation shopping, X_{17}	β_{17}	-		-	-	0.155	0.000	-0.187	0.001
Shopping Fee, X_{18}	β_{18}	-		-0.190	0.000	-0.128	0.000	-0.173	0.002
Shopping Time X_{19}	β_{19}	-		-	-	-	-	-0.067	0.005
	R^2	0.585		0.622		0.644		0.624	
	SEE	0.682		0.800		0.739		0.818	
	F	73.942		45.354		64.540		44.469	

Spent Money for the Shopping (X18). For the model on the weekday category, the significant variables that influenced the trip intensity are Family Size (X3), Work Family Size (X4), Occupation (X6), Household Income (X7), Shopping Objectives (X17), Spent Money for the Shopping (X18), and Shopping Duration (X19).

Overall, it can be stated that the dominant variables that affect the trip intensity of the traditional market's visitor are Occupation (X6), Household Income (X7), Travel Distance (X13), and Spent Money for the Shopping (X18).

4. CONSLUSION

The present study has analysed the travel behavior of traditional market's visitors in Makassar city such the socio-economic-demographic characteristics, trip chain, and the shopping travel attributes of the visitor. Furthermore, the trip intensity model of visitors to the traditional market by using a multiple linear regression model approach has been successfully carried out, especially towards female visitors and their various on the motorcycle ownership.

By taking a case study on the traditional market visitors in the Niaga Daya Market, one of the largest traditional markets in Makassar City

obtained a description of the phenomenon that the dominant visitor in traditional market is visitors using motorcycles as the travel mode. The level of motorcycle ownership of the visitors is one unit and more than one unit of motorcycles. The modeling results show that the trip intensity of the visitors to traditional market is significantly influenced by occupation, household income, distances from the house to the market, and the spent money of shopping variables.

The study results have provide some expectation that the model development of the visitor travel behaviors is needed in advanced studies such as choice model of the arrival time and travel mode to traditional markets of the visitors.

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