Boarding House Property Market Trends and Investor Preferences in Boarding House Development: A Comparative Study with Web Scraping

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ABSTRACT

The development of the education industry and other supporting sectors scattered in the Sleman Regency - Indonesia has influenced the mushrooming of boarding houses. It is essential to use business intelligence for boarding house investors to analyze market trends to produce a boarding property business that is not inferior to its competitors. This study aims to contribute to the boarding house investors to obtain information on the characteristics, relationships, and effects of boarding house facilities on the rental prices set to remain competitive in the market. A total of 658 boarding house data from an e-commerce platform was extracted using business intelligence web scraping to determine the characteristics of the boarding house market trend in Sleman Regency. Multinomial Logistic Regression was used to find out the facilities for rooms, bathrooms, shared services and equipment, and common rooms, making the difference in rental prices for superior, exclusive, intermediate, and standard boarding house classes. The Multinomial Logistic Regression analysis results revealed that boarding houses with high rental prices were more concerned with things directly felt by tenants (everything about their room needs). Meanwhile, boarding houses with affordable rental prices prioritized things that general tenants could use/utilized.

Keywords: boarding house, market trends, web scraping, business intelligence, investor preferences

ABSTRAK

Berkembangnya industri pendidikan dan sektor pendukung lainnya yang tersebar di Kabupaten Sleman – Indonesia turut mempengaruhi menjamurnya indekos. Pemanfaatan business intelligence penting bagi investor indekos untuk dapat menganalisis tren pasar sehingga menghasilkan bisnis properti indekos yang tidak kalah dengan kompetitornya. Penelitian ini bertujuan untuk memberikan kontribusi kepada para pengusaha indekos untuk memperoleh informasi mengenai karakteristik, hubungan, dan pengaruh fasilitas indekos terhadap harga sewa yang ditetapkan agar tetap kompetitif. Sebanyak 658 data dari platform e-commerce diekstrak dengan business intelligence web scraping untuk mengetahui karakteristik tren pasar indekos di Kabupaten Sleman. Regresi Logistik Multinomial digunakan untuk mengetahui fasilitas kamar, kamar mandi, layanan dan perlengkapan bersama, serta ruang bersama, yang membuat adanya perbedaan harga sewa kelas indekos: Superior, eksklusif, menengah, dan standar. Hasil analisis Regresi Logistik Multinomial mengungkapkan bahwa indekos dengan harga sewa yang tinggi lebih mementingkan hal-hal yang dirasakan langsung oleh penyewa yaitu segala sesuatu tentang kebutuhan kamarnya. Sedangkan indekos dengan harga sewa terjangkau mengutamakan hal-hal yang dapat dimanfaatkan oleh penghuni umum.

Kata Kunci: *indekos, market trends, web scraping, business intelligence, investor preferences*

I. INTRODUCTION

Yogyakarta Special Region is an education center of Indonesia. Sleman Regency is located in Yogyakarta which has attracted many people to study in this region. Apart from being known as a center of education, the central region of Sleman (which covers Mlati, Sleman, Ngaglik, Ngemplak, Depok, and Gamping Sub-Districts) is also a center of trade and services. Based on statistical data on current migration by the Central Bureau of Statistics (BPS, 2011, 2016) Indonesia for 2010 and 2015, Sleman Regency had the largest number of student migration from diploma, undergraduate, to postgraduate levels compared other

with regencies/cities in Yogyakarta Special Region, reaching more than 21,000 students migrate to study in Sleman Regency. Likewise, the number of people migrating to work as laborers/employees in the Sleman Regency was the largest than other sub-districts/cities in Yogyakarta Special Region, reaching more than 29,000 people (BPS, 2011, 2016).

Moreover, education is vital in building society (Agarwal, Ramadani, Gerguri-Rashiti, Agrawal, & Dixit, 2020), and various business opportunities can be raised from it. One of them is a business that concerns the primary human needs, namely the residential property business. A boarding house is a means of temporary housing for students and the general public. In general, choosing a property location takes into account many factors (Agarwal et al., 2020).

The growth of school and university education, as well as various industrial sectors, impacts the increasing need for boarding property. Quoted from an article *"21 Ide Bisnis Dahsyat untuk Meraih Sukses Finansial* [21 Great Business Ideas for Achieving Financial Success]" by Yodhia (2020), boarding houses are one of the promising choices as a long-term business (Gholipour, 2020). This increase in demand is strongly influenced by the population involved (Ahmed Ali, 2018; Lee, 2018; Moussa & Abou Elwafa, 2017). One of the impacts is that the surrounding community's quality of life is getting better (Hosseini, de la Fuente, & Pons, 2016; Scott & Langhorne, 2012; Sulistyono et al., 2022). On the market, there are lots of boarding rental prices and boarding facilities offered. Boarding house characteristics are essential factors that influence decisions and satisfaction in living, including environmental conditions and resource availability (Sena et al., 2021; Shan, 2020; Xu, Liu, Wu, Zheng, & Zuo, 2020).

Competition in the increasingly advanced industrial world requires companies to be able to provide services that can meet the needs and satisfaction of their consumers (Kusuma et al, 2022). Therefore, a boarding house investor must first know the characteristics of boarding house facilities based on rental prices so that they are not inferior to competitors (can meet consumer expectations). One of the factors that impacts customers is that they must feel comfortable using it (Attaianese & d'Angelor, 2018; Burov, 2019; Kalteh, Mortazavi, Mohammadi, & Salesi, 2021; Valérie, Beguin, & Duarte, 2018).

There are various informations on boarding advertisements on the internet that can be accessed quickly whenever people want. However, the increasing volume and complexity of data (big data) from time to time is a challenge to use business intelligence to gain insights (OmniSci, 2020). Big data can help make better decisions based on clear evidence rather than intuition (Aversa, Hernandez, & Doherty, 2021; Jeble, Kumari, & Patil, 2017; Modgil, Gupta, Sivarajah, & Bhushan, 2021; Singh et al., 2020; Song & Song, 2021). Big data concerning boarding house market trends helps boarding entrepreneurs analyze market trends for boarding house construction.

Past literature has focused on discussing rental housing in terms of tenant preferences in making decisions to rent a place to live. Tenants want facilities that make them comfortable to live (Ghifari & Prihartanti, 2017). Pradana, Setijanti, and Septanti (2019) identified what potential consumers prioritized in making decisions about boarding houses in Surabaya, Indonesia, namely as many as 49% preferred TV and AC facilities, 31% chose TV facilities only, and 20% chose TV, AC, and water heater facilities. As many as 53% chose additional space facilities in the form of a private bathroom, and 47% chose additional bathroom, sink, and kitchen space. As many as 65% chose complete facilities with mattress, study desks, chairs, wardrobes, and wi-fi, 32% chose mattresses, wardrobes, and wi-fi, 1% chose mattress and wardrobe facilities, and 2% chose to bring their equipment (empty room). As many as 59% chose to have a living room and kitchen, 30% chose the living room, kitchen, and mosque, and 11% chose only the living room. 59% chose a room size of 3x4 meter ($12m^2$), 34% chose a room size of 4x6 meter ($24m^2$), and 7% chose a room size of 3x3 meter ($9m^2$).

Research on boarding houses in terms of investor preferences in boarding house development based on the boarding property market trend has not been conducted. Research that approaches in terms of investor preference was carried out by Amenyah and Fletcher (2013) for apartment rentals (Melser, 2020; Odubiyi, Oguntona, Oshodi, Aigbavboa, & Thwala, 2019; Saunders & Tulip, 2020; Su et al., 2021; Zambrano-Monserrate & Ruano, 2019). They explored the impact of location and apartment characteristics on rental prices in the Accra Metropolitan Area. The study found a relationship between the availability of facilities and the rental rate. Therefore, this current study tries to apply one of the business intelligence applications with a data-driven approach, namely the web scraping technique. Web scraping techniques have been proven to be able to manage data effectively (Kinne & Axenbeck, 2020; Matta, Sharma, Sharma, Pant, & Sharma, 2020; Nicolas, Kim, & Chi, 2021; Skoulikaris & Krestenitis, 2020). Web scraping was utilized as a data mining technique for boarding house e-commerce platforms on the internet to explore various insights regarding the factors influencing the determination of boarding rental prices. This research explores the results of data mining from a boarding house e-commerce platform to reveal the characteristics, relationships, and effects of boarding house facilities on the rental prices set in order to provide insight for boarding house investors in order to have a competitive boarding house business.

II. METHOD

This study conducted a homestay survey using secondary data available on the internet, namely the Mamikos website, the number one boarding e-commerce platform in Indonesia. The researchers used secondary data from the internet due to the ease of data collection compared to research with primary data collection, which, of course, required expensive costs, the effort to obtain data directly from the boarding owner informants was difficult and took a long time. Even more, in this industrial 4.0 era, the role of business intelligence is needed to support companies in making efficient and effective decisions. The availability of various data on the internet that can be accessed in real-time and flexible at a relatively low cost has encouraged researchers to take advantage of it.

Therefore, this study collected secondary data with web scraping techniques. Web scraping is one of the business intelligence in IoT, used to extract data/information from online sources. In this study, the web scraping tool used was the free trial version of the ScrapeStorm software. The secondary data from www.mamikos.com were collected from the period 26 June 2020 to 14 August 2020. ScrapeStorm software was chosen because of its ease of extracting large volumes of data in a matter of fast time. The ScrapeStorm software utilized in conducting this research was the free trial version, so it was limited to the maximum amount of data extracted, which was 100 data/day/account. Because of this limitation, the researchers extracted boarding data in the Sleman Regency area every day using the generated e-mail accounts. The scraping results were then exported into Excel format. The process of making all data one was carried out. After that, the data cleaning process was performed from the noise data, namely handling the wrong values, incomplete data, and incorrect information. The cleaned data were carefully collated ready for analysis. The total final data ready to be analyzed was 681 data with 56 variables.

The volume and complexity of the data variables obtained must be translated into easily understood information. To gain insight from the data, data processing was carried out with various statistical analyzes. This study used descriptive statistics to describe the data characteristics in general and multivariate inferential statistics with the multinomial logistic regression technique to determine what facilities were considered in determining the rental price of a boarding house. Descriptive analysis was assisted by Microsoft Excel software and SPSS software for multinomial logistic regression analysis.

Multinomial logistic regression was used to predict the dependent variable (in the form of nominal data categories with > 2 categories or can be called a polycotomy), which was given one/more independent variables (https://statistics.laerd.com, 2018). The independent variables in logistic regression can be nominal categories/continuous, or a mixture of both in one model (Pallant, 2016). The primary purpose of multinomial logistic regression is to identify independent variables that affect group membership in the dependent variable and build a classification system based on a logistic model to determine group membership (Black & Babin, 2019). Equation 1 is a multinomial logistic model, which states the log odds as a linear function of the independent factors.

$$ln\frac{Pr(Y_i = k-1)}{Pr(Y_i = k)} = \alpha_{k-1} + \beta_{k-1,i}X_i \qquad (1)$$

Description:

$\frac{\Pr(k-1)}{\Pr(k)}$ = The probability of each category (Y), where k is the reference category

a = Category constants $k-1$.

β = Log odds, the coefficient of the X-i independent variable in the category $k-1$

X_i = The independent ith variable

The probability of each category was compared with the probability of the reference category, expressed using Equation 2. All the probability categories must add up to one.

$$Pr(Y_i = k-1) = \frac{e^{\beta_{k-1,i}X_i}}{1 + \sum_{k=1}^{k-1} e^{\beta_{k-1,i}X_i}} \qquad (2)$$

III. RESULT AND DISCUSSION

3.1 Characteristics of the Distribution of Boarding Houses

This research area was Sleman Regency, Yogyakarta Special Region, Indonesia. As many as 74% of boarding houses were scattered in Depok Sub-District, 19% in Mlati Sub-District, 6% in Gamping Sub-District, and 1% in Mlati Sub-District. It is not surprising that many boarding houses have been built in Depok District. Based on monograph data on the official government website for Depok District (2019), there were 69 colleges/academies. Depok sub-district is a very strategic area to build boarding houses as temporary housing for students outside the region.

Based on the tenant's status, 0.4% of boarding houses were reserved only for employees, and 86% of boarding houses were for the general (students and employees), with 13.3% of boarding houses allowing

tenants to be married couples. Besides, it was known that the type of boarding house in the Sleman Regency was dominated by female boarding houses, which was 58%. The remaining 30% were male boarding houses, and 12% were mixed boarding houses. It is the right decision to target boarding houses not only for employee tenants but also for student tenants due to the large number of students in the Sleman Regency. However, accepting a married couple/mixed tenant needs more supervision, given the existence of other tenants, namely unmarried men/women.

Based on the area of the room, it was known that the smallest room area was 2 m × 1.5 m ($3m^2$), and the widest was 7.5 m x 7 m ($52m^2$). Several lodges had very spacious rooms, above most boarding houses in general, ranging from about 12 $m^2$to 52 m^2. Reporting to an article on how to design a boarding house by Okezone (2014), the minimum room size is 2.5 m x 3 m ($7.5m^2$), assuming that the furniture used is a single bed, wardrobe, and study table. The median boarding room area in Sleman Regency was 12 m^2, meaning that many boarding houses have met the standards, with most boarding houses being <12 m^2 in size. The room's size needs to be considered to meet the tenants' convenience in terms of placing their belongings. Investors must ensure that the minimum space requirements for occupancy are met. Do not let it just to pursue profit, there is room to be sacrificed, or the area is not up to the standard so that it reduces comfort (Okezone, 2014).

3.2 The Determination of Provision of Boarding House Facilities

A The next stage was to analyze what facilities affected a boarding house's rental price using multinomial logistic regression. The analysis was carried out using multinomial logistic regression because the independent variable data (facilities in rooms, bathrooms, shared services and equipment, and common rooms) were obtained in the form of nominal with binary; 1 means provided, and 0 means not provided. Because multinomial logistic regression was employed to predict categorical results, it was necessary to change the dependent variable data on rental prices from continuous to categorical ratios. This categorization was done by calculating the class width shown in Equation 3. However, before determining the class width, it was crucial to remove the outliers on multinomial logistic regression because they could affect the overall observation. All outliers were deleted so that from 681 raw data, 658 outliers handling results were obtained.

$$Class\ width = \frac{Maximum\ value - Minimum\ value}{The\ desired\ interval}$$

$$Class\ width = \frac{IDR.2{,}750{,}000 - IDR.250{,}000}{4} = IDR.625{,}000{,}-$$

Based on rental price data and boarding house availability, it could be concluded that the higher the rental price, the fewer the number. It could be influenced by the hypothesis of the law of demand, stating that the lower the price of an item, the greater the number of goods demanded, and vice versa. Many investors preferred to set up boarding houses at low prices to reach more tenants.

In this study, an analysis was carried out with multinomial logistic regression for four facility objects: room, bathroom, shared services and equipment, and common room. There were 19 room facility variables in the data, nine-bathroom facilities variables, eight shared service facilities and equipment variables, and 13 common room facilities variables. The percentage of each of these facilities in shared service facilities and equipment and common room facilities, respectively, can be seen in Figure 1 and Figure 2. The use of multinomial logistic regression was only explained in determining the provision of boarding room facilities based on the boarding rental price class. The other three objects, namely the analysis of determining the facilities for bathrooms, shared services and equipment, and the common room, are briefly discussed.

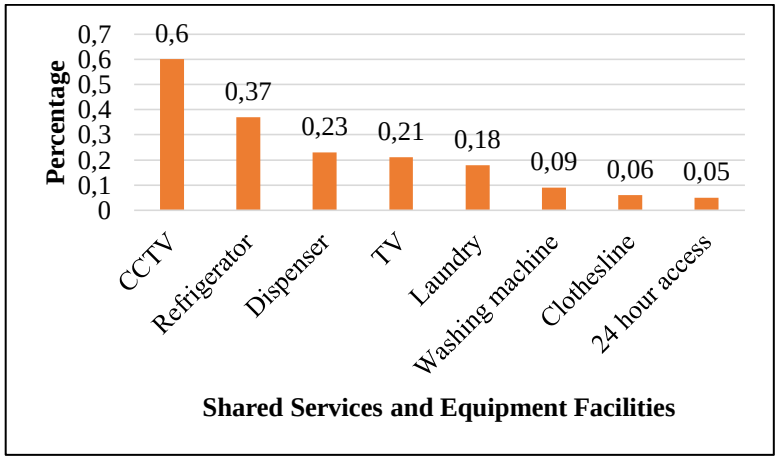

Figure 1. Percentage of Shared Services and Equipment Facilities in Boarding House

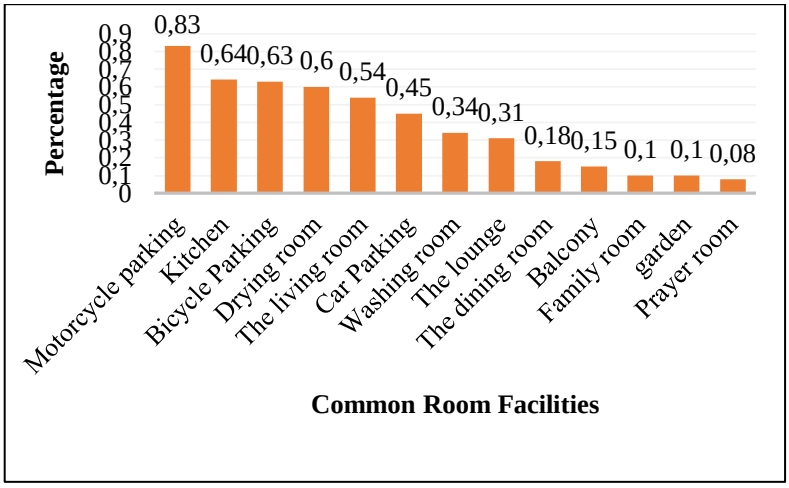

Figure 2. Percentage of Shared Room Facilities in Boarding House

Several predictor variables for room facilities had a small proportion. By considering the proportion data, elimination could be carried out. The predictor variables, namely sofa, bolster, and dining table facilities, were very small, namely <3%, so it was decided not to be included in the multinomial logistic regression analysis because they were considered not to affect the rental price.

The significance and suitability of the model for the data were determined by the Cox & Snell $\boldsymbol{R^2}$and Nagelkerke $\boldsymbol{R^2}$ statistics on the Pseudo $\boldsymbol{R^2}$ output, as well as the Chi-Square (Nantomah, Haruna, & Kaba, 2017). The values of Cox & Snell $\boldsymbol{R^2}$and Nagelkerke $\boldsymbol{R^2}$ indicate the amount of variation in the dependent variable described by the model; the minimum value is 0 to a maximum of about 1 (Pallant, 2016). In the multinomial choice model, the higher the Pseudo $\boldsymbol{R^2}$, the better the model (Cullinane, 2004). However, it is not always true. In practice, the Pseudo $\boldsymbol{R^2}$ value is neglected because there is no generally accepted measure for this type of model and has empirical and theoretical upper bounds that are sometimes substantially less than one (O'Donnell & Connor, 1996). In contrast, the measure for determining model accuracy was to use the statistical significance of the Chi-Square final model, showing the relationship between the dependent variable and the combination of the independent variables (O'Donnell & Connor, 1996).

Estimated parameters in multinomial logistic regression were identified and compared with the base category (reference category) of the dependent variable (Long, 1997). Pallant (2016) explained information about the contribution/importance of each predictor variable that can be seen in the Wald test statistical value. Other information is the value of significance (Sig.). The confidence level used in this study was 95%. Thus, if the value at significance is ≤0.05, it means that the variable contributes significantly to the model's predictive ability. Besides, information on the probability of a case falling into a specific category can be found in the output value β (log odds). The value of β can be positive/negative, which tells the direction of the relationship, i.e., which factors increase the probability of a Yes answer and which factors decrease it. Another vital piece of information from SPPS is the value of Exp (β), the odds ratios (OR) for each independent variable. According to Tabachnick, Fidell, and Ullman (2007), the odds ratio represents the change in odds on the outcome of one category when the value of the predictor increases by one unit.

In the parameter estimation output, there is also information on standard errors (Std. Error). In the model for determining the provision of boarding room facilities based on the boarding rental price class, Std. Error had a value of> 2, which was in the variables of a pillow, air conditioning, mirror, and wi-fi facilities. Standard error >2 indicates multicollinearity in the β coefficient model (Cullinane, 2004). Multicollinearity is a situation that shows a high intercorrelation between independent variables (Pallant, 2016). Ideally, the independent variables will be closely related to the dependent variable but not closely related to one another. Thus, the facilities for pillows, air conditioning, mirrors, and wi-fi were also eliminated following the variables of facilities for a sofa, bolster, and dining table. Thus, there were 13 variables of boarding room facilities remaining. The sample size guideline for multinomial logistic regression shows a minimum of 10 cases per independent variable (Schwab, 2002). The number of boarding room facilities' variables was the largest, so that the minimum amount of data required was 130 data. After going through the outliers' detection process, the data owned was 658, so the data owned have met the minimum sample size of multinomial logistic regression.

After eliminating the predictor variables for a sofa, bolster, dining table, pillow, air conditioner, mirror, and wi-fi, the multinomial logistic regression analysis process with SPSS was carried out again. The standard boarding rental price class was chosen as the reference (basic category). The output of the model's suitability with Chi-Square is shown in Table 1 and the output parameter estimates are displayed in Table 2.

Table 1. Model Fitting Information for Room Facilities

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	860.242			
Final	410.132	459.110	39	.000

Table 2. Multinomial Logistic Regression Model for Room Facilities

Price[a]		B	Std. Error	Wald	Sig.	Exp(B)
Superior	Intercept	6.710	1.669	16.175	.000	
	[Mattress=0]	-19.791	.000	.	.	2.541E-9
	[Mattress=1]	0[b]	.	.	.	.
	[Table=0]	1.296	.968	1.794	.180	3.655
	[Table=1]	0[b]	.	.	.	.
	[Chair=0]	-1.647	.831	3.926	.048	.193
	[Chair=1]	0[b]	.	.	.	.
	[Cupboard=0]	.770	.788	.955	.329	2.159
	[Cupboard=1]	0[b]	.	.	.	.
	[Cable TV=0]	-3.274	1.058	9.575	.002	.038
	[Cable TV=1]	0[b]	.	.	.	.
	[TV=0]	-4.613	.797	33.498	.000	.010
	[TV=1]	0[b]	.	.	.	.
	[Fan=0]	-1.684	.835	4.069	.044	.186
	[Fan=1]	0[b]	.	.	.	.
	[Refrigerator=0]	.554	.875	.401	.527	1.740
	[Refrigerator=1]	0[b]	.	.	.	.
	[Dispenser=0]	.860	1.066	.650	.420	2.362
	[Dispenser=1]	0[b]	.	.	.	.
	[Sink=0]	.891	.961	.859	.354	2.436
	[Sink=1]	0[b]	.	.	.	.
	[Dressing table=0]	-2.529	1.013	6.226	.013	.080
	[Dressing table=1]	0[b]	.	.	.	.
	[CS=0]	-1.425	.679	4.411	.036	.240
	[CS=1]	0[b]	.	.	.	.
Intermediate	Intercept	7.180	1.320	29.591	.000	
	[Mattress=0]	-.597	.515	1.342	.247	.551
	[Mattress=1]	0[b]	.	.	.	.
	[Table=0]	-.473	.353	1.802	.179	.623
	[Table=1]	0[b]	.	.	.	.
	[Chair=0]	-1.025	.291	12.417	.000	.359
	[Chair=1]	0[b]	.	.	.	.
	[Cupboard=0]	-.662	.402	2.713	.100	.516
	[Cupboard=1]	0[b]	.	.	.	.

	[Cable TV=0]	-2.400	.895	7.190	.007	.091
	[Cable TV=1]	0[b]	.	.	.	.
	[TV=0]	-2.834	.436	42.264	.000	.059
	[TV=1]	0[b]	.	.	.	.
	[Fan=0]	-1.303	.445	8.570	.003	.272
	[Fan=1]	0[b]	.	.	.	.
	[Refrigerator=0]	1.613	.566	8.131	.004	5.019
	[Refrigerator=1]	0[b]	.	.	.	.
	[Dispenser=0]	-.229	.633	.131	.717	.795
	[Dispenser=1]	0[b]	.	.	.	.
	[Sink=0]	.429	.563	.580	.446	1.536
	[Sink=1]	0[b]	.	.	.	.
	[Dressing table=0]	-2.063	.813	6.431	.011	.127
	[Dressing table=1]	0[b]	.	.	.	.
	[CS=0]	-.411	.427	.928	.335	.663
	[CS=1]	0[b]	.	.	.	.
Exclusive	Intercept	6.726	1.411	22.713	.000	
	[Mattress=0]	.479	.627	.584	.445	1.615
	[Mattress=1]	0[b]	.	.	.	.
	[Table=0]	-.133	.495	.072	.789	.876
	[Table=1]	0[b]	.	.	.	.
	[Chair=0]	-1.519	.375	16.396	.000	.219
	[Chair=1]	0[b]	.	.	.	.
	[Cupboard=0]	-.664	.512	1.683	.195	.515
	[Cupboard=1]	0[b]	.	.	.	.
	[Cable TV=0]	-2.429	.924	6.908	.009	.088
	[Cable TV=1]	0[b]	.	.	.	.
	[TV=0]	-4.191	.463	82.000	.000	.015
	[TV=1]	0[b]	.	.	.	.
	[Fan=0]	-.126	.626	.041	.840	.881
	[Fan=1]	0[b]	.	.	.	.
	[Refrigerator=0]	1.664	.614	7.337	.007	5.282
	[Refrigerator=1]	0[b]	.	.	.	.
	[Dispenser=0]	-.097	.693	.020	.888	.907
	[Dispenser=1]	0[b]	.	.	.	.
	[Sink=0]	-.082	.595	.019	.890	.921
	[Sink=1]	0[b]	.	.	.	.
	[Dressing table=0]	-2.052	.839	5.985	.014	.128
	[Dressing table=1]	0[b]	.	.	.	.
	[CS=0]	-.596	.464	1.652	.199	.551
	[CS=1]	0[b]	.	.	.	.

a. The reference category is: Standard.

b. This parameter is set to zero because it is redundant.

The interpretations of the parameter estimate output are as follows:

Superior Class vs. Standard Class

- Compared with providing mattresses, not providing mattresses was less considered in Superior Boarding House than Standard Boarding House even though it was not significant.
- Compared with providing a table, not providing a table was more considered in a Superior Boarding House than a Standard Boarding House even though it was not significant.
- Compared with providing chairs, not providing chairs was significantly less considered at Superior Boarding House than Standard Boarding House.
- Compared with providing cabinets, not providing cabinets was more considered in the Superior Boarding House than the Standard Boarding House, although it was not significant.
- Compared with providing cable TV, not providing cable TV was significantly less considered at Superior Boarding House than Standard Boarding House.
- Compared with providing TV, not providing TV was significantly less considered in Superior Boarding House than Standard Boarding House.
- Compared with providing a fan, not providing a fan was significantly less considered at Superior Boarding House than Standard Boarding House.

- Compared with providing a refrigerator, not providing a refrigerator was more considered in Superior Boarding House than Standard Boarding House, although it was not significant.
- Compared with providing a dispenser, not providing a dispenser was more considered in Superior Boarding House than Standard Boarding House even though it was not significant.
- Compared with providing a sink, not providing a sink was more considered in Superior Boarding House than Standard Boarding House even though it was not significant.
- Compared with providing a dressing table, not providing a dressing table was significantly less considered in Superior Boarding House than Standard Boarding House.
- Compared with providing cleaning services, not providing cleaning services was less considered at Superior Boarding House than Standard Boarding House, although it was not significant.

Exclusive Class vs. Standard Class

- Compared to providing mattresses, not providing mattresses was more considered in Exclusive Boarding House than Standard Boarding House, although it was not significant.
- Compared to providing a table, not providing a table was less considered in Exclusive Boarding House than Standard Boarding House, although it was not significant.
- Compared to providing chairs, not providing chairs was less significantly considered at Exclusive Boarding House than Standard Boarding House.
- Compared to providing wardrobe, not providing wardrobe was less considered in Exclusive Boarding House than Standard Boarding House, although it was not significant.
- Compared to providing cable TV, not providing cable TV was significantly less considered at Exclusive Boarding House than Standard Boarding House.
- Compared to providing TV, not providing TV was less significantly considered at Exclusive Boarding House than Standard Boarding House.
- Compared to providing fans, not providing fans was less considered in Exclusive Boarding House than Standard Boarding House, although it was not significant.
- Compared to providing a refrigerator, not providing a refrigerator was significantly more considered at Exclusive Boarding House than Standard Boarding House.
- Compared to providing dispensers, not providing dispensers was less considered in Exclusive Boarding House than Standard Boarding House, although it was not significant.
- Compared to providing a sink, not providing a sink was less considered in the Exclusive Boarding House than the Standard Boarding House, even though it was not significant.
- Compared to providing a dressing table, not providing a dressing table was significantly less considered in Exclusive Boarding House than Standard Boarding House.
- Compared with providing cleaning services, not providing cleaning services was less considered at Exclusive Boarding House than Standard Boarding House, even though it was not significant.

Intermediate Class vs. Standard Class

- Compared to providing mattresses, not providing mattresses was less considered on the Intermediate Boarding House than Standard Boarding House, although it was not significant.
- Compared to providing a table, not providing a table was less considered in the Intermediate Boarding House than the Standard Boarding House, although it was not significant.
- Compared to providing chairs, not providing chairs was significantly less considered in Intermediate Boarding House than Standard Boarding House.
- Compared to providing wardrobe, not providing wardrobe was less considered in the Intermediate Boarding House than the Standard Boarding House, although it was not significant.
- Compared to providing cable TV, not providing cable TV was significantly less considered on Intermediate Boarding House than Standard Boarding House.
- Compared to providing TV, not providing TV was significantly less considered on Intermediate Boarding House than Standard Boarding House.
- Compared to providing a fan, not providing a fan was significantly less considered on the Intermediate Boarding House than the Standard Boarding House.
- Compared to providing a refrigerator, not providing a refrigerator was significantly more considered on a Intermediate Boarding House than a Standard Boarding House.
- Compared to providing dispensers, not providing dispensers was less considered on the Intermediate Boarding House than the Standard Boarding House, although it was not significant.
- Compared with providing a sink, not providing a sink was more considered in the Intermediate Boarding House than the Standard Boarding House, even though it was not significant.

- Compared to providing a dressing table, not providing a dressing table was significantly less considered in the Intermediate Boarding House than the Standard Boarding House.
- Compared to providing cleaning services, not providing cleaning services was less considered at the Intermediate Boarding House than the Standard Boarding House, although it was not significant.

Table 3. Fitting Information Model for Room Facilities

Observed	Predicted				
	Superior	Standard	Intermediate	Exclusive	Percentage
Superior	0	2	3	13	0.0%
Standard	0	274	15	4	93.5%
Intermediate	0	89	54	63	26.2%
Exclusive	0	26	31	84	59.6%
Overall Percentage	0.0%	59.4%	15.7%	24.9%	62.6%

The classification accuracy rate should usually be 25% or more, higher than the proportional by chance accuracy rate. Proportional by chance accuracy rate was calculated by adding up the marginal percentage squares (see Table 3.) of each category, namely $0.445^2 + 0.313^2 + 0.214^2 + 0.027^2$ = 34.3%. The overall classification accuracy level for the room facilities model can be seen in Table 3, which was 62.6% greater than the proportional by chance accuracy criteria of 42.8% (1.25 × 34.3%). Thus, it could be concluded that the classification accuracy criteria have been met.

Boarding Room Facilities

- At Superior Class Boarding House, the facilities that were more considered by boarding house owners to provide were mattresses, but its priority over Standard Class boarding houses was not significant. The facilities that significantly differentiated Superior Class Boarding House with Standard Class Boarding House for more provided were chairs, cable TV, TV, fan, dressing table, and room cleaning service.
- At the Exclusive Class Boarding House, the facilities that were more considered by the boarding house owner to be provided were tables, wardrobes, fans, dispensers, sinks, and room cleaning services, but its priority compared to the Standard Class boarding houses was not significant. The facilities that significantly differentiated the Exclusive Class Boarding House from the Standard Class Boarding House for the more provided were chairs, cable TV, TV, and dressing table.
- At the Intermediate Class Boarding House, the facilities that were more considered by the boarding house owner to be provided were mattresses, tables, cupboards, dispensers, and room cleaning services, but its priority over the Standard Class boarding houses was not significant. The facilities that significantly differentiated a Intermediate Class Boarding House from a Standard Class Boarding House for more provided were chairs, cable TV, TV, fan, and dressing table.
- At the Standard Class Boarding House, the facilities that were more considered to be provided could be seen if the sign of influence on the Superior, Exclusive, and Intermediate Class Boarding Houses was all positive (+), namely refrigerator facilities.

The provision of chairs, cable TV, TV, and dressing table affected boarding houses' rental price at a 95% confidence level. Thus, probabilities were determined only for these variables (assuming that 50% of investors changed their decision to provide them). The following is a calculation of the probability of each variable.

$$Log\frac{P(Superior\ Room)}{P(Standard\ Room)}$$
$$= -1.647\text{chair} - 3.274\text{cable TV} - 4.613\text{TV} - 2.529\text{dressing table}$$
$$= -1.647(0.5) - 3.274(0.5) - 4.613(0.5) - 2.529(0.5)$$
$$= -6.0315$$

$$Log\frac{P(Exclusive\ Room)}{P(Standard\ Room)}$$
$$= -1.519\text{chair} - 2.429\text{cable TV} - 4.191\text{TV} - 2.052\text{dressing table}$$
$$= -1.519(0.5) - 2.429(0.5) - 4.191(0.5) - 2.052(0.5)$$
$$= -5.0955$$

$$Log\frac{P(Intermediate\ Room)}{P(Standard\ Room)}$$
$$= -1.025\text{chair} - 2.400\text{cable TV} - 2.834\text{TV} - 2.063\text{dressing table}$$

$$= -1.025(0.5) - 2.400(0.5) - 2.834(0.5) - 2.063(0.5)$$
$$= -4.161$$

Thus, the probability of boarding house rental prices could be predicted as follows:

$$P(Superior\ Room) = \frac{e^{(6.0315)}}{e^{(6.0315)} + e^{(5.0955)} + e^{(4.161)} + e^{(0)}} = 0.64573$$

$$P(Exclusive\ Room) = \frac{e^{(5.0955)}}{e^{(6.0315)} + e^{(5.0955)} + e^{(4.161)} + e^{(0)}} = 0.25325$$

$$P(Intermediate\ Room) = \frac{e^{(4.161)}}{e^{(6.0315)} + e^{(5.0955)} + e^{(4.161)} + e^{(0)}} = 0.09947$$

$$P(Standard\ Room) = \frac{e^{(0)}}{e^{(6.0315)} + e^{(5.0955)} + e^{(4.161)} + e^{(0)}} = 0.00155$$

Bathroom Facilities at Boarding House

- In Superior Class boarding houses, the facilities that boarding owners considered more to provide were private bathrooms, but its priority over Standard Class boarding houses was not significant. The facilities that significantly differentiated the Superior Class Boarding House from the Standard Class Boarding House for the more provided were shower and sink.
- In the Exclusive Class Boarding Houses, facilities that significantly differentiated the Exclusive Class Boarding House from the Standard Class Boarding House to be more provided were a private bathroom, shower, sink, and a shower bucket.
- In the Intermediate class boarding houses, the facilities that boarding owners considered more to provide were sinks and shower buckets, but its priority over the Standard class boarding houses was not significant. The facilities that significantly distinguished a Intermediate Class Boarding House with a Standard Class Boarding House to be more provided were private bathrooms, sitting toilets, and showers.
- In the Standard Class Boarding House, the facilities considered more to be provided could be seen if the sign of influence on the Superior, Exclusive, and Intermediate Class Boarding Houses had all (+) positive values, namely facilities of outside bathroom, squat toilets, and bathtub.

The provision of showers affected the boarding house rental price at a 95% confidence level. Thus, probabilities were determined only for these variables (assuming that 50% of investors changed their decision to provide them).

Boarding House Shared Service and Equipment Facilities

- In Superior Class boarding houses, the facilities that were more considered by boarding house owners to be provided were CCTV, refrigerators, and washing machines, but its priority over Standard Class boarding houses was not significant. Facilities that significantly differentiated a Superior Class Boarding House with a Standard Class Boarding House to be more provided were shared TV, dispenser, and laundry service.
- In the Exclusive Class Boarding House, the facilities that boarding owners considered more to provide were 24-hour freedom of access, CCTV, refrigerator, and washing machine, but its priority over the Standard Class Boarding House was not significant. The facilities that significantly differentiated the Exclusive Class Boarding House from the Standard Class Boarding House to be more provided were shared TV, dispenser, and laundry service.
- In the Intermediate Class Boarding House, the facilities that were more considered by the boarding house owner to be provided were 24 hour-free access, CCTV, shared TV, and washing machine, but its priority over the Standard Class boarding house was not significant. Facilities that significantly differentiated a Intermediate Class Boarding House with Standard Class Boarding House to be more provided were refrigerators, dispensers, and laundry services.
- In the Standard Class Boarding House, the facilities that were more considered to be provided could be seen if the sign of influence on the Superior, Exclusive, and Intermediate Class Boarding Houses had a (+) value of all, namely laundry facilities.

The provision of dispensers and laundry affected the boarding house rental price at a 95% confidence level. Thus, probabilities were determined only for these variables (assuming that 50% of investors changed their decision to provide them).

Shared Room Facilities at Boarding House

- In Superior Class Boarding House, the facilities that boarding owners considered more to provide were the dining room, kitchen, lounge, family room, garden, and balcony, but their priority over Standard Class

boarding houses was not significant. The facilities that significantly differentiated the Superior Class Boarding House from the Standard Class Boarding House for the more provided were the living room, prayer room, and car park.

- In the Exclusive Class Boarding House, the facilities that boarding owners considered more to provide were the living room, kitchen, prayer room, balcony, and bicycle parking, but the priority over the Standard Class boarding house was not significant. The facilities, which significantly differentiated the Exclusive Class Boarding House from the Standard Class Boarding House to be further provided, were the dining room, lounge, garden, and car park.
- In the Intermediate Class Boarding House, the facilities that were more considered by the boarding house owner to be provided were the drying room, living room, dining room, kitchen, prayer room, garden, and balcony, but the priority compared to the Standard Class boarding house was not significant. The facilities that significantly differentiated a Intermediate Class Boarding House with a Standard Class Boarding House to be more provided were the lounge and car park.
- In the Standard Class Boarding House, the facilities that were more considered to be provided could be seen if the sign of influence on the Superior, Exclusive, and Intermediate Class Boarding Houses had all (+) positive values, namely laundry and motorbike parking facilities.

The provision of car parking affected the boarding house rental price at a 95% confidence level. Thus, probabilities were determined only for these variables (assuming that 50% of investors changed their decision to provide them).

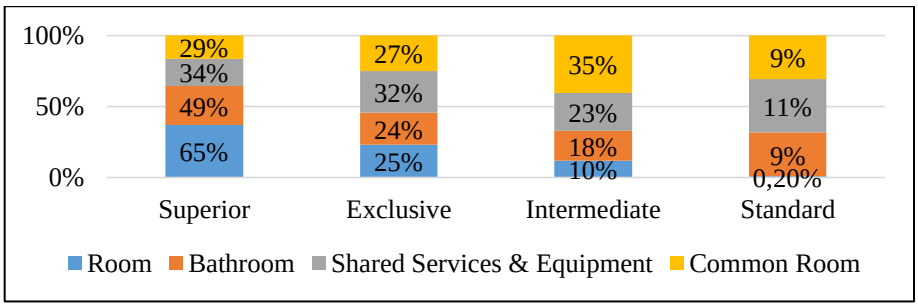

Figure 3. Comparison of Facility Interest Proportion by Boarding House Class

In summary, the analysis with multinomial logistic regression uncovered that the facilities that were significantly more considered by the Superior Class boarding house investors (IDR. 2,125,003,- - IDR. 2,750,003,-) to provide were chairs, cable TV, TV, fans, and dressing tables, room cleaning service, shower, bathroom sink, shared TV, dispenser, laundry service, living room, prayer room, and car park. Facilities that were significantly more considered by the Exclusive Class Boarding House investors (IDR. 1,500,002,- - IDR. 2,125,002,-) to be provided were chairs, cable TV, TV, dressing table, private bathroom, shower, bathroom sink, shower bucket, shared TV, dispenser, laundry service, dining room, lounge, garden, and car park. Facilities that were significantly more considered by Intermediate Class Boarding House investors (IDR 875,001,- - IDR 1,500,001,-) to provide were chairs, cable TV, TV, fans, dressing tables, private bathrooms, sitting toilets, showers, refrigerators, dispenser, laundry service, lounge, and car park. Facilities that were significantly more considered by the Standard Class Boarding House investors (IDR. 250,000 - IDR. 875,000) to provide were refrigerator, outdoor bathroom, squat toilet, bathtub, clothesline, laundry room, and motorbike parking. The classification accuracy results of all multinomial logistic regression models were all fulfilled. The probability prediction results of the facilities based on the boarding class are displayed in Figure 3. The probability results explained that half the change in the decision to provide facilities would result in the probability of ownership of the boarding class category.

III. CONCLUSION

This study drew data from the extraction results at one of the boarding house e-commerce platforms, www.mamikos.com, to provide insights to boarding house entrepreneurs to obtain information on the characteristics, relationships, and influence of boarding facilities on the rental prices set in the Sleman Regency, Yogyakarta Special Region, Indonesia. From the 19 bedroom facility variables and 9 bathroom facility data extraction results, there was elimination and leaving 12 bedroom facility variables and 8 bathroom facilities variables, which were the determinants of boarding rental prices. Meanwhile, in shared services and equipment and common room facilities, respectively, there were 8 and 13 predictor variables that determined the rental price, respectively. Rental prices could be divided into four class categories: Superior boarding house (IDR. 2,125,003,- to IDR. 2,750,003,-), Exclusive boarding house (IDR. 1,500,002,-

to IDR. 2,125,002,-), Intermediate boarding house (IDR. 875,001,- to IDR. 1,500,001,-), and Standard boarding houses (IDR. 250,000,- to IDR. 875,000,-).

Motorbike parking was considered more in Standard boarding than Superior, Exclusive, and Intermediate boarding houses, while car parking was significantly more considered Superior, Exclusive, and Intermediate boarding houses than Standard boarding houses. The target consumer class influenced it. A person's income will affect one's asset ownership. The higher a person's income, the more likely the assets they have. With a rental price of ≤ IDR 875,000, a standard boarding house was targeted at lower-class tenants. Thus, the vehicle assets owned will be in accordance with financial capabilities.

There is an interesting finding; namely, the refrigerator was more considered to be provided in the Standard Class Boarding House than other classes. In other words, it showed that most tenants came with some level of furniture beyond what standard rental housing expected (Troy, Van den Nouwelant, & Randolph, 2019). Lodgings above Standard Class considered providing chairs and additional facilities, such as cable TV, TV, dressing table, and dispenser. The next finding is that room cleaning services were the difference between the Superior Class Boarding House and other boarding house classes. The provision of cleaning services needs to be considered, given the high expectations of consumer demand, as shown in a survey conducted by Pradana et al. (2019) on middle- and upper-class students. It found that 85% chose cleaning staff, and the remaining 15% chose to clean their rooms. Laundry and drying rooms were considered at the Standard Boarding House to be provided as a laundry facility for renters that the tenants themselves could do. In contrast to the standard boarding houses, superior, exclusive, and intermediate boarding houses considered providing laundry services to help tenants take care of their dirty clothes. This laundry service can be a mutual relationship for tenants and investors. Offering laundry services will undoubtedly increase rental rates, but it will ease renters and investors' work, providing additional income opportunities for boarding investors.

Another finding is that the need for privacy is what differentiated boarding classes. Standard Class boarding houses tended to be less concerned with bathroom privacy. An outside bathroom with squat toilet facilities and a bathtub was more considered to be built by the Standard Class Boarding House investors because it is proportional to the rental price charged. Meanwhile, boarding houses above the Standard Class tended to pay more attention to the tenants' privacy, namely providing private bathrooms with shower facilities and bath buckets. It is crucial to pay attention to the decision to build a private/public bathroom. This choice depends on the target boarding market class. Based on a demand survey, tenants preferred private bathroom facilities over outside bathrooms (La Roche, Flanigan, & Copeland Jr, 2010; Pradana et al., 2019; Troy et al., 2019) because of their privacy needs and no need to queue with other tenants. The balance between the ratio of the number of tenants to the number of outside bathrooms and the ratio of the room area to the bathroom needs to be considered. Then, in Indonesia, a shower is indeed synonymous with upper-middle housing for bathroom facilities because it adds to the aesthetic impression, while the bathtub tends to be in the middle to lower housing. It is unfortunate for Standard class investors because using a shower can reduce water consumption and save consumer bathing time compared to using a dipping bath. An article about the house by Ratnasari (2019) explained that a shower could pump up to 9.5 liters/minute. If consumers cleaned the body in just ten minutes, only 95 liters of water was wasted. Meanwhile, it took approximately 7.5 minutes to fill the tub full when using a scoop, with a 23 liters/minute water tap power. The total water used by consumers was ± 172.5 liters, much more significant than using a shower.

The probability prediction results revealed that the Superior Class boarding house facilities of the most prioritized by investors to be provided, respectively, were facilities for rooms, facilities for bathrooms, facilities for shared services and equipment, and facilities for common rooms. Exclusive Class Boarding House Facilities from the most priority to be provided, respectively, were facilities for rooms, facilities for shared services and equipment, facilities for common rooms, and facilities for bathrooms. For Intermediate and Standard class boarding house investors, room facilities were the last priority, followed by bathroom facilities. However, compared to Intermediate Class Boarding House investors, for Standard Class boarding house investors, providing facilities for shared services and equipment was prioritized to provide facilities for shared rooms. All of this indicated that a boarding house with expensive rents was relatively concerned with things directly felt by tenants, namely everything about their room needs. Meanwhile, boarding houses with affordable rental prices prioritized things that all tenants could use/utilized, namely everything for shared services, equipment, and space.

With the development of the internet, it is hoped that investors will be able to dig up various information and collect data regarding the provision of boarding facilities from various online sources. Web Scraping techniques can be used as a tool to extract data or information regarding market developments automatically. The results of this extraction are used as data-driven to conduct market research in order to gain a competitive advantage. Multinomial Logistic Regression can be used to help investors find out what facilities are being considered in a class category. The results support decisions in determining priorities for

providing facilities based on class categories, namely whether investors will differentiate facility offerings from other competitors in whole/part/same as those on the market.

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