ASSESSMENT OF HOUSING CHOICE CRITERIA FOR THE UNIVERSITIES' STUDENTS IN NORTH CYPRUS USING AHP METHOD

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ÖZ

Considering the effective factors of student housing choice in North Cyprus universities, this study attempts to explore the most significant criteria in advance, then evaluates the importance of criteria by applying the analytic hierarchy process (AHP) is one the more broadly used multi-criteria decision making (MCDM) methods with pairwise comparison between criteria. Feedback of the first part of study was gained using sixty interviews to know how the quality of housing service can be improved for universities' students, and consequently, for the second part of research, via hundred valid AHP standard questionnaires. A four-level hierarchical model was structured with sixteen sub-criteria, and the findings of the model analysis revealed that the preferred housing choice factors respectively are: Proximity, Cost, Rules and Regulations, Peace, and Privacy, followed by Maintenance, Room Arrangement, Ventilation, Internet access, Communication, Reading Section, Empathy, Culture, Common lounge, Kitchen, Social Class. It identifies the attributes that influence students' decisions on which can aid the institution's housing administrators and private landlords to improve tangible and intangible housing qualities and facilities.

Keywords: Housing choice, Analytic Hierarchy Process (AHP); Multi-criteria decision making (MCDM); North Cyprus.

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1.   Introduction

Academic efficiency is one of the more important constituents of success at higher-level institutions such as universities. Price, Matzdorf, Smith, and Agahi (2003) observed that students' social and interactive growth is positively related to having sufficient facilities at universities. Also, according to Adewunmi, Omirin, Famuyiwa, and Farinloye (2011), "facilities available to students" and "support services" are indicators that highly affect academic productivity. Many researchers such as Najib, Ulyani, Yusof, and Abidin (2011) are of the opinion that providing good environments in student houses or dormitories helps improve students' intellectual abilities.

Hassanain (2008) observed that both mutual interest among students and educational outcomes can be promoted through effectively planned residential facilities. He further observed in his research that suitable and proper dormitory facilities can offer intellectual stimulation, security, inspiration, and cooperation; therefore, in achieving the goal of improving student performances the influence of housing facilities should not be underrated.

The Turkish Republic of Northern Cyprus as a strategic area and the third biggest island in the Mediterranean Sea is located to the south of Turkey, West of Asia and North of Africa, 75, 200, and 380 km respectively. Turkish Republic of Northern Cyprus was established in 1983 that it has population of over 300,000 with the per capita income around 15,000 US$ which it is recognized only by its mainland, Turkey. Many overseas students have been attracting to North Cyprus with more than eight universities and colleges since 1982 as a sequence of the prosperous growth of its education sector. At the 2011-2012 academic year, around 53,000 students were studying in the universities of North Cyprus, which 20.40% were Turkish Cypriots, 72.95% were from Turkey, and 6.65% were international (Katircioğlu, 2014; Teralı, Zorlu, Bulbul, & Gurkan, 2014).

In spite of the growing number of students coming to the island for educational purposes, no qualitative or quantitative research has been done to evaluate the current student-housing situation.

Hence, the need for this study, which will help evaluate the current student-housing situation, ensure necessary feedback, and help project future needs. It will also provide a basis from which decision-makers can determine how to improve the current housing situation in terms of its design, location, etc., as well as how to make changes to future housing.

The purpose of this research is to determine the housing situation of students in North Cyprus universities as a case study. It identifies the attributes that influence students' decisions on which apartment or dormitories to rent and ultimately seeks to discover how service quality can be improved by prioritizing these attributes.

For the purposes of this research, university housing will be divided into three categories: university-owned on-campus dormitories, private-owned on-campus dormitories, and off-campus housing.

2.   Literature Review

2.1.   The Service Concept and Dimensions of Service Quality

According to Jumat, Coffey, and Skitmore (2012) service is a pecuniary activity that involves effectuating values and providing benefits to customers at definite times and places by creating anticipated change in either the recipients of the service or on their behalf. In Johnston's (2005) opinion, service is a synthesis of effects and skills conveyed to the customer; consequently, consumers evaluate a service rendered based on its outcome and their experience with it.

Di Mascio (2007) opines that target market services and the concept of service have interrelated features. He also describes the service concept as a blend of goods and services sold to customers. To determine the service provider's level of success, it is expedient to first appraise the customer's perception level of service quality. According to Bashir, Sarki, and Samidi (2012), the question is how to evaluate this. Service quality cannot be perceived by a customer in a shallow or one-dimensional approach but must be judged based on several factors both relevant and related to the context.

2.2.   Service Quality in the Context of Students' Accommodation

In the past two decades, there have been various endeavors by a few researchers to recognize, assess, and comprehend the major features affecting housing value in diverse contexts, such as motels and hostels. An evaluation of previous studies indicates that there are different scopes of service quality in different housing research contexts (Lockyer, 2005; Clemes, Gan, & Ren, 2011; Bitner, 1992; Choi & Chu, 2001; Tzeng, Teng, Chen, & Opricovic, 2002). Different students in service quality, especially in housing sectors, have been found on the famous SERVQUAL model proposed by Parasuraman, Zeithaml, and Berry (1988).

Normann (1991) categorized service products into core service and supplemental service components. He described "core services" as the main reason why an organization is in the service sector and as showing the organization's fundamental ability to create worth for and with their customers. Core services in the student-housing context can be inferred to be the most crucial reason why students rent their accommodations for a period. Therefore, facilities such as restrooms and bedrooms are basic things that students probably consider first when seeking to rent an accommodation as far as core services related to student housing are concerned.

In contrast to core services, Normann (1991) described "complementary services" as those that are auxiliary. He further subcategorized complementary services into enhancing (supporting) and enabling (facilitating) services. "Supporting services" create added value rather than expediting the delivery of the core services to the client, while "facilitating services" are services that are crucial for implementing the core service. In student housing context, supporting services include reading rooms, libraries, parking garages, entertainment facilities, etc. Supporting services are not the most vital factors

student-housing rentals and are only desired if they are readily available; on the other hand, facilitating services in student housing are services that are necessary for wholesome and healthy accommodation, including security, utilities (electricity, water, etc.), and rules and regulations.

Aside from the core and complimentary aspect of student housing quality, the overall quality and cost of housing are more important factors in evaluations of student housing quality. Nimako (2012), Gera (2011) and Cronin, Brady, and Hult (2000) are of the opinion that in the service delivery context, the price paid by customers to acquire the service and the service provided are important quality factors in service/product evaluation.

Factors that can affect the service-user experience may include the service's age, quality, technology, choice, speed and choice, but even though most firms may share some factors, not all factors apply to all firms (Wei & Ramalu, 2011). The physical attributes of a residential location, such as ventilation, lighting, and the positioning of windows and common areas in dormitories, also contribute to overall housing satisfaction (Mohit & Azim, 2012). A variety of factors may impact students' experiences of their chosen residences, ranging from physical to demographic attributes (Foubert, Tepper, & Morrison, 1998).

Najib and Sani (2012) are of the view that the physical attributes of student residences, such as room size, density, architectural design, and floor level influence students' experiences of living in student housing. Foubert et al. (1998) agreed, saying that factors such as location, architectural design, space, and support services influence students' experiences, and they noted further that noise, temperature, air quality, and light also have a significant influence.

Based on Hassanain's (2008) research, quiet is the most important requirement for any student housing, while Najib et al. (2011) are of the opinion that a quality housing experience emanates from having a quiet study area, a good relationship with one's roommate, and high quality facilities. Students evaluate their housing experiences based on the crowding level of the rooms and the availability of privacy (Amole, 2008), but Hassanain (2008) opined that students' housing experiences depend on physical qualities such as having wider and brighter rooms with less stress and noise. Najib and Sani (2012) said that an ideal student residence would provide security and privacy, create a silent study area, encourage friendship among its users, and help dormitory administrators satisfy residents' needs and aspire to improve student residential life. With positive experiences of quality facilities and services, students tend to perform best in school (Najib & Yusof, 2010).

Service providers now understand that the key to achieving a competitive advantage in their market niche is most dependent on customers' perceived value and, as such, they should focus on delivering value via the establishment of long-term client relationships through the consistent delivery of services that goes beyond expectations (Gouthier, Giese, & Bartl, 2012). According to Jones (2004), zero error, prompt and efficient service delivery within a cultured business environment, and acceptable

cost as perceived by consumers constitute service excellence. The benefits and challenges of service excellence are highlighted in previous studies revealing that the expectations of both students and other stakeholders are growing (Khan & Matlay, 2009).

Few studies explore both the social and physical factors that influence satisfaction with student housing; examples of such studies are Khozaei, Hassan, and Khozaei (2010) in Malaysia and Foubert et al. (1998) in the United States. Kaya and Erkip (2001) also focused on perceptions of crowding and room size in Turkey to evaluate student satisfaction. In 2008, Hassanain studied the level of satisfaction in relation to functional performance (e.g., furniture quality and room layout) and technical performance (e.g., temperature comfort) to sustain student-housing facilities.

In addition, residence hall qualities were researched by Amole (2009), which corresponded with the high level of satisfaction among students' residence in Nigeria. Although the research by Hassanain (2008), Kaya and Erkip (2001) were carried out in developing countries, location was distinct in relation to the climate and culture in the locations such as South East Asia. A report by Dahlan, Jones, Alexander, Salleh, and Alias (2009) on South East Asia investigated the impact of a temperate environment in on-campus rooms in Malaysia and analyzed students' perceptions of being attached to specific housing and their satisfaction with it. To cater to students' housing needs, modern facilities are considered necessary (Najib & Yusof, 2010).

Past research has recognized different physiognomies that impact students' residential contentment. Research carried out by Olujimi and Bello (2009) specified that personal restrooms, kitchen, social spaces, and study areas should be the basic facilities available. Internet access, whether Wi-Fi or network connection, was also highlighted by Schenke (2008) as a feature that students placed value on. Important communal facilities such as kitchens, laundry rooms, television rooms, and study rooms were cited by Torres-Antonini and Park (2008). Further, it was determined that extra amenities such as parking lots, ATM machines, mini markets and cafeterias should be provided. Including these urban facilities was found to increase the level of satisfaction with student housing (Khozaei et al., 2010; Abramsson, 2009; Torres-Antonini & Park 2008).

Some studies show that, while living on-campus may look and feel the same in different places, the way programs are experienced and viewed by students are not the same. According to Thomsen (2008), independence, convenience, privacy, and security are seen as advantages, but negative elements such as noise and visitation restrictions and rules are also associated with living on-campus. Indicative or significant reasons for students' intention to live off-campus were the less significant factors for on-campus (e.g., cooking meals, parking space, etc.), while less important factors were significant predictors of on-campus living (e.g., available academic support, meal plan, etc.). The academic performance of off-campus students is not impacted by their environment; although living off campus

was found to be more challenging than staying on campus (Omar, Abdullah, Yusof, Hamdan, Nasrudin, & Abullah, 2011).

2.3.   Student Housing in North Cyprus

2.3.1.   University-Provided Student Housing

As statistical studies show that students who reside on campus have higher success rates than those who do not. The larger universities such as Eastern Mediterranean University (EMU) has traditionally made students' accommodation its responsibility. The university has several dormitories on campus, more than five of which are university owned, and over seven of which are build-operate-transfer (BOT). The university-owned dormitories are cheaper than the BOT dormitories in that the cost of the university dormitories is priced in the local currency (Turkish Lira [TL]) while BOT dormitories are priced in dollars. The university-owned dormitories and BOT dormitories have several features in common:

- Cost-effective benefits.
- Security.
- Communication.
- Basic needs.
- Internet facilities.
- Healthy eating.

2.3.2.   Private Housing

Private housing includes accommodation that is owned by individuals and rented privately either from the owners or through estate agents. High rent, lack of available housing, doubtful contract terms, low housing standards, and housing far from campus are the major problems associated with the private student housing market (Thomsen & Eikemo, 2010).

There are different types of private housing units in North Cyprus. According to Kubi (2009), housing units can be categorized based on their number of stories, residential density, type, and inhabitants. "Apartment flats" are single unit flats that are assembled to form a multi-story building. Such flats vary in design and size and include studio apartments and apartments with various numbers of bedrooms. "Detached" housing, also known as independent residences, are individual, separate housing units that are freestanding and usually built with surrounding yard (Meyer & Schwager, 2007). "Semi-detached housing" stand partly alone because they share only a common wall with another house. According to Hurnaus (2012), a "skyscraper" is a building with an exceptional height that is totally supported by a framework of beams from which the walls are suspended, unlike a building supported by load-bearing walls. "Clusters" follow a division method in which detached housing units are grouped relatively close, leaving open spaces such as common areas.

Housing locations can be categorized as having low and high demand markets based on their proximity to schools, house qualities, and cost. A "high demand market" location is characterized as being between one and 19 kilometers from a school and having high rental prices and better house qualities, while a "low demand market" location is defined as being 20 kilometers or more away from school and having a reasonable/low rental cost.

3.   Methodology

3.1.   Developing the Hierarchical Structure

According to the study of Lee (2014), "The first step of the AHP is to develop a hierarchical structure decomposing a complicated problem into several integrated dimensions (factors or attributes)."

In order to creating the hierarchical model, sixty respondents were initially interviewed to know how the quality of housing service in North Cyprus can be improved for universities' students. This enabled the authors to prioritize the model's elements.

The tables below show the results of interviews based on the category and frequency. Based on our qualitative part, in each category, the top four sub criteria with respect to the frequency are exerted as elements of our hierarchy. From Table 1, peace, privacy, social class, and culture placed among first four; hence, they were selected as the sub-criteria for social quality.

*Table 1. **Frequency of sub-criteria for social quality***

	Sub-criteria	Frequency
	Peace	23
	Privacy	18
Social Quality	Social class	10
	Culture	6
	Ethnicity	3

Based on the frequency of the sub-criteria in Table 2, communication, empathy, rules and regulations, and common lounge were nominated as sub-criteria of interaction.

Table 2. **Frequency of sub-criteria for interaction**

	Sub-criteria	**Frequency**
	Communication	28
	Empathy	12
Interaction	Rules and regulations	9
	Common lounge	7
	Walkway	4

From Table 3, cost, maintenance, proximity, and room arrangement were the first four in place quality.

Table 3. Frequency of sub-criteria for place quality

	Sub-criteria	**Frequency**
	Cost	18
	Maintenance	16
Place Quality	Proximity	13
	Room arrangement	11
	Elevator	2

For the sub-criteria for facility in Table 4, ventilation, reading section, internet access, and kitchen were the first four explored sub-criteria.

Table 4. Frequency of sub-criteria for facility

	Sub-criteria	**Frequency**
	Ventilation	8
	Reading section	7
	Internet access	6
	Kitchen	6
	Good bed	5
	Bathroom/shower	5
	TV	5
Facility	Washing machine	4
	Refrigerator	4
	Microwave	3
	Pet care	3
	Bookshelf	2
	Car park	1
	Cupboard	1

After all the attributes have been explored, improving accommodation service quality is defined as the goal of the study, which is the first level; tangible and intangible services are the dimensions on the second level; level three shows social qualities and interaction under intangible services and facilities and place qualities under tangible services. The fourth and final level shows the sub-criteria. The research model is proposed in Figure 1 as below:
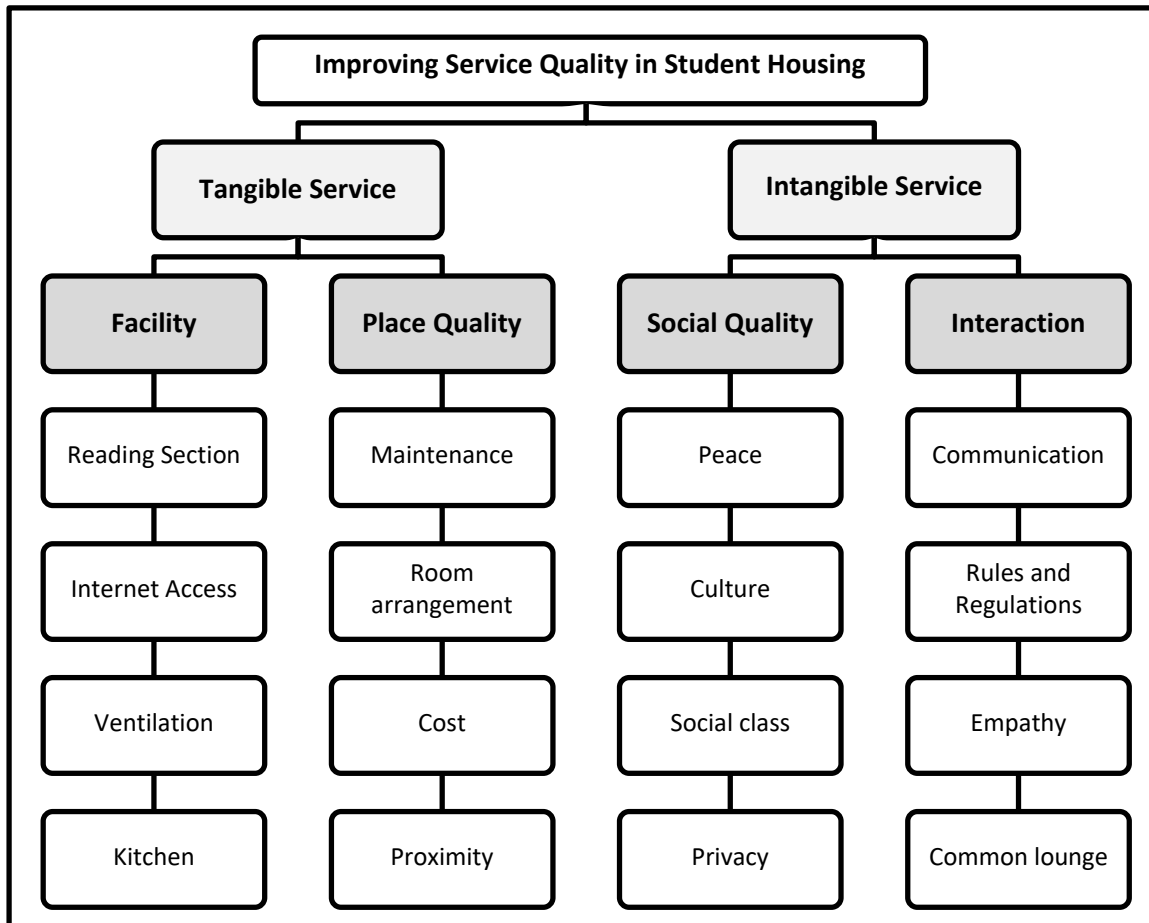

Figure 1. Research Model

3.2. Factors Used in the Study

3.2.1. Intangible Services

This is defined as services rendered that are imaginary and cannot be felt, and this was further categorized to social quality and interaction. Social quality sub-criteria include privacy, internet access, ventilation, and peace while interaction consisted of communication, empathy, rules/regulations, and room arrangement.

3.2.2. Tangible Services

This includes services rendered that can be physically touched or felt. Tangible services were also categorized as facilities and place qualities. Facility sub-criteria included kitchen, refrigerator, reading section, and bathroom/shower, while place quality comprised proximity, cost, maintenance, and

Room arrangement.

All above-mentioned intangible and tangible criterion are defined in Table 5 below:

Table 5. Definition of applied elements

Facility	Amenities provided
Place Quality	Quality or characteristics possessed in relation to location
Social Quality	Qualities possessed that help in relating with others
Interaction	Action that occurs which has effects two or more parties
Reading section	An area set aside for studying
Internet access	Services that connect objects and people
Ventilation	Proper circulation of air in the house
Kitchen	A room equipped with cooking facilities
Maintenance	Scheduled and unscheduled repairs and renovation
Room arrangement	Flexibility that allows tenants to be able to rearrange the apartment to their standard
Cost	The amount charged for room or apartment
Proximity	Near or close to the university
Communication	Easy conveyance of information
Rules and regulations	Principle governing the tenants
Empathy	Understanding and sharing other's feelings
Common lounge	A public lounge which is comfortably furnished with a variety of recreational and relaxation facilities
Peace	Free from conflicts and being calm
Culture	Suitable social behavior of the tenants
Social class	Society based on social and economic status of the tenants
Privacy	Being free from being observed or disturbed by other tenants

3.3.   The Setting and Sampling

This study is part of a larger study that evaluated criteria for improving service quality in student housing in the Turkish Republic of Northern Cyprus. Regarding to the defined objective, some important issues must be considered including adequacy of sample size. The sample size sufficiency should be controlled by the researcher with respect to the group sizes, which is essential for the research target being inquired (Aker and Aghaei, 2019). From the AHP perspective, it is a subjective method that does not entail a large number of respondents and small sample is satisfactory. The attitudes of a small group of key informants are usually adequate to make reliable results, although given that rough estimations (Cheng & Li ,2001; Lee, 2014). As mentioned before, for carrying out interviews to explore model's elements, the respondents were selected using a random sampling method, which ensured that all categories of students (by level of education, sex, marital status, and residential location) had an equal chance of being selected. However, in the second quantitative phase, for distributing the structured AHP standard questionnaire, based on convenience sample approach that is a kind of non-statistical sampling method, universities' students in Famagusta were designated for the study. Often, respondents are nominated because they happen to be in the right place at the right time. Indeed, convenience sampling was implemented for university picks the focus of the study due to their overwhelming students housing choice and also used here with those students of universities who were at university that particular

moment that we visited (Teimouri et al., 2018). It is therefore likely that the result of this study will be generalized for all students housing in the island. 121 questionnaires were distributed between the students out of whom 107 of them were retrieved. However, seven of the regained questionnaires were worthless (Arasli, Teimouri, Kiliç, & Aghaei, 2017). The questionnaires included the demographics of the respondents and a nine-point intensity of relative importance scale in lieu of the analytical hierarchy process (AHP).

3.4. An Overview of Analytic Hierarchy Process (AHP)

The AHP approach was developed by Saaty (1980) and is one the more extensively used multi-criteria decision making (MCDM) methods. Lee et al. (2001) noted that AHP has been applied to a wide variety of decision and judgment processes. This methodology is utilized to build up an assessment model that incorporates diverse measures into a single overall score for positioning choice options. Keeping in mind the end goal, there must be rearrangements of a different model issue by decomposing into a multi-level hierarchy structure. Acquiring solutions in the AHP is not a statistical method because it can be employed by an individual decision-maker or group to analyze and proffer a solution to an MCDM problem. The application of AHP methodology includes three fundamental steps:

a)   Hierarchy development or decomposition.

b)   Comparative judgments or characterizing and executing information gathering to obtain pairwise examination information on components of the hierarchy structure progressive structure.

c)   Building a need rating or synthesizing needs (Harker & Vargas, 1987).

The dimensions, criteria and sub-criteria are not equally imperative to the choice at every level of the hierarchy, and every option rate diversely on every criterion. According to Crouch and Brent Ritchie (1998) AHP can provide an analytical procedure that can join and solidify the assessment of choices and criteria by either an individual or a group included in the decision making task. It should be noted that the two elements that are compared at a particular time largely reduce the conceptual complexity of the analysis. Given a pairwise correlation, the analysis includes three undertakings:

a)   Building up a pairwise correlation matrix at every level of the hierarchy from the second level and working down,

b)   Processing the relative weights for every component of hierarchy, and

c)   Valuing the consistency ratio to check the consistency of the judgment.

Elements in every level are contrasted in sets with deference with their significance to the element in the next higher level. Beginning at the highest point of the hierarchy and working down, the pairwise comparisons at a given level can be decreased to a number of square matrix $A = [a_{ij}]_{nxn}$ as in the following:

$$\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix}$$

The matrix has reciprocal properties, which are:

$$a_{ji} = \frac{1}{a_{ij}}$$

Satty (1980) recommended that in AHP, a scale of relative importance from1 to 9 should be applied for making subjective pairwise and this can be seen in Table 6 below:

Table 6. Relative importance (9-point scale)

Relative Importance	Definition	Description
1	Equal importance	Two activities contribute equally to objective 1.
3	Moderate importance of one over another	Judgment slightly favor one activity over another.
5	Essential or strong importance	Judgment strongly favor one activity over another.
7	Demonstrated importance	An activity is strongly favored, and its dominance is demonstrated in practice.
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation.
2, 4, 6, 8	Intermediate values between the two adjacent importance	When a compromise is needed.
Reciprocals of the above numbers	Reciprocal for inverse comparison	

(Source: Chen, 2006)

Based on the study of Chen (2006) to acquire an aggregate measure of the pairwise comparisons of all persons involved in the study as respondents, the geometric mean of all assessments using equation (1) can be calculated as follows:

$$a_{ij}^{ag} = \sqrt[Q]{\prod_{q=1}^{Q} a_{ij}^{q}} \qquad (1)$$

Where a_{ij}^{q} is an element of matrix A of an individual $q = 1, 2, \ldots, Q$, and a_{ij}^{ag} is the geometric mean of all individuals a_{ij}^{q}.

Chen (2006) described that in the case where all pairwise matrices have been formed, the weight vectors $w = [w_1, w_2, \ldots, w_{n1}]$ should be computed based on Satty's eigenvector procedure. This weight computation comprises of two basic steps:

I.   Foremost, pairwise comparison matrix, $A = [a_{ij}]_{nxn}$, is normalized using equation (2) as below:

$$a_{ij}^* = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}} \tag{2}$$

for all $j = 1, 2, \ldots, n$.

    II.   The weights are computed by equation (3) as follows:

$$w_i = \frac{\sum_{j=1}^n a_{ij}^*}{n} \tag{3}$$

for all $i = 1, 2, \ldots, n$.

It was showed by Satty (1980) that a relationship is available between the weight vector, w, and the pairwise comparism matrix, A as shown in

$$Aw = \lambda_{max} w \tag{4}$$

The λ_{max} is a very important validating value in AHP which can be used as a reference index to screen information via calculating the consistency ratio (CR). The consistency index (CI) for each of the matric can be obtained in the following equation (4) and this will help in calculating the CR.

$$CI = \frac{\lambda_{max} - n}{n-1} \tag{5}$$

Then, CR can be calculated using the following equation (5):

$$CR = \frac{CI}{RI} \tag{6}$$

According to the findings of Saaty (1989), random pairwise comparisons have been replicated to yield average random indices for various sized matrices. The values of RI are given in Table 7 as below:

Table 7. Random inconsistency (RI) indices (n = 10)

N	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.51

If the value of $CR < 0.10$, the produced results are consistent, however, CR $\geq$ 0.1 indicates inconsistent judgement.

4.   Data Analysis and Findings

4.1.   Demographic Profile of Respondents

A descriptive analysis was conducted to determine the demographic profile of the respondents by gender, age, marital status, education, location of hostel/apartment, cost of hostel/apartment, and number of roommates, as well as how they knew about their dorm/apartment in Table 8 as below:

Table 8. Summary of respondents' sociodemographic profiles

CATEGORY	FREQUENCY
GENDER	
Male	51
Female	49
AGE	
16-20	28
21-25	32
26-30	22
31-35	18
MARITAL STATUS	
Single	81
Married	19
EDUCATION	
Undergraduate	53
Masters	35
PhD	12
LOCATION OF HOSTEL/APARTMENT	
On-campus	64
Off Campus	36
COST OF HOSTEL/APARTMENT MONTHLY (TL)	
Below 1000	4
1,000-2,000	13
2,000-3,000	55
Above 3,000	28
NUMBER OF ROOMMATES	
0	33
1	31
2	22
3	11
Above 3	3
HOW DID YOU KNOW ABOUT YOUR DORM/ APARTMENT	
Friend	64
Family	20
Agent	16

4.2.   Research Results

Expert Choice 11.0 was used in the analysis of the proposed model. Weights were allocated to

the elements of all levels of the hierarchy by imputing the geometric mean value of each pair comparison. For the sake of clarity, the rank order for 'place quality' in the model is calculated without using the software. In continue, the local weights of the sub-criteria for place quality are calculated, following the table (9), (10), and (11):

Table 9. ***Initial pairwise comparison matrix components of place quality (PQ)***

	PQ1	PQ2	PQ3	PQ4
PQ1	1	0.83	0.82	0.94
PQ2	1.20	1	0.57	0.56
PQ3	1.22	1.76	1	0.70
PQ4	1.06	1.79	1.43	1
$\sum_{i=1}^{4} a_{ij}$	4.48	5.38	3.82	3.20

Where

PQ1: Maintenance

PQ2: Room Arrangement

PQ3: Cost

PQ4: Proximity

Using the equation (2) and (3), the initial pairwise comparison matrix is normalized and the local weights calculated in Table 10 as follows:

Table 10. ***Normalization, local weight calculation, and prioritization***

	PQ1	PQ2	PQ3	PQ4	Local Weight	Ranking
PQ1	0.22	0.15	0.21	0.29	0.218	3
PQ2	0.27	0.19	0.15	0.18	0.198	4
PQ3	0.27	0.33	0.26	0.22	0.270	2
PQ4	0.24	0.33	0.38	0.31	0.315	1

So based on AHP method to place in order, the rank of each sub-criterion in the place quality group are displayed in Table 10 above.

Afterwards, for consistency checking of conducted AHP analysis in this study, based on Equation (5), (6), and Table (7), the following stages are performed.

Firstly, weighted sum vector (WSV) computation is shown as below:

$$\begin{bmatrix} 1 & 0.83 & 0.82 & 0.94 \\ 1.20 & 1 & 0.57 & 0.56 \\ 1.22 & 1.76 & 1 & 0.70 \\ 1.06 & 1.79 & 1.43 & 1 \end{bmatrix} \begin{bmatrix} 0.218 \\ 0.198 \\ 0.270 \\ 0.315 \end{bmatrix}$$

WSV $= [0.900\ 0.790\ 1.105\ 1.287]$

Then, consistency vector (CV) and consistency index (CI) should be calculated as follows:

PQ1: 0.900/0.218= 4.128

PQ2: 0.790/0.198= 4.000

PQ3: 1.105/0.270= 4.092

PQ4: 1.287/0.315= 4.086

$CV = [4.128\ 4.000\ 4.092\ 4.086]$

According to the equation (5), consistency index is equal to:

$$CI = \frac{4.128 - 4}{4 - 1} = 0.043$$

And by following Equation (6), consistency rate is:

$$CR = \frac{0.043}{0.9} = 0.048$$

Since obtained consistency index (CI) is much lower 0.10, so we can confirm the consistency and reliability of expert judgments.

In order to ease and accuracy in calculations, as well as saving time, the rest of local weights for each group of attributes in different levels of the model are generated by the software and illustrated in Table 11 as follows:

Table 11. Summary of final importance weight and ranking of the model's elements

Model element	Dimension/ Criteria Local weights	Sub-criteria Local weights	Global weights	Ranking
Tangible Service	0.536			
Facility		0.418		
Reading Section		0.252	0.0565	11
Internet access		0.269	0.0603	9
Ventilation		0.272	0.0609	8
Kitchen		0.207	0.0464	15
Place Quality		0.582		
Maintenance		0.218	0.0680	6
Room Arrangement		0.198	0.0618	7
Cost		0.27	0.0842	2
Proximity		0.315	0.0983	1

Intangible Service	0.464				
Social Quality		0.507			
Peace			0.299	0.0703	4
Culture			0.209	0.0492	13
Social Class			0.195	0.0459	16
Privacy			0.297	0.0699	5
Interaction		0.493			
Communication			0.26	0.0595	10
Rules and Regulations			0.308	0.0705	3
Empathy			0.221	0.0506	12
Common lounge			0.211	0.0483	14

In continue, initially the local ranking of groups of elements in each level, and then global ranking of the elements of the lowest level of the model are reported. For the level of main dimensions, tangible service had a 0.536 weight, which was higher than intangible at 0.464 which shows students gave priority to the tangible services in student housing in North Cyprus.

The results of next level, comparing place quality versus facility, which are criteria for tangible services, are shown. Place quality was prioritized over facility having a weight of 0.582 and 0.418, respectively.

Likewise, social quality and interaction were compared, and as Table 11 depicts, social quality was given preference with a weigh of 0.507 while interaction had a weight of 0.493.

All sub-criteria in the fourth level under Facility, Place Quality, Social Quality, and Interaction were compared locally, and an overall consistency rate are much lower than 0.10, so forth we can say it has good consistency and the paired comparisons of the models are fairly acceptable.

For the group of Facility, the sub-items are ranked from highest to lowest importance as Ventilation (0.272), Internet Access (0.269), Reading Section (0.252), and Kitchen (0.207). About the next group of elements under the Place Quality which is the most important group in the previous level, they ranked as Proximity (0.315), Cost (0.270), Maintenance (0.218), and Room arrangement (0.198). Likewise, for the group of Social Quality, the positions of items are Peace (0.299), Privacy (0.297), Culture (0.209), and Social Class (0.195). Lastly, the ranks of the group of Interaction are revealed as Rules and Regulations (0.308), Communication (0.60), Empathy (0.221), and Common Lounge (0.211), correspondingly.

The final global ranking of the sub-criterion of the proposed student housing choice hierarchy in Table 11 disclosed that the top Five ranked criteria are Proximity to university (0.0983), Cost (0.0842), Rules and Regulations (0.308), Peace (0.0703), Privacy (0.0699). The Five lowest ranking criteria are Empathy (0.0506), Culture (0.0492), Common Lounge (0.0483), Kitchen (0.0464), and Social Class (0.0459).

5.   Conclusion

This study examined how housing service quality can be improved for universities' student in North Cyprus. First, this study sought to understand service quality and service user's experiences in relation to student housing and the dimensions of student accommodation quality to identify factors affecting service user's ranking of attributes. Identifying the attributes important to students in selecting housing is essential for improving the overall service quality of student housing by institution administrators and private landlords. This work has identified sixteen attributes and the relative importance of these attributes. Perceiving the improvement of service quality in student housing as a MCDM problem, the comparative importance of each couple of attributes was effectively obtained using an MCDM method: AHP. This research examined the significant criteria affecting students' decisions in renting accommodation and further proposed an AHP model for the decision-makers. Based on the results, four quality dimensions emerged from the research: social quality, interaction, facility, and place quality.

Data analysis displays that the first five effective criteria in student housing are Proximity, Cost, Rules and Regulations, Peace, and Privacy, respectively.

Proximity is the most important criterion which is concluded from the current study among 16 considered sub-criteria in the model. Proximity to the university has two main advantages in choosing a student residence: first, in terms of controlling the time and so forth the possibility of timely attendance in classes and exams, second, in terms of transportation expenses, which saves the cost of moving to the university. Interestingly, because of the short distance between home and university, the culture of riding bicycle is common among students in this region. It should be noted, most of the large-scale universities, provide free shuttle student service for most hours of the day during the week, even on vacations.

Cost is the next significant criterion in students housing choices so that based on their budget, they look for houses with an affordable cost of rent. Rules and regulations are also crucial so that vices such as stealing can be minimized and there can be orderliness. In the case of Peace as an intangible criterion, because once there is peace, there is security, and students can live as students without fear and stress. The fifth essential factor is privacy which helps students choose a more relaxed place for life and hear fewer noises from apartments beside, upstairs, or downstairs. Although they may get a shared space where they can place things like barbecue grills, patio furniture, they get their own private storage and parking space, and etc.

6.   Recommendations

These findings can aid the institution's housing administrators and private landlords in designing innovative housing facilities. In order to input all criteria (i.e., facility, place quality, social quality, and interaction), the first five sub-criteria to consider are Proximity, Cost, Rules and Regulations, Peace, and Privacy. Another important thing that should be considered is creating

university-owned on-campus or off-campus housing for married couples, because all married couples interviewed pointed this out need.

Future studies should examine whether the AHP instrument is valid at other North Cyprus universities and at universities abroad and validate the four-level model for student housing. Further research on how ethnicity and course of study could affect the service quality of student housing should be carried out.

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