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THE ROLE OF DEMOGRAPHIC, TRIP CHARACTERISTICS, SERVICE PERFORMANCE, AND SATISFACTION FACTORS ON TRANS KOETARAJA PASSENGERS' LOYALTY

Summary. Operating since 2016 in Banda Aceh, Indonesia, Trans Koetaradja is a public transportation service that continues to face challenges related to low passenger numbers. Several factors are thought to contribute to this issue, including the quality of service, passenger satisfaction, and customer loyalty. This research analyzes the extent to which demographic attributes, travel behavior, service performance, and satisfaction influence passenger loyalty to the Trans Koetaradja system. This research was conducted across six corridors, with data collected through questionnaires and analyzed using Stata. The results indicate that only age (20%) significantly impacts loyalty, while other demographic and trip-related factors, such as gender, education, and trip frequency, do not. Key service performance factors influencing loyalty (32.9%) include operating hours, timeliness, stop distance, bus crew readiness, and passenger comfort. Despite these findings, amenities such as free fares and air conditioning have minimal impact, as private vehicles remain more affordable and convenient. Furthermore, the limited bus route network restricts its broader usage. Expanding the route network and implementing policies such as higher parking fees and road pricing are recommended to promote the use of public transportation, thus improving passenger loyalty.

1. INTRODUCTION

Public transportation in developing countries, such as Indonesia, differs significantly from that in developed countries. Noteworthy differences include the completeness of facilities and infrastructure, the interconnection between modes, and public interest. According to Indonesian Law No. 22 of 2009 on Road Traffic and Transportation, public transport vehicles are defined as those used to carry passengers or goods in exchange for payment [1]. Public transportation is essential for reducing the impact of congestion, which is already occurring in many cities. In addition, public transportation has short-term goals that emphasize increasing fuel efficiency and controlling vehicle emissions [2]. Therefore, policies that favor public transportation to reduce the growth of private vehicles need to be improved, such as policies aimed at accessibility, minimum service standards for public transportation, intermodal integration, and maintenance of public facilities.

Banda Aceh, a relatively small city in Indonesia, has a public transportation network that has yet to reach all parts of the city. Before 2016, Banda Aceh was served by public transportation called labi-labi. Over time, the number of public transportations has continued to decrease due to a lack of public

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enthusiasts. Since 2016, the Government of Aceh has been managing the Trans Koetaradja bus service, providing public transportation across Banda Aceh and neighboring regions. The buses operate across six corridors and are free of charge. The number of people using Trans Koetardja buses is low. Only one corridor, the CBD of Banda, which contains the Aceh–Darussalam (education center) route, has high passenger numbers, especially during rush hours. Outside these hours, the number of passengers is low, just like in the other five corridors. The service performance of the Koetaradja Trans bus will likely determine passengers' loyalty to using the bus in daily activities. Service performance is related to the quality and consistency of services provided by providers to meet consumer expectations. Evaluating a company's service quality poses a significant challenge due to its strong dependence on consumer perceptions. According to [3], improving service quality is essential to achieving customer satisfaction. This performance is typically measured using five key indicators: tangible elements, consistency, responsiveness, assurance, and empathy.

If the service provided aligns with passengers' expectations, it will be perceived positively in terms of performance and satisfaction, which can strengthen passenger loyalty. On the other hand, if the service performance falls short of expectations, passengers are likely to perceive the service quality as inadequate, leading to a decline in their loyalty. According to [4], service performance is a critical determinant of passenger loyalty, particularly within the Trans Koetaradja bus system, where the intangible nature of services necessitates consistent efforts to meet user expectations. Therefore, understanding the key drivers of loyalty is imperative to support Trans Koetaradja's management in developing targeted strategies to enhance user retention and attract new riders. Despite this, the extant literature has predominantly focused on assessing service quality and user satisfaction in public transport, with limited empirical attention to the specific variables influencing loyalty—especially in fare-free transit systems operating in smaller urban environments such as Banda Aceh. However, there remains a limited number of comprehensive studies that integrate multiple influencing factors, including demographic characteristics, travel attributes, service performance, and passenger satisfaction, into a single loyalty model developed explicitly for Trans Koetaradja users.

Given the existing gaps in previous studies, this research aims to explore the following key questions:

1. How significant is the influence of demographic and travel-related factors on passenger loyalty?
2. How do service quality and passenger satisfaction influence loyalty among Trans Koetaradja users?

This study examines the overall service quality of the Trans Koetaradja bus system while evaluating passenger satisfaction and loyalty. It also explores the extent to which demographic characteristics, travel behavior, perceived service performance, and satisfaction levels contribute to passenger loyalty. This research was conducted across six operational corridors of Trans Koetaradja, which connects Banda Aceh to surrounding areas. The assessment of service performance is grounded in the five core dimensions of service quality outlined in the SERVQUAL model: tangibles, reliability, responsiveness, assurance, and empathy [5]. The *tangibles* dimension encompasses the physical condition and availability of infrastructure and facilities that are visible to passengers. *Reliability* reflects the consistency and accuracy in service delivery as promised. *Responsiveness* highlights the promptness and willingness to assist customers. *Assurance* indicates the service provider's competence in building user confidence. Lastly, *empathy* captures the ability to offer personalized service and understand user needs [6–7].

2. METHODS

2.1. Population and sample

The population in this study consisted of individuals who used Trans Koetaradja bus services along six primary routes covering Banda Aceh's central business district (CBD) and surrounding regions. These routes were as follows:

1. From the CBD to Darussalam (Koridor 1),
2. From the CBD to Lambaro and Sultan Iskandar Muda International Airport (Koridor 2A),
3. From the CBD to Ulee Lheue Port (Koridor 2B),
4. From the CBD through Setui to Mata Ie (Koridor 3A),
5. From the CBD through Lhong Raya to Mata Ie (Koridor 3B)
6. From the CBD to Ulee Kareng and Sultan Iskandar Muda International Airport (Koridor 5)

The total population of Trans Koetaradja bus passengers in 2021 was 435,000 [8]. The sample size in this research was determined based on the formula proposed by Hair et al. The minimum sample size is 330, which was obtained by multiplying the number of variables by 10 [9]. In total, 363 samples were collected.

2.2. Research variables

This study analyzed the influence of demographic attributes, travel characteristics, service performance, and passenger satisfaction on user loyalty by examining a total of 36 observed variables. Demographic and trip characteristics consisted of seven variables, bus service performance had 25 variables, and passenger satisfaction had four variables. Demographic and trip characteristics consisted of the following variables: age, gender, education, occupation, trip purpose, car ownership, and frequency. Variables related to Trans Koetaradja bus service performance are as follows:

I. Service Performance of Trans Koetaradja
   A. Reliability
      1. Ease of access and availability of the bus service (X_{A1}).
      2. Daily operational hours of the bus (X_{A2}).
      3. Passenger waiting time at designated bus stops (X_{A3}).
      4. Time taken to reach the intended destination (X_{A4}).
      5. Average speed of bus travel (X_{A5}).
      6. Timeliness of bus departures (X_{A6}).
      7. Timeliness of bus arrivals (X_{A7}).
      8. Distribution and accessibility of bus stops (X_{A8}).
      9. Distance intervals between consecutive bus stops (X_{A9}).
      10. Coverage and layout of bus routes (X_{A10}).
   B. Responsive
      1. Driver compliance with traffic laws and safety standards (X_{B1}).
      2. Competency and control in driving performance (X_{B2}).
      3. Bus crew responsiveness in assisting passengers in need (X_{B3}).
      4. Orderliness in managing passenger boarding and seating (X_{B4}).
   C. Assurance
      1. Passenger safety and security during bus trips (X_{C1}).
      2. Passenger protection and comfort at bus stops (X_{C2}).
      3. Availability of emergency safety equipment (e.g., extinguishers, glass breakers, jacks, first aid) (X_{C3}).
      4. Onboard facilities for vulnerable groups such as the elderly, pregnant women, and passengers with disabilities (X_{C4}).
   D. Empathy
      1. Attentiveness of the bus crew in serving passenger needs (X_{D1}).
      2. Courtesy and friendly behavior of the crew (X_{D2}).
      3. Effectiveness of communication between the crew and passengers (X_{D3}).
   E. Tangibles
      1. Physical maintenance and condition of the bus (X_{E1}).
      2. Cleanliness and tidiness of the vehicle's interior (X_{E2}).
      3. Comfort level based on bus temperature (X_{E3}).
      4. Passenger load or occupancy levels on board (X_{E4}).

II. Satisfaction of Transkoetaradja Bus Passengers
   F. Satisfaction variables
      1. Feelings of comfort and enjoyment during bus use (X_{F1}).
      2. Convenience experienced while waiting at the stop (X_{F2}).
      3. Alignment of actual service with passenger expectations (X_{F3}).
      4. Absence of complaints during the journey (X_{F4}).

III. The Loyalty of Trans Koetaradja Bus Passengers (Y)
   1. Continued intention to use Trans Koetaradja for future travel.
   2. Preference for Trans Koetaradja over other similar services.
   3. Willingness to recommend Trans Koetaradja to others.
   4. Intention to provide feedback and suggestions to the bus management.

2.3. Scale of measurements

This study assessed service quality by distributing a standardized questionnaire to users of the Trans Koetaradja bus system along six designated corridors. The study employed a five-point Likert scale to record participant perceptions, with choices ranging from "strongly disagree" to "strongly agree" [10].

2.4. Data collection

The primary data in this study comprised passenger demographics, travel characteristics, perceptions of bus service performance, satisfaction level, and loyalty. Data were gathered through questionnaire-based surveys conducted along six corridors of the Trans Koetaradja bus system. In addition, secondary data included information on the number of operational corridors and the corresponding passenger volumes for each Trans Koetaradja route.

2.5. Data processing

The average of respondents' answers was computed using Excel. Meanwhile, the model of the effect of demographic and trip characteristics of respondents, service performance of Trans Kotaradja, and passenger satisfaction on passenger loyalty was analyzed using Strata software, a statistical software package used for data science. The data analysis in this study was adhered to the following structured steps:

1. Compiling survey results, which encompassed respondent demographics, trip characteristics, perceptions of bus service performance, satisfaction levels, and loyalty indicators.
2. Quantifying demographic and trip characteristics by calculating the percentage distribution for each categorical variable.
3. Computing mean scores for each item related to service performance, satisfaction, and loyalty. These average scores were then grouped by service corridor to assess the perceived service level, satisfaction, and passenger loyalty associated with the Trans Koetaradja system.
4. Categorical grouping of demographic and trip variables (X_1 to X_7) was conducted to facilitate the modeling of the relationship between these variables and passenger loyalty.
5. Aggregating mean scores for service performance and satisfaction items (X_{A1} to X_{A10}; X_{B1} to X_{B4}; X_{C1} to X_{C4}; X_{D1} to X_{D3}; X_{E1} to X_{E4}; X_{F1} to X_{F4}) to develop a predictive model of their influence on passenger loyalty (Y).
6. Utilizing regression analysis to examine the following relationships:
   a. the effect of demographic and trip-related characteristics (X_1 to X_7) on loyalty (Y), and
   b. the influence of service performance and satisfaction indicators (X_{A1} to X_{A10}; X_{B1} to X_{B4}; X_{C1} to X_{C4}; X_{D1} to X_{D3}; X_{E1} to X_{E4}; X_{F1} to X_{F4}) on loyalty outcome (Y).
7. Regression outputs, including intercepts and coefficients, were interpreted to determine the direction (positive or negative) of the relationships between independent and dependent variables. The strength of these relationships was assessed using the correlation coefficient.

All statistical analyses were carried out using Stata Software, chosen for its robustness in handling multivariate regression models and capturing interaction effects among variables. Moreover, the selection of variables was carefully determined based on insights from previous studies and supported by field observations, ensuring their relevance in explaining passenger loyalty behavior within the context of public transportation services.

3. RESULTS AND DISCUSSION

3.1. Passengers' demographic and trip characteristic variables

Table 1 illustrates the demographic composition and travel behavior attributes of the Trans Koetaradja bus passengers who participated in this study. The respondents were predominantly females, with an age under 35 years old and a high school education or higher. Respondents who were still students comprised 41.05% of the sample, while the rest were workers, homemakers, and unemployed. The dominant trip purpose was routine activities such as school, college, and work. Most respondents owned a vehicle, and only 19.28% did not. The frequency of weekly trips using the Trans Koetaradja Bus was less than three. These results suggest that the use of Trans Koetaradja buses by respondents is not predominantly for routine purposes that require commuting five to six times per week.

Table 1

Passengers' Demographic and Trip Characteristics

Description	Frequency	
Age (years) – X_1		
1: younger than 35	249	68.60%
0: 35 or older	114	31.40%
Gender – X_2		
1: Female	217	59.78%
0: Male	146	40.22%
Education – X_3		
1: ≥ Senior high school	249	68.60%
0: < Senior high school	114	31.40%
Occupation – X_4		
1: Students	149	41.05%
0: Others	214	58.95%
Trip – X_5		
1: Routine activities	204	56.20%
0: Incidental activities	159	43.80%
Private vehicle ownership – X_6		
1: Yes	293	80.72%
0: No	70	19.28%
Travel frequency (weekly) – X_7		
1: Three times or more	140	38.57%
0: Less than three times	223	61.43%

3.2. Trans koetaradja bus performance, passenger satisfaction, and loyalty

Service performance, passenger satisfaction, and loyalty toward Trans Koetaradja public bus services were assessed using the mean scores derived from respondent evaluations. These scores were interpreted using a five-point Likert scale with the following classification: very poor/disloyal ($1.00 < x \leq 1.80$), poor/disloyal ($1.80 < x \leq 2.60$), fair/moderately loyal ($2.60 < x \leq 3.40$), good/loyal ($3.40 < x \leq 4.20$), and very good/very loyal ($4.20 < x \leq 5.00$) [11–12].

The results indicate variations across corridors in terms of service performance, satisfaction, and loyalty. In Corridor 1, all three indicators show a downward trend. A similar pattern is observed in Corridor 2A, though the decline is more pronounced for the loyalty indicator. Corridor 2B showed consistent values for service performance and loyalty, while the satisfaction score was higher. Meanwhile, Corridors 3A, 3B, and 5 exhibited a general decline across all three indicators.

Service performance in Corridors 1, 2B, 3A, and 5 requires improvement to reach the "very good" category. Likewise, passenger satisfaction in Corridors 1, 3A, and 5 should be enhanced to achieve a "very satisfactory" level. Corridor 2A passengers showed the lowest loyalty, indicating a need for strategic intervention. In contrast, Corridors 1, 2B, 3A, and 5 fell within the "loyal" range; only Corridor 3B reached the "very loyal" classification.

These findings suggest that five out of the six corridors need efforts to strengthen passenger loyalty. A detailed comparison of the performance, satisfaction, and loyalty scores across corridors is presented in Fig. 1.

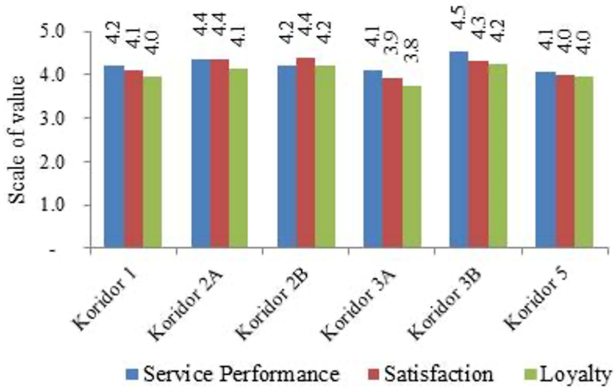

Fig. 1. Performance, satisfaction, and passenger loyalty

3.3. The effects of demographic and trip characteristics factors of trans koetaradja bus passengers

In this study, *loyalty* is defined as the ability to maintain and attract Trans Koetardaja public bus transportation users. This study reveals age as the only factor that affects the loyalty of Trans Koetardja Bus passengers, as shown in Table 2. Meanwhile, gender, education, and occupation factors do not affect passenger loyalty. The variables of trip characteristics (trip purpose, vehicle ownership, and frequency) do not affect passenger loyalty. The linear regression model obtained is $y = -0.7773X_1 + 16.6930$. This model shows that the loyalty of older passengers (≥35) will be 16.6930, while the loyalty of younger passengers (<35) will decrease by 0.7773. The determination value obtained is 0.20, indicating that only 20% of the age variable affects passenger loyalty to ride the Trans Koetaradja bus, while other variables influence the remaining 80%. The correlation coefficient (r), derived from a coefficient of determination value of 0.447, is within the moderate range. The correlation strength is categorized as follows: very weak (0.00–0.199), weak (0.20–0.399), moderate (0.40–0.599), strong (0.60–0.799), and very strong (0.80–1.00) [13–14].

Table 2

Socio-economy model

Variable	Coefficient	t-value	p-value
Intercept	16.6930	71.116	0.000
Age (X_1)	-0.7773	-2.743	0.006

R^2: 0.20

Number of samples: 363

Beyond demographic and trip-related attributes, service quality and passenger satisfaction are important determinants of loyalty among public transport users. Woo et al. [15] identified several key factors contributing to passenger satisfaction, including:

- Safety, which refers to the protection of facilities, staff, and personal belongings.
- Comfort, which includes cleanliness, orderliness, seat availability, and the overall travel environment.
- Convenience, which includes proximity between bus stops and origin/destination points, as well as service frequency.
- Flexibility, which relates to waiting times, delays, and operational speed.
- Affordability, which includes fares and the share of monthly transportation expenditure.

Moreover, findings from other studies [16–17] suggest that perceptions of safety, security, reliability, and comfort are significantly positively associated with satisfaction and loyalty in public transport usage. Interestingly, accessibility was found to have an insignificant influence on satisfaction and loyalty levels. This result contrasts the conclusions of [18], who emphasized that accessibility plays a critical role in maintaining and attracting users of public transportation services.

The present findings demonstrate that both service performance and passenger satisfaction shape passenger loyalty. Table 3 presents 10 key variables identified as influencing loyalty to the Trans Koetaradja bus service. Within the reliability dimension, four significant indicators were identified: X_{A2} (daily operational hours of the bus), X_{A4} (time taken to reach the intended destination), X_{A7} (timeliness of bus arrivals), and X_{A9} (distance intervals between consecutive bus stops). Among these, all variables exhibited a positive influence on passenger loyalty, except X_{A7}, which had no significant contribution. This suggests that while on-time arrivals may not be a major concern, travel duration (X_{A4}) remains a crucial factor in ensuring passenger retention and satisfaction. Under the responsiveness dimension, only X_{B3} (bus crew responsiveness in assisting passengers in need) significantly affected loyalty. In the tangibles category, three indicators were identified: X_{E1} (physical maintenance and condition of the bus), X_{E3} (comfort level based on bus temperature), and X_{E4} (passenger load or occupancy levels on board). Notably, X_{E3} negatively affected loyalty, with a coefficient of -0.4472. According to field observations, this was likely due to non-functional air conditioning during data collection on one of the buses. Lastly, in the passenger satisfaction dimension, two factors demonstrated a positive influence on loyalty: X_{F1} (feelings of comfort and enjoyment during bus use) and X_{F4} (absence of complaints during the journey).

The multiple linear regression model developed in this study is as follows: $Y = 2.5997 + 0.3986X_{A2} + 0.3089X_{A4} – 0.3745X_{A7} + 0.3966X_{A9} + 0.3592X_{B3} + 0.3558X_{E1} – 0.4472X_{E3} + 0.6182X_{E4} + 1.0999X_{F1} + 0.4967X_{F4}$. The model suggests that, with all service performance and passenger satisfaction variables held constant at zero, the initial level of passenger loyalty is 2.5997. The coefficient of determination (R^2) is 0.329, indicating that 32.9% of the variance in passenger loyalty can be attributed to the explanatory variables included in the model. The remaining 67.1% is likely influenced by external factors not addressed in this study. Furthermore, the correlation coefficient (r) of 0.574 reflects a moderate positive association between service performance, passenger satisfaction, and loyalty.

This study examined the factors influencing passenger loyalty in public transportation, with a focus on the influence factors of mode selection, as identified in previous studies. However, there are differences in the influencing factors, particularly in demographic and trip characteristic variables, despite their interconnectedness. Mode selection refers to one's interest in using a specific mode of transport, and loyalty is the ability to maintain and attract public transportation users. According to Tamin [19], mode selection between private and public vehicles is influenced by many factors, including demographic, socioeconomic, and trip factors. Han et al. [20] also revealed that gender, income, and trip purpose affect people's mode choices. [21–23] also revealed that women tend to choose private vehicles for mobility because they make more trips, especially short-distance trips that are not for work. Women also tend to have a more complex number of trips than men [22]. A separate study incorporating a broader range of variables identified several key determinants influencing travel mode selection, including passengers' socioeconomic and demographic profiles, household characteristics, trip-related factors, and perceived satisfaction with public transport service quality. Socioeconomic and demographic attributes consist of gender, age, income level, educational background, and private

vehicle ownership [15, 24]. Meanwhile, trip-related variables cover aspects such as travel purpose, journey duration, commuting distance, bus usage frequency, and the maximum acceptable waiting time [15]. Based on the comparison of this study's results with the outcomes of several previous studies, different factors influence transportation mode selection and passenger loyalty.

Table 3

Bus performance, passenger satisfaction, and loyalty models

Variable	Coefficient	t-value	p-value
Intercept	2.5997	2.284	0.023
X_{A2}	0.3986	1.905	0.058
X_{A4}	0.3089	1.677	0.094
X_{A7}	-0.3745	-2.158	0.032
X_{A9}	0.3966	2.395	0.017
X_{B3}	0.3592	1.920	0.056
X_{E1}	0.3558	1.691	0.092
X_{E3}	-0.4472	-1.971	0.049
X_{E4}	0.6182	3.461	0.001
X_{F1}	1.0999	5.279	0.000
X_{F4}	0.4967	3.278	0.001

R^2: 0.329

Number of samples: 363

The observed differences in the influencing factors may be attributed to variations in place characteristics and passenger travel behavior. Passenger loyalty to reuse public transportation is strongly determined by the experience one has while using it. Nelloh et al. [25] stated that travel experiences positively affect passenger satisfaction, and satisfaction positively influences customer loyalty. Passenger loyalty is influenced by multiple factors, with psychological components (especially those tied to travel experiences) playing a significant role. In the field of transportation, satisfaction with one's travel experience is often regarded as a central element that fosters continued use. When users view public transport services as positive and fulfilling, they are more likely to remain loyal and continue using the service over time.

4. CONCLUSIONS

The current findings indicate that among the demographic and trip-related variables, age is the only factor that exhibits a measurable impact on passenger loyalty, contributing approximately 20%. Other variables such as gender, educational background, employment type, trip purpose, private vehicle ownership, and bus usage frequency were not found to significantly influence loyalty toward the Trans Koetaradja bus service. Regarding service performance, three indicators under the reliability dimension demonstrated a significant influence: X_{A2} (daily operational hours of the bus), X_{A7} (timeliness of bus arrivals), and X_{A9} (distance intervals between consecutive bus stops). Within the responsiveness category, X_{B3} (bus crew responsiveness in assisting passengers in need) emerged as a critical factor. From the tangibles dimension, X_{E4} (passenger load or occupancy levels on board) was found to contribute to loyalty levels. In terms of passenger satisfaction, two variables were identified as influential: X_{F1} (feelings of comfort and enjoyment during bus use) and X_{F4} (absence of complaints during the journey). Overall, these variables collectively explain 32.9% of the variation in passenger loyalty, suggesting that the remaining 67.1% is influenced by external factors not addressed within the scope of this study. The modest contributions of demographics, travel characteristics, service quality, and satisfaction in explaining loyalty align with the current context, in which public interest in using the Trans Koetaradja bus service remains limited. Factors such as free fares, air conditioning, and new bus fleets appear to have a minimal impact. This may be attributed to the affordability and convenience of

private vehicle ownership, which offers greater flexibility. Additionally, the limited route coverage may contribute to the public's reluctance to adopt public transport as a preferred mode of travel. Therefore, the expansion and optimization of the route network should be viewed as a key strategic priority in future planning efforts. This must be supported by policy interventions aimed at promoting a shift toward public transportation usage, such as increased parking fees and the implementation of road pricing mechanisms. Although these recommendations are not derived directly from the statistical model, they are substantiated by field observations and are consistent with previous research emphasizing the importance of accessibility and regulatory policies in shaping commuter behavior. It is also important to recognize that this research is based on data collected through structured questionnaires, which primarily capture variables related to user demographics, trip characteristics, service quality, and satisfaction. Future studies could incorporate additional explanatory factors, particularly those addressing route coverage and transportation governance, to develop a more comprehensive understanding of the elements influencing loyalty in public transportation systems.

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