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Author/s:

Fatourehchi, D;Candido, C;Skillington, K;Doloi, H

Title:

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Date:

2024

Citation:

Fatourehchi, D., Candido, C., Skillington, K. & Doloi, H. (2024). Leveraging Google reviews to explore users' perspectives on student accommodation in Melbourne. Widera, B (Ed.) Rudnicka-Bogusz, M (Ed.) Onyszkiewicz, J (Ed.) Wozniczka, A (Ed.) 37th PLEA Conference for Sustainable Architecture and Urban Design., pp.811-816. Passive Low Energy Architecture.

Persistent Link:

<https://hdl.handle.net/11343/354704>

Leveraging Google reviews to explore users' dissatisfaction with student accommodation in Melbourne

DORSA FATOUREHCHI¹ CHRISTHINA CANDIDO¹ KATIE SKILLINGTON¹ HEMANTA

DOLOI¹

¹ Faculty of Architecture, Building and Planning, The University of Melbourne, Melbourne, Australia

ABSTRACT: Amid increasing demand for investment in student accommodation in Australia, ensuring high-quality lodgings has become vital for sustaining a positive student experience. To achieve this, accommodations should provide an environment where students feel comfortable, healthy, and well. This research aims to identify key design and performance gaps in current purpose-built student accommodation (PBSA) in Melbourne. Through a text-mining approach, nearly 2000 online reviews from 16 PBSA in Melbourne were analysed and compared, concentrating on students' perceptions regarding comfort and dissatisfaction. Sentiment, thematic, and probability analysis were implemented to reveal performance-related issues. This research found that students' dissatisfaction often centred on the Indoor Environmental Quality (IEQ) of their rooms. Interestingly, students' dissatisfaction with their physical surroundings was not strongly influenced by the quality or availability of communal spaces. Probability analysis revealed that students who were dissatisfied with IEQ were 85% more likely to be dissatisfied with the interior design features of their rooms. The same cohort was also more than 50% likely to make negative comments about lack of controllability and adaptive opportunities within their rooms, demonstrating the importance of autonomy for students in their private spaces. Through the consideration of occupants' dissatisfaction, the findings indicate the importance of addressing interior design and IEQ performance as potential solutions to enhancing the performance of PBSA in Melbourne.

KEYWORDS: Comfort, student accommodation, IEQ performance, Interior design

1. INTRODUCTION

Purpose-built student accommodation (PBSA) is a fast-growing building portfolio in Australia because of the strong demand from international students which accounts for the third-largest export item for the country [1]. Despite pandemic constraints, Melbourne has seen an increase in the number of PBSAs, from 70 in 2018 to 110 in 2023 [2]. Combined, these buildings host a total of 20,000 students in Melbourne alone – this is 38% of total resident population in the Central Business District (CBD) [3].

This recent boom has prompted the release of new guidelines for establishing a baseline for building performance in the sector, such as the Student and Shared Accommodation Guidelines [4], which makes recommendations about private indoor space sizes, communal spaces, neighbourhood characteristics, sustainability, and waste management. However, as part of IEQ criteria, these guidelines highlighted issues regarding temperature in student accommodation that had been designed based on the existing Environmentally Sustainability Design (ESD) requirements. For instance, a report regarding student accommodation in Victoria pointed out several IEQ-related issues mentioned by some housing providers and Council officers, such as temperature and acoustic control within buildings [4].

Despite these efforts to establish building and IEQ performance, research studies are yet to follow suit – at the time this paper was written, only four peer-reviewed papers were found on Scopus reporting findings from IEQ-related research in student accommodation in Australia [5-8]. This is at odds with the increasing demand to build PBSAs around the country over the last decade. This is potentially a critical issue considering the documented effect of IEQ on students' health, dissatisfaction, and academic performance [9-11]. Studies have also shown the impact of biophilic design on psychological restoration of the students and higher academic scores [9, 12]. More recently, interior design has emerged as an important dimension, due to its significant effect on students' dissatisfaction [6-7, 13]. Accordingly, the International Education Association of Australia [14], the quality of student accommodation – in terms of interior design and IEQ performance – requires improvement [13, 8].

This paper contributes to the research gap in Australia by reporting findings about user dissatisfaction observed in PBSAs from data harvested from Google Reviews (GRs).

2. METHODS

This study analysed a total of 2,000 comments voluntarily posted on Google from 2013 to 2023, focusing on 16 student accommodation buildings in Melbourne. NVivo and Leximancer were used to analyse text database.

Sentiment analysis was used to identify reviews that were negative in nature. For this step, machine learning was utilised since such methods are indicated to be more accurate than other approaches [15]. Specifically, this research used an Azure machine learning algorithm as it has been shown that it can build effective sentiment analysis models to perform data analytics [16]. The sentiment scoring range was 0 to 1, with scores close to 1 being identified as positive [17]. This research purposefully selected reviews that scored close to 0 to extract the negative sentiments. As each review might contain positive and negative statement(s), this study implemented sentence-level sentiment analysis for higher accuracy [18]. Further, to develop insights regarding the most and least mentioned aspects in negative comments, exploratory content analysis was deployed to identify concepts that could aid the coding of the text-based data. This approach enabled themes to be defined as the coding process was completed. Finally, conditional probability analysis was conducted to understand the likeliness of different negative sentiments co-occurring with one or more identified themes.

3. RESULTS AND DISCUSSION

3.1 Prevalence of IEQ issues based on negative sentiments

Through analysing the content of data with negative sentiments, high-level concepts were identified. These concepts were room, experience, student activities, and social activities.

In the word frequency analysis (Fig. 1), it was demonstrated that the term “room” emerged as the most frequently used term in negative reviews with 1 to 3-star ratings. In terms of frequency, “room” was followed by “place”, “service”, “cleaning”, and “temperature (hot)”. This highlights the importance of private room amenity, services, and IEQ, such as thermal environment. More detailed concepts are shown in Fig. 2.

Sentiment scores of the negative reviews were also computed and the breakdowns are reported in Table 1.



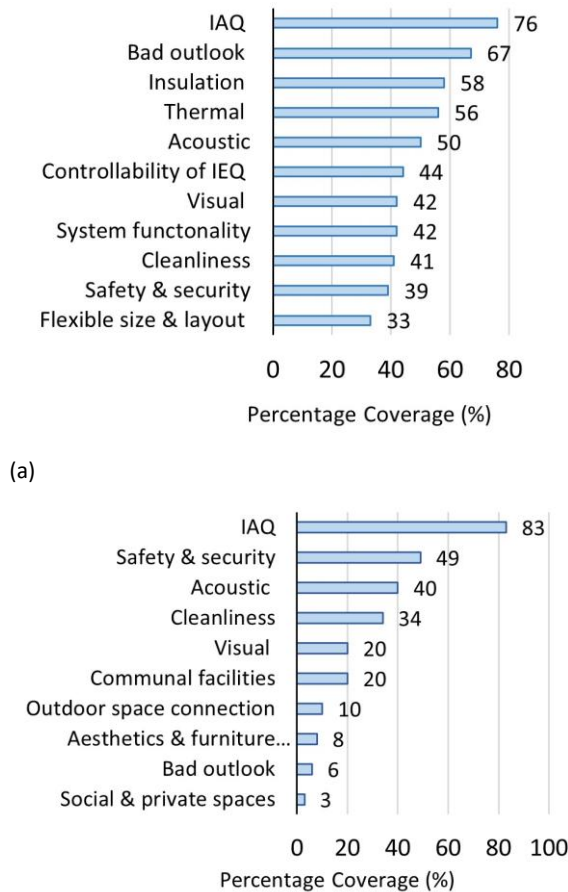
Figure 1: Content and word frequency analysis of the scraped textual data.

The negative sentiment scores showed that thermal and IAQ aspects of private rooms were closer to zero, which suggests more negativity around those themes among dissatisfied users.

The thematic and sentiment analysis revealed interesting results regarding users’ dissatisfaction. As shown in Fig. 3, the negative sentiments were mostly centred around physical aspects of their private space and quality aspects of their communal spaces. This implies that when occupants were very dissatisfied, their priority concern was their private room’s thermal, visual, and acoustic comfort, architectural characteristics (e.g., size, layout, etc.), adaptive opportunities and systems (e.g., passive and active building system and controllability). In terms of communal spaces, quality aspects related to safety and security, utility, services, and facilities were the main issue among dissatisfied students.

Results suggest the critical role of student accommodation providers in maintaining the basic standards for IEQ. Without this maintenance or basic provision, students could experience significant dissatisfaction, especially if indoor environmental quality needs are not met in the private spaces. Interestingly, students’ IEQ complaints increased when they realised they had no control over temperature and noise, or even the unavailability of opportunities to retrieve their comfort. These factors – such as students’ autonomy, controllability, and privacy – underscored the criticality of these features for students to avoid discomfort and unhealthy situations in their private room.

It can also be concluded from the sentiment analysis that the mentioned features were negatively affecting students’ health. The high room temperature resulted in frustrated students, reducing their sentiment score (higher negativity) with their private spaces. The lack of controllability in these PBSA compounded these negative sentiments. Since this type of accommodation is considered an all-inclusive building (e.g., utility and housing costs in one bill), it is of utmost importance to address such existing problems in PBSA.



(b)
Figure 2: Percentage coverage of the themes among dissatisfied students with: (a) private rooms and (b) communal areas for IEQ and design aspects.

Table 1: Sentiment scores of negative reviews.

Space Type	Private Room		Communal Spaces	
Themes	Negative score average	SD	Negative score average	SD
Cleanliness	0.13	0.13	0.11	0.12
IAQ	0.11	0.14	0.15	0.13
Thermal	0.11	0.12	NA	NA
Visual	0.12	0.14	0.19	0.21
Acoustic	0.14	0.13	0.15	0.14
Aesthetics & quality of furniture	0.14	0.14	0.11	0.09
Bad outlook	0.16	0.20	0.21	0.12
Connection with natural light	0.15	0.16	0.36	0.09
Nature connection	0.20	0.12	NA	NA
Outdoor space connection	0.19	0.12	0.18	0.14
Insulation	0.17	0.16	NA	NA
IEQ controllability	0.1906	0.13	NA	NA

Functional active & passive systems	0.15	0.13	NA	NA
Flexible size, layout and storage	0.16	0.14	0.12	0.10
Safety and Security	0.17	0.15	0.13	0.13

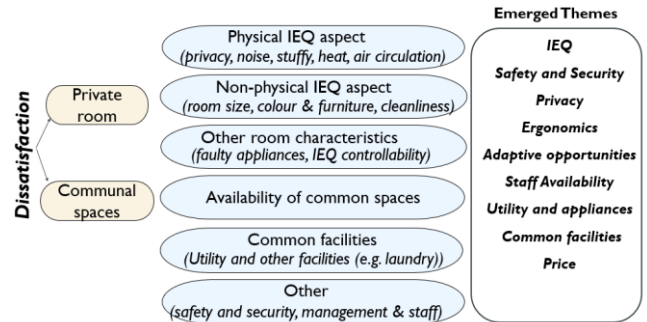


Figure 3: Emerged themes from the negative sentiments of online review.

Furthermore, among the students who showed dissatisfaction with their room, they would rather pay less and live in a lower-quality private housing than reside in a PBSA that was not prioritising their basic needs above other opportunities, such as social and recreational spaces. This finding emphasises how the availability of certain features in their room should be of paramount concern in interior design before providing additional communal features in any PBSA.

For the communal areas, the complaints were mostly about the availability or the adequacy of spaces for a particular purpose. Some of the students mentioned the low capacity of library areas and study spaces. There were also complaints regarding the availability of communal spaces to use during their free times (e.g., gym, cinema room, etc.). Other factors such as cleanliness, safety, and security aspects were also mentioned in the negative reviews. For instance, there were complaints regarding broken windows, safety and security in hallways, and stolen objects from communal areas, all of which negatively affected their perception of communal areas.

3.2 Emerged themes based on the negative reviews

3.2.1 IEQ

As previously discussed, IEQ was one of the most important features when it came to increasing dissatisfaction with private indoor environments. In some comments, students mentioned high temperatures and less natural ventilation as contributors to their negative feelings (e.g., frustration) and physical health (e.g., headache). For example, one user noted that “when it’s 25°C outside it’s near 40-50°C inside, it feels unsafe ...”.

Previous studies have highlighted the negative impact of thermal conditions and ventilation on

students' satisfaction levels and work efficiency [6-7]. Another study also pointed out that student dissatisfaction with IEQ may result in poor sleep quality and health symptoms [19].

The negative reviews for IEQ were mostly related to private spaces, but there were also some complaints associated with communal areas. For example, some students mentioned that due to safety reasons, users were unable to open their doors to take advantage of crossflow ventilation from the hallway.

3.2.2 Controllability, autonomy and affordance

As previously mentioned, another negative factor cited by the students was the lack of opportunity to change their indoor environment when users felt thermally uncomfortable. According to [20], the human-building interaction with respect to the thermal environment becomes crucial, as occupants can be comfortable in a wider range of temperatures than what is defined by standards. Therefore, controllability in the room can play a vital role in creating more comfortable environments by giving the users the autonomy to instantly change their indoor environment (e.g., operable windows). In one comment, a student mentioned that *"Ventilation in the room is noisy as hell and you can't do anything about it because windows are sealed."* Users also indicated that no alternatives were provided to reduce indoor temperature. In line with this study, research conducted by [21] highlighted that controllable windows are necessary for sustainable student housing facilities. Many studies demonstrate that a constant thermal environment might not lead to more satisfaction among occupants. Therefore, the controllability feature in the indoor environment not only can create a more dynamic environment but could also result in perceptions of control and thus, higher satisfaction of occupants [22].

3.2.3 Inclusivity and adaptability in use

In terms of physical features, dissatisfied students mentioned both private and communal spaces in terms of adaptive opportunities. Students mainly complained about their room's size and layout. Some students referred to their room as a *"shoebox"*, noting that it might not be worthy of the rent they are paying. In contrast, some students were satisfied with their room's layout, mentioning that *"Rooms are well lit with natural light and sizable"*. This demonstrates the importance of interior design on students' satisfaction. In line with this finding, studies have shown the importance of interior design as a predictor of student satisfaction with their accommodation [23-24].

Reviews also mentioned available active and passive systems to control IEQ in their room when discomfort occurs. In one comment, a student

criticised the unavailability of windows: *"the rooms open a tiny 2-3 inch's provided no ventilation..."*.

The results from this study also aligned with [22], which regarded room size and flexibility as important facilities to be considered in sustainable housing. In a study by [25], room layout design was also shown to create spatial adaptation opportunities for the occupants in the context of residential buildings. Moreover, [26-27] pointed out the important role of room layout in balancing thermal comfort and energy savings in residential buildings.

For the communal spaces, reviews mostly complained about the inadequacy of most communal and private spaces to accommodate activities such as socialising, studying, or cooking. This outcome aligns with [28], which noted that a lack of adequate private and communal spaces has been identified as problematic in the Post Occupancy Evaluation (POE) of some student accommodation. In addition, the morphological configuration of communal spaces was indicated to predict students' satisfaction [23]. This might be due to the extent to which it can facilitate social interaction. Another study also highlighted the importance ratio of public spaces to private spaces, which could negatively affect their living, learning, and social experiences [29].

3.2.4 Connectivity and interaction

In terms of negative aspects, users criticised the view of the room *"... its location near cemetery, especially in rooms in which windows point at it looks terrifying"*. In terms of light and colour, some students complained about the aesthetics of their private room *"I feel like I'm stuck in a dark grey box. It's aesthetically pleasing but at the same time it's very depressing and the lighting I feel is not enough too"*. This aligns with other research that has highlighted the importance of bright colours to boost pleasure in students [30] and the efficacy of interior lighting on well-being [22].

In line with the results of this study, biophilic features and nature views appear to play an important role in increasing occupants' satisfaction and improving their attention [31-32].

3.2.5 Functionality and accessibility

This theme emerged? from comments focusing on the functionality of building systems, accessible facilities and amenities, proximity to campus, and efficient storage and space utilisation. Among the negative comments, building systems were mentioned to be useless to achieve thermal comfort during winter or summer, such as: *"Heater is not hot, it's completely useless in winter"*. After a POE of student accommodation, a study [33] found that amenities related to IEQ (e.g., ventilation, lighting, and sound) were important elements in student accommodation facilities. Another study showed building facilities influenced students' comfort and

satisfaction, affecting their academic performance [34].

In terms of functionality of communal spaces, some users expressed complaints about the accessibility of some areas, such as their courtyard. In this instance, users mentioned being unable to use the courtyard, and considered it as being there solely for appearances.

3.3 Relationship between IEQ experiences and dissatisfaction in student accommodation

The probability analysis revealed that users dissatisfied with the IEQ of their private room were around 88% more likely to also report dissatisfaction with design-related issues of their room. Among the users dissatisfied with IEQ, it was 50% more likely that they criticise thermal issues (private and communal spaces), insulation, and controllability and adaptive opportunities in their room. Therefore, the room's thermal characteristics were the most important aspect of their comfort. It was interesting that thermally dissatisfied students were more inclined to negatively mention their rooms' poor outlook, insulation, controllability, connection with the outdoors, layout, and lack of adaptive opportunities. In terms of controllability of windows and thermal discomfort, users noted the lack of ventilation due to fixed windows in their private room. In terms of interior design and IEQ issues, users pointed out insulation and design-related issues of their floor plan. Results suggest that the uncontrollability and design-related issues (e.g., layout) exacerbated their thermal perception, contributing to lower health outcomes and compromised satisfaction.

Interactive effects were also seen between different IEQ aspects (e.g., thermal, visual, acoustic). Among the users dissatisfied with thermal comfort, it was 53% probable that they negatively mentioned noise and air quality. Among thermally dissatisfied users, it was also 54% more likely that they would express negative sentiments about health and design-related issues. The analysis showed that users dissatisfied with IEQ in their private space were 50% more likely to negatively talk about the indoor-outdoor connection of their space and the capacity of the communal spaces. As mentioned in the previous section, when users felt thermally uncomfortable in their private space, they also realised the lack of adaptable space in the communal spaces, which negatively affected their satisfaction. Some users mentioned that *"rooms no ventilation ...and common study area has noisy students as it not a quiet library"*. The probability analysis also showed that among users complaining about accessible communal spaces, it was 50% more probable that they were thermally dissatisfied with their private room. The

result was in line with a study [35] that suggested users would feel uncomfortable if there were a lack of opportunities in their space to change IEQ.

4. CONCLUSION

This research demonstrated the important aspects to be investigated for re-establishing high-performance student accommodation based on users' longitudinal experiences from their spaces. For this purpose, a diagnostic approach was implemented to first identify the important factors affecting users' negative sentiments of their living environment, specifically examining health and dissatisfaction. It was found that dissatisfied users mostly highlighted the poor quality of their IEQ in their private room, paying less attention to the facilities provided by the communal spaces. Other negative aspects were the lack of adaptive opportunities in their private space, the available adaptive opportunities to maintain their comfort, and the flexibility of their room layout.

After analysing the users' sentiments from the reviews, the important themes were extracted for further analysis to explore whether these themes have contributing effects on users' health and dissatisfaction. This phase revealed that users' dissatisfaction was concurrently affected by multiple themes. Therefore, the assumption of a single cause and effect might not be a best approach to studying students' IEQ-related health and satisfaction, as there were design-related aspects that alleviated or worsened their experience with their built environment.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to Sustainable and Healthy Environments (SHE Lab) and the Faculty of Architecture, Building and Planning and The University of Melbourne, for providing access to the facilities required for this research activity as well as a full PhD scholarship given to the first author of this paper.

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