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Residential Satisfaction in Student Housing

An empirical study in Stockholm, Sweden

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Abstract

This study attempted to assess the residential satisfaction in student housing in Stockholm, Sweden. It examined how satisfied the current residents were and the indictors which predicted residential satisfaction in this context. Moreover, it investigated whether residential satisfaction varied between different socio-demographic groups. A list of 24 indictors were identified through reviewing literature and the semi-structured interview. Data were obtained from a questionnaire survey, of which the participants were selected through simple random sampling. A total of 183 valid responses were analyzed through descriptive analysis, stepwise regression, t-test and analysis of variance. The results showed that the current occupants were generally satisfied with the student housing. Seven indicators appeared to be predictors of satisfaction, among which the strongest ones were kitchen facilities, cleanliness and public transport stations. In terms of socio-demographic characteristics, those with a shorter residential duration were found to be more satisfied, and studio residents were more satisfied compared with corridor-room residents.

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Life is always more exciting than imagined. Journey goes on, to learn more and contribute more.

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Sammanfattning

Denna studie försökte bedöma tillfredsställelsen med boende i studentbostäder i Stockholm, Sverige. Den undersökte hur nöjda de nuvarande invånarna var och vilka indikatorer som förutspådde boendenöjdhet i detta sammanhang. Dessutom undersökte man om tillfredsställelsen i boendet varierade mellan olika sociodemografiska grupper. En lista med 24 indikatorer identifierades genom granskning av litteratur och den semistrukturerade intervjun. Data hämtades från en enkätundersökning, varav deltagarna valdes ut genom ett enkelt slumpmässigt urval. Totalt 183 giltiga svar analyserades genom deskriptiv analys, stegvis regression, t-test och variansanalys. Resultaten visade att de nuvarande boende generellt sett var nöjda med studentbostäderna. Sju indikatorer verkade vara prediktorer för tillfredsställelse, bland vilka de starkaste var köksfaciliteter, renlighet och kollektivtrafikstationer. När det gäller sociodemografiska egenskaper visade sig de med kortare boendetid vara mer nöjda, och studioboende var mer nöjda jämfört med invånare i korridorrum.

Förord

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1 Introduction

1.1 Background

Housing is associated with quality of life as well as physical and psychological well-being (Shaw, 2004; Baiden et al., 2011). Basically, it works as a dwelling unit that fulfils the human need for shelter. Moreover, beyond the dwelling unit, housing affects people through various associated aspects, including the located neighbourhood, the facilities and services, and natural elements. (Coley, Sullivan and Kuo, 1997; Vera-Toscano and Ateca-Amestoy, 2008). In this sense, housing performance has become a concern for researchers, policy makers as well as housing developers.

In terms of assessing the performance of housing, the concept of residential satisfaction can be used (Teck-Hong, 2012). Residential satisfaction refers to individuals' affective and cognitive perception towards the places of residence (Ogu, 2002; Amole, 2009). It reflects the degree of contentment with reference to one's current housing situation (Mohit, Ibrahim and Rashid, 2010). Two types of attributes are believed essential to individuals' assessment of housing: the physical attributes such as location and characteristics of design, and the social attributes such as social relationships and safety (Amérigo and Aragonés, 1997; Kaya and Erkip, 2001; Parkes, Kearns and Atkinson, 2002).

Residential satisfaction research has been conducted from various perspectives, among which student housing residential satisfaction has attracted increasing attention. Student housing is a special type of housing provided to a particular group of residents. It usually offers fully equipped facilities such as bedrooms, bathrooms, washrooms, laundry, etc. to ensure a pleasant living and learning environment (Amole, 2009; Najib, Yusof and Osman, 2011; Sanni-Anibire and Hassanain, 2016). Student housing is a critical part of educational experience due to its influence to students' wellbeing, including academic performance, school adaptation, involvement as well as sense of responsibility (Blimling, 1999; Hassanain, 2008; Choi, Park and Lee, 2016).

In Sweden, the problem of student housing shortage leads to a continuous demand for student housing developments. According to Swedish Higher Education Authority, the number of registered first- and second-cycle-students increased from 343,210 in 2016 to 384,500 in 2020. Of the 384,500 registered students, 73% (282,000) attended only on-campus study. However, the student housing provided is not sufficient to accommodate such number of students. According to Statistics Sweden, in 2021 there were 108,034 student housing all together. Among the cities in Sweden, Uppsala, Stockholm, Göteborg and Lund have a top ranked number of student housing, yet these cities experience a particular serious student housing shortage. To alleviate this problem, a high construction rate has been maintained. For example, Studentbostadsföretagen, the industry organization focusing on student housing, revealed that an additional 5,400 student housing units were expected to be ready by 2024 in Stockholm.

Confronting such huge demand for student housing development, however, in Sweden there is a lack of research into student housing. To promote better student housing developments and thus students' wellbeing, it should be worthwhile to understand the residential satisfaction in student housing in Sweden.

1.2 Research aims and research questions

Given the importance of student housing for students' wellbeing as well as the lack of understanding of students' perception of Swedish student housing situation, this study is therefore conducted to examine residential satisfaction with student housing in Sweden, taking Stockholm as the area of study.

The study aims to investigate the overall satisfaction level of the current occupants in Stockholm's student housing and the predictors of satisfaction in this context. Furthermore, it aims to explore whether there are differences in satisfaction between groups with different sociodemographic characteristics. In compliance with the research aims, three questions were put forward:

1. What is the level of residential satisfaction perceived by the students with the student housing in Stockholm?
2. What are the determining indicators that can improve the residential satisfaction level of the students in Stockholm?
3. Does residential satisfaction vary with respect to socio-demographic groups?

1.3 Delimitation

This study attempts to gain insight into student housing conditions in Stockholm, Sweden from the perspective of current occupants. Stockholm, the capital of Sweden, has top-ranked number of student housing units while suffers from severe student housing shortage, which makes it a good representation. Besides, since the author studied in Stockholm, it could be much easier to conduct empirical studies here than in other cities.

2 Literature review

2.1 Definitions and classic theories

Residential satisfaction (RS) is an interdisciplinary topic arising within fields such as sociology, psychology, geography, marketing, architecture and planning (Riemer, 1943; Festinger, 1954; Morris and Winter, 1975; Oliver, 1980; Cutter, 1982; Galster, 1985; Lu, 1999). It refers to the affective and cognitive perception towards one's place of residence (Cutter, 1982; Amole, 2009). This consciousness is complex and dynamic since it not only reflects the feelings towards the physical residential environment, but also in relation with the non-physical aspects such as the inhabitants' social networks and aspirations (Galster, 1985; Amérigo and Aragonés, 1997; Biswas et al., 2021). As Galster (1985) classified, the concept of residential satisfaction has been employed by housing developers, policymakers and analysts and used in four different ways. It has been utilized to predict individuals' perceived quality of life (Campbell, Converse and Rodgers, 1976), to judge the success of private and public housing developments (Lansing, Marans and Zehner, 1970; Onibokun, 1974), to predict residential mobility and housing demands (Golant, 1971; Speare, 1974; Morris, Crull and Winter, 1976) and to assess residents' perceptions of weaknesses in their residential environment so as to direct public or private efforts to improve the current situation (Western, Weldon and Haung, 1974).

As an interdisciplinary topic, residential satisfaction is rooted in various theories in different fields. Psychologist Maslow's "Theory of Human Motivation" about the hierarchy of needs suggests that a more basic need is satisfied prior to the more complex needs (Maslow, 1943). Social psychologist Festinger's "Social Comparison Theory" reveals the importance of comparison with others on people's self-evaluation in the absence of objective means (Festinger, 1954). Oliver's "Expectancy Disconfirmation Theory" provides a marketing perspective, addressing that satisfaction is influenced by the disconfirmation between perceived performance and expectations (Oliver, 1980). All these theories are regarded to have provided diverse foundations for understanding the concept of satisfaction (Emami and Sadeghlou, 2021).

On a more relevant level, there are four theories associated with residential satisfaction (Mohit and Al, 2014; Biswas et al., 2021; Emami and Sadeghlou, 2021). "Theory of Home Adjustment" is one of the earliest theories that look into the relationship between the physical residential structure and the family needs from both an architectural and a sociological perspective (Riemer, 1943). From Riemer's point of view, in architectural content, with a limited budget, the architects should balance three pairs of items, namely, privacy/space, distance/proximity and equipment/total space, to improve the comfort of the family; in social content, the housing needs vary in time and vary with family type and composition. He further claimed that satisfactory home adjustment can be achieved via the objective part of the physical shelter and via the subjective part of individual attitudes and family behavior (Riemer, 1943).

Building upon Riemer's work, Rossi's "Housing Needs Theory" is a theoretical advance in areas of housing study. According to this theory, the "lack of fit" existing between residents' current and desired housing needs will lead to dissatisfaction, which will subsequently increase the residential mobility as families tend to adjust this lack of fit (Cowgill and Rossi, 1956). The author also identified push factors which lead to a move out of the current residence and pull factors which reflect the attractiveness of the potential choices of residence (Cowgill, 1956).

While in Rossi's work the influence of physical and social environments on housing needs seems more implicit, Morris et al. developed the "Housing Deficit Theory", explicitly viewed housing needs as cultural housing norms (Morris, Crull and Winter, 1976). In this theory, families are believed to judge their housing conditions by two criteria, cultural norms and family norms. If the housing fails to fit with the normatively derived needs, a housing deficit is said to exist. This situation leads to a high dissatisfaction level and thus an intension to reduce the deficit. In this case, families may response through three ways: residential mobility, residential adaptation and family adaptation (Morris and Winter, 1975; Morris, Crull and Winter, 1976).

Last but not least, Galster introduced the psychological construct of residential satisfaction and indicated how satisfaction or dissatisfaction is manifested in his "Psychological Construct Theory" (Galster, 1985). In Galster's view, residents judge their residential situation based on a "reference" condition that is cognitively constructed by themselves (Galster, 1985). If the current situation meets or surpasses the reference condition, the residents are believed to be satisfied. On the contrary, an over-threshold deficiency between current and reference condition would lead to two possible consequences: adaptation, such as reducing aspirations and redefining needs; or dissatisfaction, which would further lead to behaviors to reduce the dissatisfaction, for example, altering current conditions or moving away (Galster, 1985).

These above-mentioned four theories provide different perspectives for understanding residential satisfaction, while there are also some similarities. The "Housing Needs Theory", "Housing Deficit Theory" and "Psychological Construct Theory" present a similar process: firstly a (negative) mismatch is perceived by the residents, which then leads to dissatisfaction, at last residential mobility may arise in order to reduce this mismatch. The ideas of these theories have been used in many empirical studies on residential satisfaction (Mohit and Al, 2014; Emami and Sadeghlou, 2021).

2.2 Student housing and students' wellbeing

When young people enter universities, it is a common situation for them to live in a new city away from their parental home. During their education period, university students are likely to live in student housing. Student housing is expected to not only serve as a safe and private dwelling, but also serve as a platform for student social contact (Willoughby et al., 2009; Najib, Yusof and Osman, 2011; Toyin Sawyerr and Yusof, 2013). Therefore, student housing usually offers various facilities to enable a pleasant living, studying and social interaction environment. Some most frequently mentioned facilities include study-bedrooms, kitchens, washrooms, laundry, pantry, recreation areas and support services such as internet services, parking lots and minimarkets (Amole, 2009; Najib, Yusof and Osman, 2011; Toyin Sawyerr and Yusof, 2013).

As an important role in student life, student housing's influence on student wellbeing have been studied by previous researchers, whereby the main perspective and findings can be summarized into three categories: academic performance, university adaptation and experience, and personal character.

In the aspect of academic performance, conflicting results have been found by former researchers. Moos's work provides an early basis for researches on how the social and environmental attributes affect students' performance. He examines the influence of environmental systems and personal systems on students' performance and claimed that

educational settings can make a difference in students' lives (Moos, 1979). Blimling (1999) summarized some empirical researches about the influence of residence halls on undergraduates' academic performance in the US. He found evidence that students living in residence halls are likely to have better academic performance compared with students living in off-campus apartments and fraternity or sorority houses. Following Moos's work, Rodger and Johnson (2005) examined the influence of residence type on students' sense of belonging, extracurricular involvement, quality of life, academic average and omnibus personality. Their results supported Moo's position, but regarding the academic success, no significant difference was found between suite-style and dorm-style residences. Paine (2007) explored whether freshmen's performance on academic, involvement, etc. differ in the type of residence (traditional, suite-style, and apartment-style). Identically, the results showed no significant difference in academic performance between the three residence types. Nevertheless, campus administrators still hold the belief that student housing facilities is essential to retain highly motivated and good-quality students (Paine, 2007; Sanni-Anibire and Hassanain, 2016; Moore et al., 2019).

With regard to university adaptation and experience as well as personal character development, most researchers came to similar conclusions that these aspects are in relation with student housing. A quality student housing is said to promote students' cooperation, involvement, school adaptation, mutual composition and inspiration as well as personal character development such as sense of responsibility (Hassanain, 2008; Choi, Park and Lee, 2016). Specifically, Rodger and Johnson (2005) revealed the student residence type's significant influence on students' sense of belonging and activity level. Similarly, Berger (1997) claimed that living in a residence hall helps establish students' sense of community. As student housing accommodates students of different backgrounds, it also shows influence on encouraging informal intellectual activities, enlarging students' knowledge in different disciplines and promoting their openness to diversity (Hassanain, 2008; Amole, 2009; Pike, 2009). On the other hand, unsatisfactory residential environment such as socially overloaded environment and crowdedness lead to a high level of stress (Valins and Baum, 1973). This effect was further explored by Evans et al. (1996) whose results showed that in an crowded residence, with greater architectural depth, residents are less likely to be distressed.

Although some empirical results are contradictory, student housing is still believed to have influence on the students' learning-living experience at least in some aspects (Hassanain, 2008; Toyin Sawyerr and Yusof, 2013). As the first experience of living independently for many young people (Moore et al., 2019), life in student housing is worthy to be explored.

2.3 Student housing residential satisfaction

Table 1 shows some student housing residential satisfaction studies and their key findings. Seen from the table, around two thirds of the studies were conducted in developing countries such as Nigeria, Saudi Arabia and Iran. There are also a few studies conducted within Europe: the one in France revealed a moderate residential satisfaction level while the one in Norway revealed a high satisfaction level of the students (Thomsen and Eikemo, 2010; Mogenet and Rioux, 2014). However, more recent literature in this topic within Europe has not been found.

Table1. Studies on student housing residential satisfaction

References	Area	Main findings and contribution
(Hassanain, 2008)	Saudi Arabia	Students were satisfied with the five identified technical performance elements (thermal comfort, acoustical comfort, visual comfort, indoor air quality, fire safety) and the five functional performance elements (interior and exterior finish systems, room layout and furniture quality, support services, efficiency of circulation and proximity to other facilities on campus) of the residence.
(Amole, 2009)	Nigeria	Students were generally dissatisfied with the housing provided for them. The quality of social and physical attributes of the housing are crucial to satisfaction. The morphological configuration of the halls of residence was also found to be a predictor of satisfaction.
(Thomsen and Eikemo, 2010)	Norway	The general level of housing satisfaction in Trondheim was high. The type of tenancy/ownership, distance to the city center and the place of study, housing characteristics, etc. were significant variables for housing satisfaction.
('Ulyani Mohd Najib, Aini Yusof and Zainul Abidin, 2011)	Malaysia	Students are generally satisfied with the student housing facilities. There is a significant positive relationship between overall satisfaction and loyalty behavior (duration of staying, retention, recommendation).
(Toyin Sawyerr and Yusof, 2013)	Nigeria	Students are dissatisfied with the facilities (bedroom, bathroom, common room and other services) because they are grossly inadequate.
(Mogenet and Rioux, 2014)	France	Students have a moderate satisfaction level with their university accommodation. Building location has a large influence on satisfaction while socio-demographic and residential variables were not predictors of the students' satisfaction.
(Dahlan, 2015)	Malaysia	The uncontrollable indoor condition leads to a higher dissatisfaction level. The room location, room orientation and shading ratio do not influence the occupants' indoor environment satisfaction.
(Khajehzadeh and Vale, 2016)	Iran	Important predictors of successful shared spaces include territory definitions, location, number of users, length of corridors, furniture, storage spaces, etc.
(Ning and Chen, 2016)	China	The university dormitories provide satisfactory physical facilities but unsatisfying services and supporting infrastructure.
(Choi, Park and Lee, 2016)	Korea	Place attachment to the home environment, measured as affective bonding, place identity, place dependence, rootedness and home meaning, had a positive relationship with housing satisfaction.
(Sanni-Anibire and Hassanain, 2016)	Saudi Arabia	The design quality and indoor environmental quality were moderate, while building support services was of low quality.
(Moore *et al.*, 2019)	America	Property management attributes, quality of unit and of amenities, ease of move-in, etc. had a positive association with residents' satisfaction while the academic class standing had a negative association.
(Xu, Sunindijo and Mussi, 2020)	Australia	The technical dimension, especially thermal and acoustic comfort, was essential to residents' satisfaction.
(Nazarpour and Norouzian-Maleki, 2021)	Iran	The level of social interaction is higher in mid-rise student housing compared with high-rise housing. Pleasant views and landscape are important components.

Although these studies are all under the topic of student housing residential satisfaction, different approaches were used. One of the approaches is to identify a set of residence-related factors and measure each of them, usually followed by classifying each of their satisfaction level as "satisfied", "dissatisfied", "strongly satisfied", "slightly dissatisfied", etc (Hassanain, 2008; Toyin Sawyerr and Yusof, 2013; Sanni-Anibire and Hassanain, 2016; Gbadegesin et al., 2021). The second approach is to employ regression analysis. Studies in this category usually use the overall residential satisfaction level as the dependent variable. The residence-related factors are the independent variables and are regressed on the overall residential satisfaction (Amole, 2009; Thomsen and Eikemo, 2010; Moore et al., 2019). Another perspective is to compare the satisfaction level towards different kind of student housing. For example, Mogenet and Rioux (2014) compared students' satisfaction with town-center and on-campus residence halls; Xu, Sunindijo and Mussi (2020) examined students satisfaction of older and newer on-campus accommodations; Nazarpour and Norouzian-Maleki (2021) evaluated high-rise and mid-rise student housing satisfaction level.

According to the presented literature, various dimensions have been examined and proved to have an influence on residential satisfaction. These include indicators related to indoor

living condition, such as room size, building appearance, storage, internet and ventilation, as well as indicators related to exterior neighbourhood condition, such as distance to academic facilities and city centre, recreation places, landscape and open space (Amole, 2009; Thomsen and Eikemo, 2010; Ning and Chen, 2016; Nazarpour and Norouzian-Maleki, 2021). Moreover, as 'satisfaction' is more a psychological state, it does not only rely on the physical residential environment (Galster, 1985); social/psychological aspects such as place attachment, privacy and social relations are also proved to be relevant to residential satisfaction (Choi, Park and Lee, 2016; Ning and Chen, 2016; Emami and Sadeghlou, 2021). In addition, personal characteristics such as age, gender, educational level, residential duration, etc. have also been taken into account in many studies.

2.4 Student housing residential satisfaction: measurements and indicators

When it comes to measuring and predicting residential satisfaction in student housing, it is important to note that the results of broader residential satisfaction might not be fully applicable. For one thing, some characteristics of this type of housing, such as property ownership, community services and shared facilities, etc., could be different from the common residential buildings (Amole, 2009; Ning and Chen, 2016). For another, university students constitute a group of occupants with special demographic background. Certain factors such as occupation, income level and number of family members might not be applicable to them, compared with the majority of residents in society (Amole, 2009; Ning and Chen, 2016). In this situation, most researchers on student housing residential satisfaction developed their own questionnaires with selected indicators.

In terms of the measurements of the overall residential satisfaction level, there are generally two ways. The first method is to use a single question on overall satisfaction, for example, "*Are you satisfied with your housing*?" (Thomsen and Eikemo, 2010; Moore et al., 2019; Nazarpour and Norouzian-Maleki, 2021). A more recognized way is to use an index of several highly correlated items on overall satisfaction. The four-item index of residential satisfaction developed by Francescato et al. (1989) is a highly cited example. This index is based on the following four questions:

(a1) How satisfied are you with living here?
(a2) How long do you want to live in this housing development?
(a3) If you move again, would you like to live in another place like this?
(a4) Would you recommend this place to one of your friends if they were looking for a place to live?

Two reasons were mentioned for using this four-item index, namely, higher reliability of the criterion compared with using a single question, and integrating the cognitive, affective and conative aspects. Following Francescato's work, Amole (2009) modified these questions to develop an index that is more suitable to the student housing context. The index is based on three questions:

(b1) How satisfied are you with living here in general?
(b2) Do you intend to move to another accommodation in the near future?
(b3) How would you rate your present bedroom for the activities of:
(i) sleeping (ii) studying (iii) entertaining friends (iv) relaxing

A Likert scale was adopted to quantify the respondents' attitude towards these questions. The index is computed as the mean of the respondent's total scores on these questions. A similar index was adopted by 'Ulyani Mohd Najib et al. (2011).

In terms of specific indicators regarding different residential characteristics, previous researchers usually identified them into groups. For example, Hassanain (2008) focused on two performance requirement categories, the technical performance category and the functional performance category, with the former including five elements and 22 indicators and the latter including five elements and 26 indicators. Amole (2009) used three types of variables, the objective physical variables, the subjective variables and the demographic variables as the independent variables in the regression model. Thomsen and Eikemo (2010) conducted a five-step multiple linear regression analysis by successionally adding five sets of variables, namely, tenancy/ownership, demographic aspects, location, housing characteristics and individual facilities. Ning and Chen (2016) identified five technical aspects and five social aspects in their post-occupancy evaluation framework. Sanni-Anibire and Hassanain (2016) also used post-occupancy evaluation but adopted three categories including design quality, indoor environmental quality and quality of building support services. There were also some researchers who didn't categorize the indicators but simply listed all of them, such as Moore et al. (2019) who listed 16 independent variables in their study.

The above-mentioned frameworks vary considerably, making system comparisons rather difficult (Ning and Chen, 2016); however, the specific indicators are overlapped. The frequently used indicators were summarized (see Appendix 1), with similar expressions recognized as the same indicator.

Notably, attention should be paid to the rationale for the indicator determination and questionnaire design. The study of Ning and Chen (2016) could be a positive example. The authors explored the residential satisfaction of university dormitories in China and focused on two aspects, technical and social aspects. Two focused groups were adopted, with the first one aiming at deriving indicators under each aspect and the second one aiming at pre-testing the questionnaire. On the other hand, in some studies it is only mentioned that the indicators were adopted by reviewing previous literature, without further explanation on how they were selected. As Adriaanse (2007) and Smrke et al. (2018) stated, some residential satisfaction studies seem to have adopted a list of "arbitrarily" defined factors by the researcher and with limited reporting on the rationale of the questionnaire development, leading to a question about the rationality of the decisions.

3 Student housing in Sweden

3.1 Student housing shortage

In Sweden, the number of enrolled students in Swedish higher education has experienced a substantial increase with fluctuations since the last decade of the last century. A large increase appeared during the last few years. According to Swedish Higher Education Authority, the number of registered first- and second-cycle-students increased from 343,210 in 2016 to 384,500 in 2020. Of the 384,500 registered students, 73% (282,000) attended only on-campus study. Besides, there were around 17,000 doctoral students in higher education.

However, the student housing provided is not sufficient to accommodate such number of students. According to Statistics Sweden, in 2021 there were 108,034 student housing all together, with an average room size of 28 square meters. Most of these student housing is located in the major university towns.

Table 2. Municipalities with most student housing

Municipality	Uppsala	Stockholm	Göteborg	Lund	Umeå	Linköping	Växjö	Örebro	Malmö
Number of dwellings	12433	12387	11608	9789	7072	5389	3980	3250	3144

Source: Statistics Sweden.

Although cities such as Uppsala, Stockholm, Göteborg and Lund have a top ranked number of student housing, these cities experience a particular serious student housing shortage. The Swedish National Union of Students, SFS, annually reviews the housing situation in 33 cities. The cities get a color mark depending on how quickly the students can be offered safe housing, with a red mark representing the most severe housing shortage. Learn from the 2021 report, Stockholm, Göteborg and Lund have been marked red every year since 2009, and Uppsala just turned yellow in 2021 from red. Specifically, in Stockholm, the approximate number of campus students is 74,000 while the provided number of student dwellings is around 12,000.

Luckily, the problem of student housing shortage has raised concerns and is being alleviated by building more. According to Studentbostadsföretagen, the industry organization focusing on student housing, an additional 5,400 student housing units are expected to be ready by 2024 in Stockholm.

3.2 Student housing in Stockholm

Student housing in Stockholm is mainly provided by housing companies and universities. Stiftelsen Stockholms studentbostäder, known as SSSB, is a student housing company in Stockholm. It aims at offering Student Union-affiliated students in Stockholm a “pleasant and affordable accommodation”. Currently as the largest students’ housing foundation in Sweden, it offers 8107 accommodations in 25 areas, with Lappkärrsberget being the largest student housing area.

The most common types of student accommodation are corridor rooms, studios and apartments. A corridor room is a room with private bathroom (shower and toilet) included, but the kitchen is shared with other students in the same corridor. Students living in a corridor room is expected to take responsibility for taking care of the common areas in the corridor, such as clean after cooking and garbage disposal. Studio is a one-room student apartment with a private kitchen and bathroom. The room size of a studio is usually larger

than that of a corridor room, ranging approximately 20 to 30 square meters. Apartment refers to a muti-room residence. Students living in an apartment have their own bedroom while share the kitchen and the bathroom. The allocation of student housing is based on the rank order determined by the number of credit days.

To assess students' attitudes and feelings, the NKI, nöjd-kund-index (satisfied customer index), is widely adopted by student housing companies in Sweden. The NKI is based on the following three items:

(c1) How satisfied the customers are with the business as a whole
(c2) How well the business meets customers' expectations
(c3) How the business is compared to an ideal one

In 2020, the NKI reported by SSSB reached 73 on a scale of 0-100. Though being higher than it was in 2019 (70), the NKI in 2020 is below the average NKI result (76) of the student housing industry in Sweden.

4 Methodology

4.1 Research design

As mentioned, some residential satisfaction studies may have problems justifying the indicator selection and questionnaire development process (Adriaanse, 2007; Smrke, Blenkuš and Sočan, 2018). To alleviate such a problem, this study adopted a combination of qualitative interviews and questionnaire surveys, with the former aiming at selecting indicators for the latter.

4.1.1 Interview

In this study, semi-structured interview was adopted to provide insights for the indicator selection. The interview included two parts. Firstly, interviewees were asked to give opinions on the indicator list summarized from previous literature. For each indicator, they were asked if they believed it had a large impact on their residential satisfaction. Secondly, questions regarding the interviewees' previous housing experience were asked. The specific questions asked differed depending on the answers provided, but generally information regarding the characteristics of their previous room as well as the satisfactory and unsatisfactory aspects were gathered.

Ten face-to-face interviews were conducted, most of which lasted for around 15 to 25 minutes. The participants consist of 5 female and 5 male students, with the three most common housing types (corridor room, studio, apartment) being covered. Basing on the interview results, the indicators that were considered by most people to have a great impact on residential satisfaction were selected. The interview summary is presented in Appendix 2.

4.1.2 Questionnaire

Questionnaire survey is a widely-employed data collection method in empirical studies on residential satisfaction (Smrke, Blenkuš and Sočan, 2018). In order to quantifying the students' residential satisfaction level, questionnaire survey is employed in this study.

The questionnaire includes 36 questions all together: 8 questionnaires on demographic features of the respondents, 3 questions on overall residential satisfaction level, 24 questions on the specific indicators, and 1 optional open-ended question regarding comments on the residences. A 7-point Likert scale was employed in measuring the satisfaction towards each of the 24 specific aspects, with the score 1, 2, 3, 4, 5, 6, 7 representing "very dissatisfied", "moderately dissatisfied", "slightly dissatisfied", "neutral", "slightly satisfied", "moderately satisfied", "very satisfied" respectively. The 7-point Likert scale was employed rather than a 5-point Likert scale because in some studies the 7-point scale showed a higher test–retest reliability (Oaster, 1989; Preston and Colman, 2000). Besides, as Weng (2004) suggested, when the participants' cognitive ability reaches a college-student level, a 7-point scale should be able to provide reliable and consistent responses.

A pilot survey was conducted with 6 students to pre-test the questionnaire. The aim was firstly to check whether there are any unclear expressions, and secondly to ensure the font size, layout and length of the questionnaire were reasonable. A few questions were modified according to the feedback from the pilot survey.

4.1.3 Data collection

The simple random sampling with the incentive of charitable donation was adopted in this study. Regarding the sampling, the initial idea was to use cluster sampling by distributing questionnaires to residents in certain buildings. However, this was then abandoned because of the difficulty to approach all the students living in the sample buildings. Instead, simple random sampling was applied by distributing questionnaires both online and offline, with the intension to exceed the minimum number of responses in limited time. The link of the questionnaire was posted on all the Facebook groups of the student housing areas that could be found. Hard copies of the survey introduction and questionnaire QR code were distributed to students in universities' libraries and study halls as well as put on the unoccupied tables. Distributing hardcopies at student housing areas was also tried but found rather ineffective and time-consuming. In order to increase the response rate, the indirect incentive was used that for each response received, 5 Swedish Krona would be donated to the Swedish Childhood Cancer Fund. The reason why direct incentives, such as monetary reward, were not adopted is that these strategies may increase the likelihood of capturing a wrong group of respondents, such as students who do not live in student housing.

Slovin's formula was used to determine of minimum number of responses (n) as suggested by Sanni-Anibire and Hassanain (2016):

$$n = \frac{N}{1 + Ne^2}$$

The effective sample size (N) for this study was 12387, assumed equal as the number of student housing units in Stockholm. With a 0.1 sample error (e), the minimum sample size should be 99. This means there is 90% confidence that a sample size of 99 can accurately represent the population.

In total 223 students entered the survey, 192 of them completed the questionnaire and 183 responses were found useful for data analysis after the outlier detection. This sample size was larger than the computed minimum sample size.

4.2 Variables used in the study

4.2.1 Overall residential satisfaction

Overall residential satisfaction is the dependent variable in this study. In order to increase the reliability of the criterion, three questions are used to measure overall residential satisfaction instead of one single question. The questions used are as follows:

(1) How satisfied are you with living here in general?
(2) If you move again, would you like to live in another place like this?
(3) How well does your current room meets your expectations?

These three questions were selected based on three references introduced in former sections: the four-item index (a1-a4) on residential satisfaction developed by Francescato et al (1989), the three-question index (b1-b3) on student housing residential satisfaction developed by Amole (2009), and the three-question index of NKI (c1-c3) used by the student housing industry in Sweden. The item (1) in this study is identical to an item (a1) and (b1). Item (a2) and (b2) were not adopted because the residential duration and mobility in student housing could be largely influenced by students' period of study, such as graduation and change of study place. Besides, under the situation of student housing shortage and allocation rules in Stockholm, residential mobility may be much limited. Question (a3) is adopted because it creates a hypothetical scenario, "if you move again", so that respondents do not need to

consider the obstacles of moving in reality. Lastly, question (c2) is adopted because it expresses similar ideas of the "Psychological Construct Theory" which indicates that satisfaction occurs when the residents' current housing situation meets their aspirations (Galster, 1985).

The three questions were measured on a scale from 0 to 10, with a higher score representing a higher level of satisfaction or agreement. The overall residential satisfaction index was calculated for each respondent as the average of their scores on these questions, as suggested by Amole (2009).

4.2.2 Indicators

According to information gathered from the interview, 24 indicators were selected out of the 54 indicators, and thereafter investigated in the questionnaire. As mentioned, they were measured through a 7-point Likert scale, with a higher score representing a higher satisfaction level towards the indicator. These 24 indicators are listed in Table 3.

Table 3. Indicators measured in the questionnaire survey

	Indicator	Explanation
1	university	closeness to your university
2	stations	accessibility to public transport stations
3	shops	quantity and variety of shops nearby (e.g. markets, restaurants)
4	green spaces	availability and closeness to green spaces and natural elements (e.g. lawns, lakes, forests)
5	electricity	electricity installations (e.g. number of electrical sockets, stability of power supply)
6	water supply	e.g. water temperature, water flow
7	internet	internet service inside your room
8	security system	quality of security system to the private spaces (e.g. gates, doors)
9	fire safety	e.g. smoke alarms, escape route
10	soundproofing	soundproofing (e.g. noise from neighbours, party noise, vehicle noise)
11	air quality	indoor air quality (e.g. humidity, smell, dust)
12	size	room size
13	orientation	room orientation (i.e. north/south/west/east facing)
14	bathroom facilities	quality of bathroom facilities (e.g. shower head, flush toilet, sink, mirror, water-tap)
15	kitchen facilities	quality of kitchen facilities (e.g. stove, refrigerator, sink, oven, microwave)
16	laundry	use of laundry (e.g. distance to the laundry, availability of washing/drying machines)
17	lifts/stairs	availability, location and quality of lifts/stairs in the building
18	rent	rent paid to the landlord
19	cleanliness	general cleanliness in the building and your room
20	garbage disposal	e.g. ease of throwing garbage, waste recycling
21	insects	activities of insects, pests, and rodents in the accommodation
22	safety	personal safety perception in the residential area (e.g. walking home at night, harassment)
23	privacy	sense of privacy in the room
24	friendship	existence of friends nearby

4.2.3 Demographic variables

Information about eight demographic characteristics were collected in this study: age, gender, nationality, educational level, enrolment status, housing type, residential duration and move experience.

4.3 Data analysis

The data analysis in this study included four steps. First of all, the demographic features of the respondents were analysed using descriptive statistics. Secondly, a descriptive analysis was performed on overall residential satisfaction and the 24 indicators. As the premise of the descriptive analysis, a reliability analysis was conducted for the three items on overall residential satisfaction, and hereafter the overall residential satisfaction index was computed as the mean score on these three items. In the third step, a stepwise multiple linear regression was applied to identify which of the indicators were predictors of the dependent variable (overall residential satisfaction index). Lastly, the independent sample t-test and analysis of variance were used to compare the means of overall residential satisfaction in different socio-demographic groups.

5 Results and analysis

5.1 Socio-economic features of the respondents

The 183 respondents' profile is presented in Table 4. These students came from more than 30 countries, a testament to Stockholm's diversity. Around half (51.4%) of them were less than or equal to 24 years old. The percentage of female respondents (58.5%) was almost 1.5 times higher than that of the male respondents (41%), which was roughly in line with the Swedish Higher Education Authority's statistics that during 2020 autumn semester women made up 61% of the first- or second-cycle enrolled students. The surprising evidence was that a large percentage of the respondents was master students (58.5%) with respect to level of study, and international students (45.9%) regarding enrollment status. This might be explained by an observation when conducting the interview that many local bachelor students did not live in student housing.

Almost all the respondents lived in one of the three mentioned student housing types: corridor rooms (45.9%), apartments (27.9%) and studios (23.5%). Many of them had lived in their current room for less than 1 year (50.3%) or 2 years (41%). While a few students (16.4%) had moved for more than twice, for 45.9% of the respondents it was their first experience in Stockholm's student housing.

Table 4. Respondents' profile

Individual characteristics	Frequency	Percentage
What is your age?		
≤ 24	94	51.4
25-29	72	39.3
≥ 30	17	9.3
What is your gender?		
Female	107	58.5
Male	75	41.0
X	1	0.5
What is your level of study?		
Bachelor's level	56	30.6
Master's level	107	58.5
Doctoral level	20	10.9
What is your enrollment status?		
Local student	84	45.9
International student	99	54.1
What is your nationality?		
Swedish	66	36.1
Chinese	24	13.1
Indian	17	9.3
Spanish	9	4.9
Other (30 countries)	67	36.6
What type of student housing do you live in currently?		
corridor room	84	45.9
Apartment	51	27.9
Studio	42	23.5
Shared room	1	0.5
Other	4	2.2
How long have you lived in your current accommodation?		
< 1 year	92	50.3
≥ 1 year, < 2 years	75	41.0
≥ 2 years	16	8.7
How many times have you moved in student housing in Stockholm?		
0	84	45.9
1	69	37.7
≥ 2	30	16.4

5.2 Descriptive analysis

Firstly, a reliability test was conducted for the three items on overall residential satisfaction. The results showed a high level of internal consistency (Cronbach's alpha = 0.859), indicating that these three items were homogeneous and measured the same concept. Therefore, it should be rational to compute the overall residential satisfaction (ORS) index for each respondent as the average of their scores on these three items.

The ORS index measured the overall residential satisfaction level of each respondent. The results (Table 5, Figure 1) showed that the majority of respondents (60%) were satisfied or very satisfied with their current residence, four times the proportion (16%) of those who were dissatisfied or very dissatisfied. The satisfied respondents constituted the largest percentage, followed by the neutral respondents. This might explain why the mean value of ORS index (6.57) was just above the lower limit of the "satisfied" level.

Table 5. Descriptive statistics of overall residential satisfaction index

Satisfaction	ORS range	Frequency	Percentage
Very dissatisfied	$0 \leq ORS \leq 2$	8	4.37
Dissatisfied	$2 < ORS \leq 4$	22	12.02
Neutral	$4 < ORS \leq 6$	43	23.50
Satisfied	$6 < ORS \leq 8$	68	37.16
Very satisfied	$8 < ORS \leq 10$	42	22.95

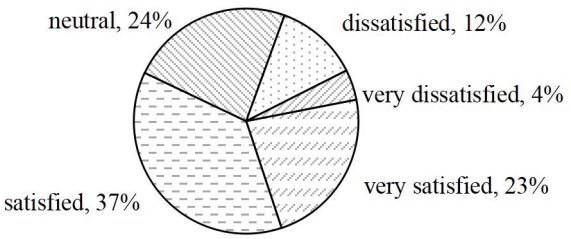

Figure 1. Overall residential satisfaction amongst respondents

The descriptive statistics of the 24 indicators were presented in Table 6. The indicator with the highest mean value was *accessibility to public transport stations* (6.27), followed by *green spaces and natural elements* (6.04). Moreover, *accessibility to public transport stations* was the item with highest mean value and lowest standard deviation, indicating a high level of satisfaction of most of the respondents. Interestingly, these two items, the only ones classified as "very satisfied", both reflecting the locational characteristics. On the other hand, the indicator with the lowest mean value was *soundproofing* (4.16), followed by *security* (4.60) and *kitchen facilities* (4.61). Overall, none of the indicators were classified as "dissatisfied" based on the means. However, exactly half (12) of the indicators were classified as "slightly satisfied" while only 2 indicators were classified as "very satisfied", indicating there was room for improvement.

Table 6. Descriptive statistics of the indicators

Items	N	Mean	Std. Deviation	Satisfaction level
ORS index	183	6.57	2.13	
Stations	183	6.27	1.006	VS
green_area	183	6.04	1.292	VS
Water	183	5.87	1.502	MS
University	183	5.68	1.569	MS
Safety	183	5.68	1.429	MS
Privacy	183	5.54	1.440	MS
Electricity	183	5.37	1.570	MS
Internet	183	5.26	1.702	MS
Insects	183	5.11	1.591	MS
Friendship	183	5.10	1.612	MS
Bathroom	183	5.09	1.675	MS
fire_safety	183	5.02	1.389	MS
garbage_disposal	183	4.99	1.844	SS
lifts_stairs	183	4.92	1.579	SS
Cleanliness	183	4.90	1.628	SS
Rent	183	4.78	1.719	SS
Laundry	183	4.72	1.743	SS
Size	183	4.69	1.581	SS
Orientation	183	4.69	1.599	SS
Shops	183	4.68	1.637	SS
air_quality	183	4.66	1.609	SS
Kitchen	183	4.61	1.657	SS
Security	183	4.60	1.703	SS
soundproofing	183	4.16	1.701	SS

Notes: VS = very satisfied (mean ≥ 6), MS = moderately satisfied (mean ≥ 5), SS = slightly satisfied (mean ≥ 4).

5.3 Regression analysis

Regression analysis allows to explore which aspects contribute the most to the overall residential satisfaction. At first, the principal component analysis (PCA) was performed to reduce the dimension of the indicators. However, it was found chaotic and thus abandoned; instead, the multiple linear regression with stepwise method was adopted to determine which indicators were most important to the respondents' overall residential satisfaction. The results of both PCA and stepwise regression were presented in the following sections.

4.3.1 Principal component analysis

Kaiser-Meyer-Olkin (KMO) value was 0.853 and the significance level for the Bartlett's test was 0.000, suggesting that the data was suitable for factor analysis. Six components with eigenvalue larger than 1 emerged and were retained, together they explained 57% of the total variance. To simplify and optimize the data structure, rotation (varimax with Kaiser normalization) was applied. The output of the rotated component matrix is presented in Table 7, where factor loadings less than 0.4 were hidden.

As Costello and Osborne (2005) suggested, "strong data" in factor analysis means high item communalities, no crossloading item (item with high loading on two or more factors), and several items load strongly on each factor; however, these criteria are hard to meet in practice. In this study, the item communalities were all larger than 0.4 and no item loaded larger than 0.4 on more than one factor, so the communality and crossloading were considered satisfactory. However, the components seemed to be problematic.

Component 1 was comprised by 11 items and accounted for 27% variation. It was named *support services* as *kitchen facilities, bathroom facilities, laundry* and *security* loaded high

on this component. Some other items such as *cleanliness, soundproofing* and *air quality* also had a high loading on this component. Compared with component 1, component 2 (*utilities*) and 4 (*location*) seem to be more clearly structured. Component 3 (*room attributes*) was mainly comprised by *rent, size* and *orientation*, the most basic attributes that people care about when renting. On SSSB's website, students can easily find the exact rent, room size and orientation of the available accommodations. On component 5 (*social interaction*), items *shops* and *privacy* had high loadings. This seems to indicate that satisfaction towards *quantity and variety of shops nearby* is positively related with satisfaction towards *privacy* in the room, which violates the common sense that if there are more shops around, there will be more people around and thus less privacy. However, a possible explanation could be that the respondents did not capture and focus on the "quantity and variety" of shops but perceived shops as places where there is extensive contact with other people. In this case, it could be argued that both shops and privacy are related with the latent aspect of social interaction. Students who are more satisfied with shops turned to be those who feels better having people around, and they may have less requirements for private space, resulting a higher satisfaction level towards privacy. Component 6 (*isolation*) was comprised by item *existence of friends nearby* and *availability and location of lifts/stairs*. It could be argued that these two items were related because they both reflected the latent aspect of isolation: satisfaction towards friends indicated the level of social isolation, while satisfaction towards lifts/stairs reflected the ease of going outside from the room - a sign of physical isolation.

Table 7. Rotated component matrix

Item	Component					
	1	2	3	4	5	6
Cleanliness	.710					
Kitchen	.677					
Bathroom	.631					
Security	.630					
Insects	.600					
Fire safety	.598					
Soundproofing	.593					
Air quality	.590					
Garbage disposal	.504					
Laundry	.496					
Safety	.448					
Water supply		.721				
Internet		.710				
Electricity		.650				
Rent			.813			
Size			.757			
Orientation			.582			
Stations				.762		
University				.717		
Green area				.610		
Shops					.725	
Privacy					.485	
Friendship						.864
Lifts/stairs						.534

Rotation method: varimax with Kaiser normalization.
Total variance explained = 57.046%, factor loadings < 0.4 were hidden.

Even if it had been tried to interpret the components, for some components, such as component 1, 5 and 6, there was confusion because they were comprised by a set of items

that could not be related by common sense. Besides, for components 5 and 6, there were only 2 items with a high loading, while factors with fewer than three items are considered unstable (Costello and Osborne, 2005). Therefore, it was decided not to use the six components as independent variables in regression. Instead, the stepwise method was used, see the next section.

5.3.2 Stepwise regression

Stepwise regression was adopted to determine the best linear combination of the 24 indicators in predicting the overall residential satisfaction. Seven indicators were selected as predictor variables to overall residential satisfaction in student housing in Stockholm: satisfaction with *quality of kitchen facilities, general cleanliness, accessibility to public transport stations, room orientation, availability and location of lifts/stairs, room size* and *rent*. The variance inflation factors (VIF) were computed to check for the presence of multicollinearity. All the independent variables had a VIF below 2, suggesting the absence of multicollinearity problem in the model.

The linear regression model explained 54.5% of the variance in overall residential satisfaction, in which all the seven predictor variables had a positive relationship with overall residential satisfaction. Of all these predictor variables, satisfaction with *kitchen facilities* contributed most to predicting overall residential satisfaction, followed by *cleanliness* and *public transport stations*. These three variables were significant at a level of 0.000. The remaining predictors in decreasing order of strength were *room size*, *lifts/stairs, room orientation* and *rent*, with the first three predictors significant at 0.01 level and the last one significant at 0.05 level.

Table 8. Stepwise regression

Variable	B	Std. Error	Beta	t value	p-value	VIF
(Intercept)	-2.869	0.828		-3.466	0.000***	
Kitchen	0.330	0.080	0.256	4.115	0.000***	1.492
Cleanliness	0.304	0.084	0.232	3.598	0.000***	1.596
Stations	0.422	0.111	0.199	3.793	0.000***	1.057
Lifts/stairs	0.205	0.071	0.152	2.874	0.005**	1.075
Orientation	0.200	0.073	0.150	2.734	0.007**	1.153
Size	0.232	0.086	0.172	2.678	0.008**	1.578
Rent	0.157	0.079	0.127	1.987	0.048*	1.562

Dependent variable = overall residential satisfaction index (ORS index).
Residual standard error = 1.468, df = 175, R = 0.738, R^2 = 0.545, F = 29.98, p < 2.2e-16.

5.4 Difference in residential satisfaction with respect to demographic variables

In order to examine whether the students' overall residential satisfaction level varied between different demographic groups, the independent sample t-test and analysis of variance (ANOVA) were employed. T-test measures the difference in the means between two groups, while ANOVA evaluates the difference in the means of more than two groups. The seven characteristics included in the analysis were *age, gender, level of education, enrollment status, type of housing, residential duration* and *move experience*, with type of housing categorized into three groups and all the other characteristics categorized into two groups. Extreme small groups, such as gender "X", type "shared room" were excluded in the analysis.

Before testing the differences among means, the associations between the seven nominal variables were examined based on Cramer's V. The results (Table 9) showed that two pairs

of variables were moderately associated: *enrollment status* and *level of education* (Cramer's V = 0.464), and *enrollment status* and *type of housing* (Cramer's V = 0.475). The other pairs of variables were all weakly associated with a Cramer's V smaller than 0.3. Therefore, three-way ANOVA was adopted to test the effect of *level of education, enrollment status, type of housing* jointly, whilst t-test used for *age, gender, residential duration* and *move experience*.

The results of t-test (Table 10) showed that the mean of overall residential satisfaction of those who had lived in their current accommodation for less than 1 year was significantly higher than those who had lived for more than 1 year (p = 0.036). No statistically significant difference was found between means of groups under *age, gender* and *move experience*. The results of ANOVA (Table 11) showed that no significant interaction effect was found for *type, status* and *edu* on ORS, while *type* had a significant main effect and *status* almost approached significance. Tukey's post-hoc test for *type* revealed that students lived in corridor rooms (mean = 6.20) had a significant lower level of ORS compared to those lived in studio (mean = 7.22, p = 0.026).

Table 9. Cramer's V of the demographic characteristics

	Age	Gender	Edu	Status	Type	Time	Move
Age	1						
Gender	0.087	1					
Edu	0.263	0.089	1				
Status	0.085	0.091	0.464	1			
Type	0.107	0.135	0.094	0.475	1		
Time	0.220	0.014	0.097	0.087	0.083	1	
Move	0.267	0.119	0.157	0.133	0.092	0.072	1

Table 10. t-test for means of ORS with respect to demographic characteristics

Variable	Group	N	Mean	Sd	t	p
Age	≤ 24	88	6.75	1.968	0.767	0.444
	≥ 25	89	6.51	2.202		
Gender	Female	105	6.71	1.989	0.646	0.519
	Male	72	6.50	2.229		
Residential duration	< 1 year	87	6.96	1.987	2.108	0.036*
	≥ 1 year	90	6.30	2.140		
Move experience	No	79	6.58	2.039	-0.271	0.787
	Yes	98	6.66	2.134		

Table11. Three-way ANOVA on ORS with respect to demographic variables

	F	*p*
Status	3.859	0.051
Type	7.329	< 0.001***
Edu	0.078	0.780
Status:type	0.239	0.788
Status:edu	0.047	0.828
Type:edu	0.900	0.409
Status:type:edu	0.845	0.432

Notes: Status = enrollment status, categorized as “local student” and “international student”. Type = type of housing, categorized as “corridor room”, “apartment” and “studio”. Edu = level of education, categorized as “undergraduate” and “postgraduate”.

Table12. Tukey’s test for differences among type of housing on ORS

Contrast	Estimate	t	*p*
Apartment - corridor room	0.606	1.657	0.225
Apartment - studio	-0.407	-0.956	0.606
Corridor room - studio	-1.012	-2.622	0.026*

6 Discussion

6.1 Overall residential satisfaction level

This study has shown that students were generally satisfied with the student housing in Stockholm, with a mean score of 6.57 on a scale from 0 to 10. This score was slightly lower, however, than that of a Norwegian study with mean 7.31 out of 10 (Thomsen and Eikemo, 2010) as well as the NKI (mean 73 out of 100) reported by Stockholm's largest student housing company Stockholms studentbostäder.

Meanwhile, the three-item index adapted from previous literature appeared to be highly reliable in measuring overall residential satisfaction in student housing. The internal consistency of the three adopted questions appeared to be higher compared with the questions used in Amole's study (Amole, 2009). It seems appropriate to avoid using the question "*Do you intend to move to another accommodation in the near future?*" adopted by Amole (2009) in Stockholm's situation, as results from the open-ended question were showing that students' mobility were indeed restricted due to the credit-day rule - "needed to wait 4 years to get enough days for the apartment". On the other hand, the question adapted from the NKI used by SSSB, "*How well does your current room meets your expectations?*", seems to be effective when measuring satisfaction. This question expresses similar idea as the "Psychological Construct Theory", where residential satisfaction level depends on the gap between current housing situation and the residents' psychological "reference condition" established by their needs and aspirations (Galster, 1985). The remark from one respondent supported such relationship: "I am satisfied with my accommodation based on my low expectations. I am a student in an expensive city hence I am happy to live in a big enough room, near enough to the city centre and university."

6.2 Predictors of overall residential satisfaction

In this study, seven indicators appeared to be the predictors of students' overall residential satisfaction, among which the most important ones are *kitchen facilities*, *cleanliness* and *public transport stations*. The finding that *quality of kitchen facilities* was an important predictor of overall residential satisfaction was not unexpected. According to the interview results, in some countries where shared on-campus dormitories are common, such as India and China, there are usually large-capacity canteens to ensure students' daily meals and thus dormitories are not equipped with kitchens. In Stockholm, however, it is common for university students to prepare their own meals in the kitchens inside student housing. Hence, the quality of kitchen facilities becomes rather important to residential satisfaction. Likewise, previous studies also revealed the importance of kitchen to the students' residential satisfaction (Amole, 2009; Najib, Yusof and Osman, 2011).

Indoor cleanliness appeared to have a significant positive contribution to residential satisfaction, corresponding to existing studies (Twale and Damron, 1991; Moore et al., 2019). Interestingly, relevant findings from the open-ended question suggested that the degree of cleanliness seemed to rely heavily on the residents, "As I live in the corridor type of residence, my satisfaction is pretty much varied by the tenants. I used to live with clean people so my experience using the kitchen with them was so great, but when they move out and new tenants was dirty, I really hated using the common area."

Accessibility to public transport stations was also found to have a significant positive effect on students' residential satisfaction, in line with previous studies (Delbosc, 2012; Seshadhri and Paul, 2017; Xu, Sunindijo and Mussi, 2020). This is not surprising as transport system

provides easy access to various facilities elsewhere. Unexpectedly, however, *closeness to university* was not a predictor of overall residential satisfaction, contrary to a Norwegian study which showed a significant positive effect between them (Thomsen and Eikemo, 2010). One possible reason is after an online-learning period due to COVID-19 pandemic, students realize that there are many other effective ways to learn besides on-campus learning, and therefore put less emphasis on the proximity to university. Another possibility might be that, the importance of location relative to the university is more likely to show in terms of 'convenience' of getting to the university rather than 'distance' to the university. This argument is inspired by some research on public transport accessibility which shows that perceived accessibility, rather than the actual distance between the residence and transport system, is associated with residential satisfaction (Hamersma et al., 2014; Olfindo, 2021). As *accessibility to public transport stations* was the only predictor relevant to locational characteristics, it seems in Stockholm, a satisfactory student housing does not necessarily need to be located near universities, shops, etc., as long as it is convenient to get to these places.

Additionally, an unexpected finding was that overall residential satisfaction seemed to much depend on the most fundamental attributes of housing while none of the socially-related indicators, such as *safety, privacy* and *friendship*, appeared to be predictors of overall residential satisfaction. Generally, both the physical aspect including equipment and services and the social aspect are believed to be influential to residential satisfaction (Amérigo and Aragonés, 1997; Biswas et al., 2021). Previous empirical studies regarding student housing also suggested a significant influence of social environment on residential satisfaction, such as Amole's study (2009) which found social attributes including social density and privacy were predictors of student housing satisfaction in Nigeria. In this regard, the results in this study should not be interpreted as social aspects mean nothing to students' residential satisfaction, as there were more than 40% variation in the dependent variable remained to be explained. It may only suggest in Stockholm's student housing, the aspects reflecting the basic necessities of life - a clean, affordable and adequately spacious shelter, a place to prepare meals, and easy commuting - are essential to students' residential satisfaction. The influence of social environment on students' residential satisfaction might be worthwhile to be further explored.

6.3 Residential satisfaction with respect to demographic characteristics

Students' overall residential satisfaction appeared to vary by length of stay in the accommodation. In this study, satisfaction appeared to be lower among students who had longer stay (more than 1 year) in their current accommodation, in line with the findings of Fang (2006) and Dekker et al. (2011). One possible reason is that the longer the students stay, the more problems they may encounter; meanwhile, residential mobility in student housing is much limited due to the credit-day rule. In this situation, residential mobility as a way to reduce dissatisfaction is blocked (Cowgill and Rossi, 1956), and dissatisfaction builds up over time. However, this does not necessarily mean satisfaction will decrease with length of stay all the time. The relationship between them seems to be more complex as there are also evidences that indicate a positive relationship (Amole, 2009). An inspiration from a relevant study is that the probability of residential relocation increases initially until a peak, and then declines as the length of duration increases (Thomas, Stillwell and Gould, 2016). Combining this observation with the view from "Psychological Construct Theory" that increasing residential mobility is one of the outcomes of dissatisfaction (Galster, 1985), it could be possible that the level of dissatisfaction follows a

similar pattern: increases until certain point and then decreases over time. Nonetheless, this study only suggested a negative relationship between residential duration and satisfaction.

Overall residential satisfaction was also found to vary between different types of housing. Specifically, students lived in studios were found more satisfied than those who lived in corridor rooms, not surprisingly. For one thing, studios may differ from corridor rooms in physical attributes such as room size and kitchen facilities, and correspondingly social interactions such as privacy and cleanliness in the common areas. Compared with studio residents, students live in corridor rooms are more likely to be affected by their neighbours, as one respondent said, "some people don't clean the kitchen or throw the garbage". For another, living in a studio seems to be more of an active choice because of the high credit days required. For example, the average credit days needed for a studio in the largest student housing area in Stockholm, Lappkärrsberget, is 661 days; while for a corridor room it is 213 days. This means when students are capable to choose studios, they can also choose corridor rooms, in which case they choose the one that best meets their expectations. Using the "Housing Needs Theory" to explain, choosing to live in a studio seems to be a voluntary behaviour that reduces the "lack of fit" between the current and desired housing need, and therefore students live in studios are likely to be more satisfied compared with those who live in corridor rooms.

6.4 Implications

The results from the interview and questionnaire of this study reveal several noteworthy points to ensure a better living experience for the university students in Stockholm. Firstly, to guarantee a satisfactory student housing, attention needs to be paid to the seven predictors in the regression model, namely, kitchen facilities, cleanliness, public transport stations, room size, lifts/stairs, room orientation and rent. Strategies such as building new student housing near public transport, ensuring kitchen facilities are adequate and working properly, and arranging more frequent cleaning services for the common areas may be of great help.

Secondly, this study calls on a more responsive and timely problem handling process as well as more attention to students' demands. For one thing, a longer residential duration was found to related with a lower satisfaction level, which, as argued, might indicate that the problems arose during the students' period of stay were not well solved. For another, comments from the open-ended question also indicate the need for better management and maintenance. Some newly built facilities could be not very useful to the residents, "they built a padel court that nobody asked for and removed green space for it"; while in the meantime, the existing facilities were not properly maintained or operated: "(in the laundry) the machines break down constantly and the drying cabinets never dry things properly" "the common room sauna are not available for use and there's no information why".

Last but not least, the results imply the importance of collective responsibility among students, as some aspects seemed to be largely influenced by neighbours. Noise from neighbours was mentioned frequently in the open-ended question, which corresponded with that *soundproofing* was the indicator with lowest satisfaction level. In this respect, students themselves can do a lot to create a better living environment, such as by avoiding making noise in late night and taking care of the common area. Authorities can also contribute by introducing stricter rules, random inspection, and conducting thorough introduction of the rules to new residents.

6.5 Limitations

There are a few limitations need to be noted. Firstly, selection bias could exist. Those who were dissatisfied with their accommodation might be more willing to fill in the questionnaire so as to report their problems. The indirect incentive of donation used in this study might alleviate this problem as it encouraged students to complete the survey; however, it is difficult to totally avoid such a problem. Also, as the hard copies of questionnaire QR code were mainly distributed in academic buildings, students who went to these places had a higher probability of being exposed.

The second one is related to the small sample size. In order to reach more students, three authorities including a student housing company and two universities were contacted, but unluckily did not receive any help due to their consideration of privacy protection of students. In the end, although the sample size was sufficiently large to yield statistically valid results, the relatively small number of responses might result in relatively low statistical power.

Additionally, to ensure a proper questionnaire length, not all the indicators summarized from previous literature were investigated. Besides the 24 indicators examined by this study, a series of the other indicators could also be influential to overall residential satisfaction, such as furniture arrangement, maintenance, regulations and relationship with neighbours. These aspects could be explored in future study.

7 Conclusion

This study investigated residential satisfaction with student housing in Stockholm. The main aims are firstly, to understand the overall residential satisfaction of students with the provided student accommodation; secondly, to identify the indicators which could predict the overall residential satisfaction; and thirdly, to examine whether the overall residential satisfaction level varies between socio-demographic groups.

A questionnaire survey was conducted to identify the students' satisfaction with student housing, on the basis of the semi-structured interview. The results showed that the current residents in Stockholm's student housing were generally satisfied with their accommodation. Aspects including kitchen facilities, cleanliness, public transport stations, room size, lifts/stairs, room orientation and rent were found to be predictors of overall residential satisfaction, according to the stepwise regression model. Moreover, in terms of demographic characteristics, studio residents were more satisfied than corridor-room residents, and those with a shorter residential duration were found to be more satisfied.

The study fills a gap in research on residential satisfaction in the context of student housing in Sweden. The three questions adopted to measure the overall residential satisfaction could also serve as reference for future research in student housing. The empirical findings provide insights of what constitute satisfactory student housing from the perspective of current occupants, which may be useful to universities and student housing companies. For future research, the influence of social and management aspects on students' residential satisfaction could be further explored.

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Appendix 1: Summary list of indicators

location (near school)	location (near city center)
accessibility to public transport stations	electricity installations
water supplies	thermal comfort
internet service	indoor noise
outdoor noise	ventilation
indoor air quality	lighting conditions
recreation services	availability of shared open space
shops	natural environment
views from the window	rules and regulations
official fee paid	maintenance of the hall
maintenance for the green areas	security
fire safety	personal safety perception
size	ceiling height of the room
age of the housing	interior finishes
building aesthetic	floor level
room orientation	landscaping and pavements around the building
bathroom	kitchen
laundry	storage
common room	parking
garbage disposal	furniture arrangement
privacy in the room	lifts/stairs
support services for disabled persons	number of persons in the hall/floor/corridor
location of bedroom on the floor	arrangement of rooms in each level in the building
relationship with neighbors	existence of friends
activities of insects, pests, and rodents	general cleanliness
being able to adapt the room to your own style	entertaining friends
ease of move-in process	self/other gap

Appendix 2: Interview summary

	Gender	Housing experience				
		country	type/tenancy	attributes	satisfactory aspects	unsatisfactory aspects
1	Male	Sweden	corridor room	own bedroom&bathroom, shared kitchen, top floor, no lifts, 3 windows	good view; generally satisfied	couldn't get sun, sometimes discouraged to go outside because there's no lift
			shared room	top floor, 2 students, own small bedroom, kitchen, bathroom, living room, with lifts	good view, good heating, plenty of refrigerator space	high rent, not easy to clean
		Singapore	corridor room	own bedroom, ground floor, shared kitchen and bathroom with 8 rooms, on-campus, no air conditioner	near school buildings	small size, sometimes hot and noisy, uncomfortable bed, couldn't get sun, passersby could see inside
		China	shared room	4 students, bathroom, no balcony	good roommate relationships	dark, humid, dirty, smelly; sometimes disturbed by roommates when sleeping
2	Female	Sweden	corridor room	own bedroom&bathroom, shared kitchen with 12 rooms	quiet, clean, good room orientation, beautiful view, acceptable rent (cost-effective)	-
			corridor room	in the same building as the above one	-	lake of diversity because most neighbors are Indian, too many parties
		China	shared room	4 students, bathroom, balcony	newly renovated, generally satisfied	sometimes disturbed by roommates
			shared room	4 students, shared bathroom with other rooms on the floor	-	old, inconvenient bathroom, bad sound insulation
3	Male	Sweden	corridor room	second floor	close to university, natural lighting is a bit better than the next one, diversity (neighbors from different countries)	too dark, can't get sun, sometimes the kitchen is not cleand on time after party
			corridor room	ground floor, next to the train line, shared kitchen with 8 rooms, 4 shared refrigerators and 8 stoves	close to university, large kitchen	serious noise from the train day and night, too dark, passersby could see inside, the sewer pipe in the bathroom burst once
		America	private rental	-	-	-
4	Male	Sweden	corridor room	ground floor, shared kitchen with 8 rooms, no furniture and light bubs when move in	have a private bathroom, cheap rent, near bus and metro stations, close to university(within 10 minutes walk), easy to go outside beacuse of ground floor, no indoor noise, safe	near the street so sometimes can hear the sound of ambulance, bad experience during the first several days after moving in(not furnished), not easy to hang pictures on the wall
		Italy	private rental	with 4 students, own bedroom(22 ㎡), first floor, beside a tall building, rent 550 euros excluded water and electricity	-	high rent, very bad lighting because of the tall building, heating didn't work
5	Female	Sweden	corridor room	with supermarket in the ground floor; keys to the building, the kitchen and the bedroom	wall color is macaron green, larger available inner space compared with the next one because the vestibule is not separated from the bedroom by a door, good room orientation and adequate sunshine	noise from supermarket supply-trucks
			corridor room	keys to the building, the corridor and the bedroom	better security (doors) compared with the above one, better natural environment, better location(near metro station)	dilapidated inner finishes
		Netherlands	corridor room	own bedroom & bathroom&refrigerator, on-campus, smaller than that in Sweden, large window	supermarket nearby with various choices, near library	noise from party, smell of marijuana
		China	shared room	4 students, small bathroom, air conditioner, washing machine, no balcony	separated shower and toilet	toilet too small
6	Female	Sweden	studio	own bedroom&kitchen&bathroom, laundry on the same floor	quiet, convenient laundry and kitchen, convenient transportation (metro and bus stations) with various lines, living alone	only one washing machine and one dry machine in the laundry
			corridor room	next to the shared kitchen, building beside the road and near the garbage disposal place, laundry in another	-	noise from kitchen upstairs beacuse of party, noise from people throwing glass bottles and garbage cleaning in the garbage disposal place,

				building		noise from people on the road
			corridor room	east facing, small kitchen	quiet	kitchen too small (half of that of the above one)
		Belgium	corridor room	ground floor, 14 ㎡, own bathroom and refrigerator, furnished, shared large kitchen, 15 rooms in a floor, outside the window was lawn and bench, off-campus	near university (12-minutes walk)	sometimes crowded kitchen, noise from people talking outside and the pub street, lake of privacy
		China	shared room	4 students, 16 ㎡, ground floor, north facing, toilet without hot water, washroom with hot water shared with the floor, shower in another building	lights out at fixed time at night so usually quiet when sleeping	Opposite was the male students' dormitory so the curtain was always closed (lack of natural lighting), humid during summer, inconveneint shower
7	Male	Sweden	studio	own bedroom&kitchen&bahroom, around 15 rooms on a floor	near university, large flow of water in the kitchen	dirty hallway, noise from neighbors, difficult to move things into the building because of the small lift, lack of communication with neighbors
8	Male	Sweden	corridor room	ground floor, 14 rooms on a floor	very satisfied, near bus staion	-
		Indian	shared room	3 students, rental include meals, canteen on the ground floor	-	no privacy, dirty and messy, sometimes rats and insects inside the building
9	Female	Sweden	apartment	2 students, 2 rooms (living room and bedroom), kitchen and bathroom	large size, near university	complicated maintenance application and slow maintenance process, high rent
		Bangladesh	shared room	4 students, shared bathroom and kitchen with 8 rooms, with bacolny	very cheap rent (around 15kr per day)	crowded (better to be 2 students in a room)
10	Female	Sweden	studio	top floor of a two-story building, south facing, near forest and lake	private kitchen, clean and quiet, convenient transportation, leisure and exercise in the woods, playground nearby	too hot during the summer, lake of opportunity to know the neighbors
			corridor room	second floor, 12 rooms on the floor, south facing, open space in front of the building	friendly neighbours, enjoy the sun downstairs, quiet and safe	far from the laundry, lack of restaurants nearby
		Hungary	private rental	3 students, each student owned one bedroom and bathroom (30-40 ㎡), shared kitchen and living room, 2 windows, not in central district	large size with cheap rent, direct tram to the university	less safe area, bad room orientation and natural lighting

Appendix 3: Open-ended question

Q37 (Optional) Do you have any comments on your accommodation?	
1	I am generally very satisfied with my accommodation, however the noise proofing of the bedrooms and the proximity to laundry and garbage disposal for my building (teknikringen 58a) are very inconvenient, as they are located in other premises beyond my building
2	I am satisfied with my accommodation based on my low expectations. I am a student in an expensive city, hence I am happy to live in a big enough room, near enough to the city center and university.
3	They are quite strict with money affairs, I have a friend that left 4 months ago and he wasn't given the money of the deposit yet. The tenants association is not very active
4	Newly built student apartment building in Ruddammen
5	I live in a student apartment by familjebostäder in Älvsjö, so it's quite different base conditions compared to for example lappis or studentbacken.
6	This didn't happen to me but a friend of mine that lives in the newly renovated apartments (as silly as it may sound to whoever thinks it sounds silly) keeps hearing her neighbors having sex multiple times during the day and during the night after 10PM. She also says that they bang on her wall when she does it. SSSB tells her she should approach them but it isn't that easy. She's a person with social anxiety so confrontation is not an option. The area is not bad at all however the availability of stores is genuinely poor, this is pretty important to students. The closest store is Coop extra and Ica nära, 2 stores that are known to be redicilously expensive. For students it's important to save money because unexpected costs arrive all the time and we can't afford buying from the closest store. The best thing i would say about the area other than that it's usually quiet (as far as i know) is the pizza place with affordable pizza prices for students right in front of Kungshamra. Good luck with your thesis, i hope all goes well!
7	My accommodation is a shared appartment on campus (we are 3 roommates)
8	Some basic appliances such as vacuum cleaners or coffee makers can help a lot
9	I'm really happy of where I live. But we had huge problems with thefts in our housing cooperative. My boyfriends bike got stolen from the basement, our basement storage got broken into, people have been stealing tires from cars etc. Because of this me and my boyfriend are afraid to store things in the basement which is quite annoying. We would like to get bikes for the summer but we're not sure if we can afford to buy bikes if those were to get stolen.
10	I don't really care about access to nature or parks, so that question is irrelevant for me. I wish I could live in a larger space but the rent is good for the area I'm living so I'm ok with living in a few sq m less than I'd like.
11	It's really great, I couldn't imagine living in a better place. The only minor inconvenience is the noise from the neighbours, but the rest is great!
12	Fairly satisfied with my apartment, close to everything and a good rent. It's also very clean and I have access to everything I need in terms of water, a good place to cook etc. it's also very safe.
13	This might be useful to you: I've lived in 4 different student apartment complexes, and the worst part of all of them have always been the laundry rooms. They are so incredibly filthy, the machines break down constantly, and the drying cabinets NEVER dry things properly. My current apartment (sssb, Apeln) is the worst in this regard.
14	Love my sssb house but communication with the landlord and pro-active measurements from them when something is wrong is 0.
15	The heating inside the apartment is poor. Kitchen exhaust doesn't work well.
16	It's kth supplied
17	I think it's a good place compared to other students housing in EU. I live in the ground floor so the light, ventilation and privacy are not so good TBH.
18	Not able to control the temperature in the room and it is very often too hot/cold in the apartment
19	In a shared/corridor area the usage of common things are not good, not everywhere but in most cases.
20	overall good
21	It was built this summer so might be why its so nice (solna residence)
22	I am very satisfied. I was pleasantly surprised when I moved in. However I would like more collective responsibility in for example the laundry room. People clean pretty badly after themselves.

23	Untidy in common areas
24	Unresponsive maintenance, they built a fucking padel court that nobody asked for and removed green space for it.
25	Unfortunately, the noise is so easy to hear and the rules are not strict enough to make students avoid having parties in accommodation buildings or apartments.
26	The heating should be improved because it doesn't work properly and you have to pay for an electric heater not to freeze. Some people don't clean the kitchen or throw the garbage so better communication and responsibility would be appreciated. Some people listen to loud music in the night which is annoying especially for people who are busy and have to study or work the next day. The alarm in the kitchen door is annoying because it turns on sometimes when you enter or leave the kitchen and it makes such an unnecessarily loud noise that is very frustrating. Some windows in the corridors and in the kitchen don't function well. They're old and won't close which means that it is colder than it should be. The Internet should be managed by sssb but instead individual students have to call telenor and ask them for the Internet renewal but it shouldn't be student responsibility. At least it wasn't like that in other student accommodations that I lived in other countries. Because heating doesn't work properly we shouldn't pay for it or it should be fixed. Where I live in Nacka, in January/February there have been few weeks issues with water. It was dirty and then they had to close it to repair it.
27	The biggest issues with my current housing are the general wear of the building, all of the outlets for air/water/electricity being worn/poorly functioning, and that broken items (like kitchen appliances, doors etc) are not fixed or replaced. The common room sauna are not available for use and there’s no information why, and there’s no information about the ongoing renovation works either, and all in alla the communication from SSSB is terrible.
28	Needed to wait 4 years to get enough day's for the apartment
29	As I live in the corridor type of residence, my satisfaction is pretty much varied by the tenants. I used to live with clean people so my experience using the kitchen with them was so great, but when they move out and new tenants was dirty, I really hated using the common area
30	Room layout: 3/7 - a 7+m deep room, even when facing southeast, means the inner corners never get sunlight :(SSSB/Nyponet for reference Also I've lived in non-student accomodation 3+ times in Stockholm (short term 2nd hand contracts), student accomodation is soooo nice in comparison with stability and affordability.
31	Cold
32	I'm lucky to live in a nice corridor close to my school.
33	The newly renoated housing is very expensive for students The service when you do a fault report takes a long time to get fixed
34	Would be nice to have an oven.
35	The landlord to care more about the fault reports in the common spaces, and give proper information if there is a severe problem eg water leakage in the area, so we are not going to have water for the next x days or hours.
36	Horrible smell
37	There is lack of a social area that could work with booking system.
38	Availability and speed of maintenance when an issue is reported is very low.
39	It is too expensive. Way to expensive
40	The maintenance system is outdated and slow. Repairs take very long and persistent complaining. Area is quite central, very close to campus, public transportation, and city center.
41	Very outdated amenities
42	I am very dissatisfied with the heathing and extremely low temperature in the apartment, which is a general problem.
43	I've had luck. Sthlm student housing situation is horrible.

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