Group 1 Final Report:

Determining the Human Experience of the Daniels Building

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INTRODUCTION

The University of Toronto's Daniels Building is home to the John H. Daniels Faculty of Architecture, Landscape and Design and is located at 1 Spadina Crescent, Toronto, ON, as displayed in **Figure 1**. Recently, the building was renovated by the Boston-based architecture firm NADAA to include a contemporary addition to the original heritage building and to function as a world-leading hub for education, research, and public outreach (UofT, 2017). Designed by Nader Tehrani and Katherine Faulker, the building has recently been awarded a COTE Award that recognizes the building for its excellent sustainable design (UofT, 2019). The revitalized building displays exemplary sustainable practices including a world-class stormwater management system, daylighting, multiple bike racks and a green roof. Moreover, it also doubles the amount of space available for Daniels students and faculty through the addition of over 100, 000 sq.ft (UofT, n.d.). Since the opening of the building in November of 2017, its successes and shortcomings have yet to be formally evaluated and documented. Therefore, the performance of various spaces across the building and the nature of the user-building relationship remains unclear to the University of Toronto.

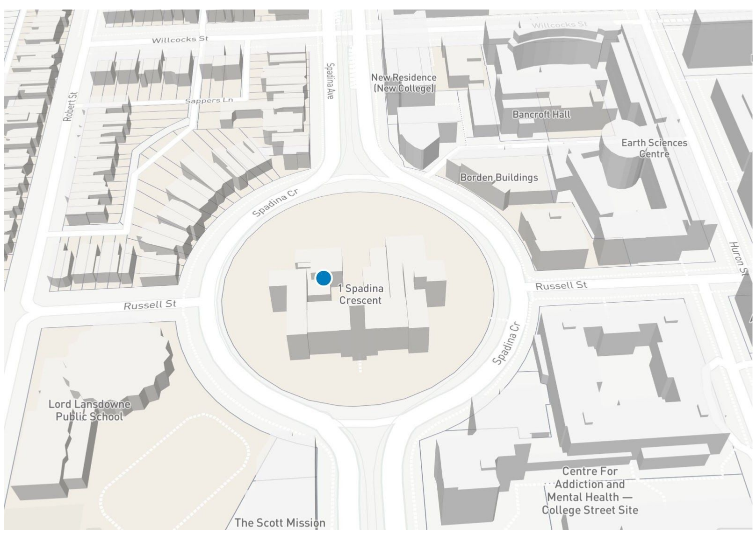

Figure 1. Map showing the location of 1 Spadina Crescent, Toronto, ON

Together with our client Alstan Jakubiec, an Assistant Professor with the Daniels faculty, we developed the following three research objectives:

1. To evaluate the Daniels Building's level of performance based on user perceptions, specifically in relation to characteristics of the building overall, thermal comfort, noise, lighting and space;

2. To compare these levels of performance across different spaces within the Daniels Building; and

3. To benchmark user satisfaction of the Daniel's Building against a large-scale building performance database

LITERATURE REVIEW

Background and purpose of POE

Post-occupancy evaluation (POE) is a well-known method which provides feedback on a building's performance. The main methods and tools used to conduct POEs are surveys, questionnaires, observations and task performance tests (Meir, Garb, Jiao & Cicelsky, 2009). POEs are used in both research and professional fields, however, the use of POE is less common in the field of architecture. Research encourages the use of POE as a learning tool that ultimately improves building performance and user satisfaction (Hay, Samuel, Watson, & Bradbury, 2017). In the past, the traditional use of POE was for technical and professional purposes rather than real practices (Li, Froese & Grager, 2018). As a result, many industries fail to evaluate human experiences and end-user perspectives and fail to reveal the complex issues at work (Roberts, 2001). To make POE more useful, research suggests transitioning from academic uses to industrial uses, and from being researcher-oriented to occupant-oriented (Li, Froese & Grager, 2018).

As a popular method for evaluating users' experience of a building, there are both benefits and challenges that are associated with POE. The benefits of POE include providing a competitive advantage, and the way in which they feedback into the building design process (Zimmerman& Martin, 2001). The barriers of employing this method relate to liability, insurance, and structural factors (Hadjri & Crozier, 2009; Hay, Samuel, Watson, & Bradbury, 2017). The Building Use Studies (BUS) questionnaire is a well-known POE protocol, and was selected for use by our group. The advantages of this method are that it is easy to administer, simple to understand, is reasonably economical to carry out, and the benchmark graphics provide comparison results with other buildings (UK Green Building Council, 2013). However, barriers of this method include difficulties with obtaining high response rates. Moreover, the language and scale used in certain questions can create ambiguity, such that 'too hot' and 'too cold' implies a range of pejorative and discomfort (UK Green Building Council, 2013). Furthermore, problems associated with benchmarking include its narrow focus on the numbers, its lack of clarity in terms of where the data comes from, and its inability to explain the human context behind the numbers (lmuti & Kathawala, 1997).

POE in schools and higher education institutions

There is a great amount of research which shows the diversity and usability of POE in schools and higher education institutions to assess the functional performance of buildings. In general, POE is a great tool for schools because it assures consistency in data gathering and the results can be benchmarked with other buildings (Motsatsi, 2015). In evaluating school classrooms and educational institutions, most of the POEs focus on examining the comfort, health, and productivity of occupants. For example, one article explores the use of POE to investigate the performance of the University of California, Berkley's East Asian library. The evaluation was designed to obtain information to address the sedentary behaviours of library users and discussed their importance in space planning and library design, and in fostering a healthy campus (DeClercq & Cranz, 2014). Another POE study conducted in a primary school demonstrates how the quality of education can be impeded by a built environment that is not conducive to learning, and that improving the built environment of schools can fulfill the health and well-being requirements of students, teachers and staff (Motsatsi, 2015).

Many research studies show that student and occupant work performance and satisfaction is affected by the building design and management characteristics. For example, one study examines the relationship between student work performance and the spatial and aesthetic characteristics of a lecture hall at the Istanbul Technical University Ayazaga Campus. The key findings suggest that building design and effective management are strongly related to the optimal performance and functioning of the building (Manahasa & Özsoy, 2016). In the City University of Hong Kong, POEs were able to help architects and building managers with planning and organizing spaces in ways that met the needs of students and improved their satisfaction (Kim, Cha & Kim, 2018).

Examining building performance and sustainability through POE

Nowadays, the sustainable design of buildings is a popular concept in the context of urbanization and the issue of climate change. POE use is important in assessing educational buildings in achieving sustainability goals and sustainable building designs. From a built environment perspective, research recommends that POEs should be a mandatory part of the building design process, and that these results should feedback into this process to improve the design of future buildings and to make them more sustainable (lmuti & Kathawala, 1997). From the perspective of users, human or social sustainability is hard to measure by POE because of different users' understandings and experiences. A case study examined the Centre for Interactive Research on Sustainability (CIRS) at the University of British Columbia, Vancouver and shows that the overall satisfaction of the CIRS building is strongly related to human features, and if a building is highly socially sustainable it may further facilitate the environmental sustainability of the building (Coleman & Robinson, 2018). Furthermore, the study argues that there are performance gaps between the design of the built environment and the lived experience of a sustainable building, which POE can help to identify (Coleman, Touchie, Robinson & Peters, 2018). Therefore, examining building performance and human sustainability through POEs is vital in understanding the larger scope of environmental sustainability and human sustainability, providing critical feedback in the process of design, and assessing future buildings.

METHODOLOGY

This research project utilized POE, which systematically evaluates the extent to which a building satisfies the needs of its end-users, and aids in addressing issues related to building performance, management, productivity, and satisfaction levels (Preiser & Vischer, 2005; Turpin-Brooks & Viccars, 2006). For our research project, the Building Use Studies (BUS) Methodology questionnaire was used to evaluate the Daniels Building. This standardized questionnaire assess the satisfaction levels of building occupants, and benchmarks the results against over 850 buildings within the BUS Methodology building performance database (BUS Methodology, 2017; Leaman et al., 2013). In addition, it uses a set of key performance indicators to evaluate characteristics of a building including temperature, lighting, noise, storage and overall comfort (Riley, Kokkarinen & Pitt, 2010). The BUS Methodology questionnaire primarily collects quantitative data through questions that are rated on a Likert scale, however, qualitative data is also collected through various comment sections. In addition to the BUS Methodology questionnaire, on-site observations were part of this research project, as we immersed ourselves in the Daniels Building environment inform our discussions. Our observations became an important part of the data interpretation process, allowing us to better understand the occurence of certain patterns.

Student responses were collected in person in four main spaces of the Daniels Building, including the Undergraduate Studio, the Graduate Studio, the Café/Atrium, and one Lecture Hall, whereas staff and faculty responses were collected in their offices and work areas. In total, 144 questionnaires were collected and coded by our te. More specifically, as displayed in **Figure 2**, 30 responses were collected from the Undergraduate Studio, 33 from the Graduate Studio, and 31 from the Café/Atrium, all of which were collected in the renovated part of the building, and 42 from the Lecture Hall, and 8 from Staff and Faculty offices and work areas, which were all collected in the old, heritage portion of the Daniels Building. Approximately 10 hours were spent collecting this data on October 16th, 17th and November 13th. Through discussions with Adrian Leaman and Sylvia Coleman, a sample size of at least 150 respondents (ie. at least 30 respondents per space) was determined for statistical purposes, such as achieving a normal distribution. This sample size was achieved for four of the five spaces.

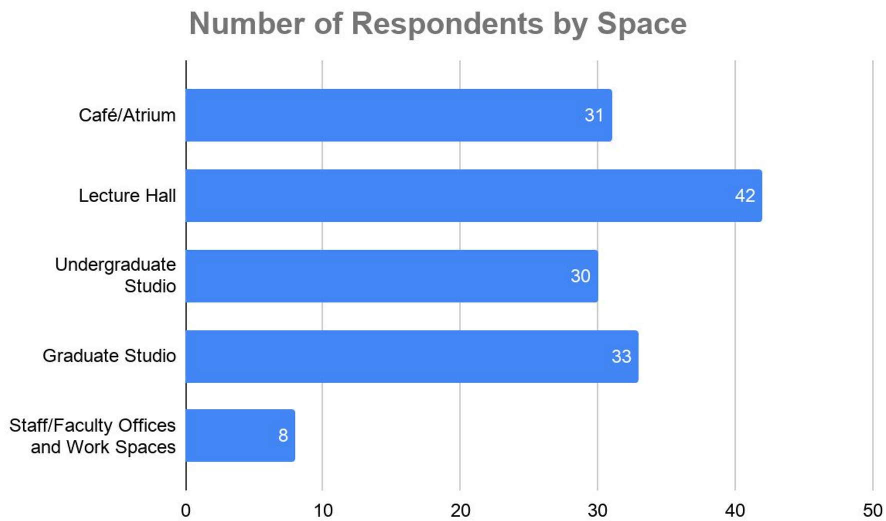

Figure 2. Distribution of questionnaire respondents by space.

The five spaces of focus for this research project all function differently, with the intent of meeting the diverse needs of the building's users. Firstly, the Undergraduate and Graduate studio spaces are primarily used for study and design work purposes. The studio spaces offer an open-concept design which facilitates collaborative work between the students. The large floor-to-ceiling glass windows provide the students with an extensive view of downtown Toronto. In addition, these windows bring in natural lighting to the spaces (**Figure 3** and **4**). The studios are housed with desks spaces and chairs, lounge areas with couches for leisure, and ping pong tables for recreational purposes. In addition, the studio spaces include resources for design projects such as computers, 3D printers, laser and waterjet cutters, and a workshop.

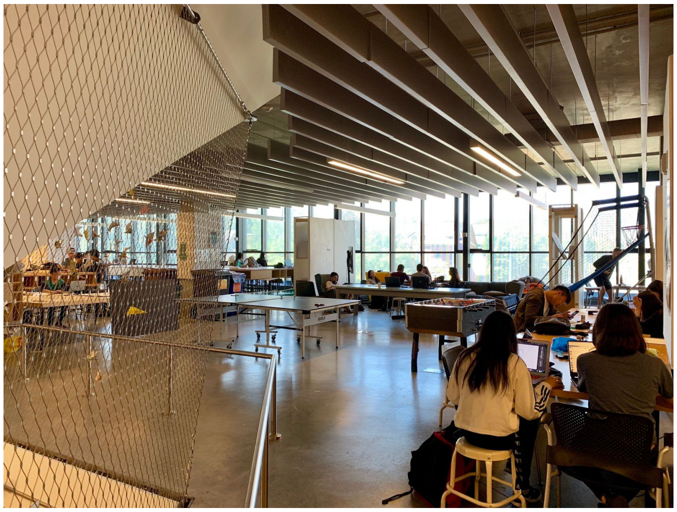

Figure 3. Image of the Undergraduate Studio

Figure 4. Image of the Graduate Studio

The cafe/atrium is a mixed-use area which serves as a meeting ground for students, faculty, and staff, and as a communal work and rest space. Within the cafe/atrium, there is a student-run coffee shop offering snacks and beverages to building users, as shown in **Figure 5**. The lecture hall is a large classroom that has long desks which line the space and a screen at the front (**Figure 6**). Finally, the faculty and staff offices are used as for personal work and provide a space for meetings between faculty and students. The faculty and staff offices are both individual and shared spaces depending on the specific offices. Typically, the faculty and staff offices are relatively small in size.

To develop an initial understanding of the data and related trends, our group began with a high-level examination of the data to identify variables of interest. Following this, the data was analyzed in two main ways: firstly, rather than simply focusing on the mean scores of the responses, the distribution of responses were analyzed and compared, and secondly, to obtain benchmark results, the data was prepared and sent to be analyzed by the BUS administrators. A variety of visuals were created and used by our group to display the data, including pie charts, bar charts, diverging stacked bar charts (produced by our client), images, summary tables, and BUS benchmark graphs, which were produced by the BUS administrators.

Figure 5. Image of the Café/ Atrium space

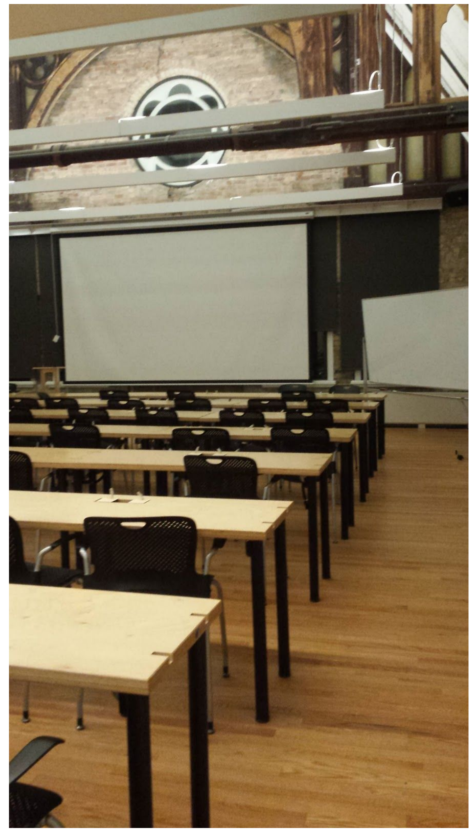

Figure 6. Lecture Hall (Room 200)

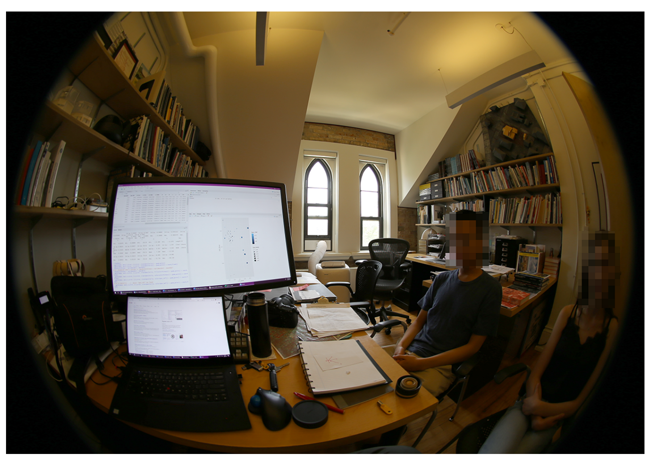

Figure 7. Image of a faculty member's office

RESULTS

High-Level Summary

As displayed in **Figure 8**, the questionnaire demographics show that 62.5% of all respondents identified as female, and 91% reported their age as under 30.

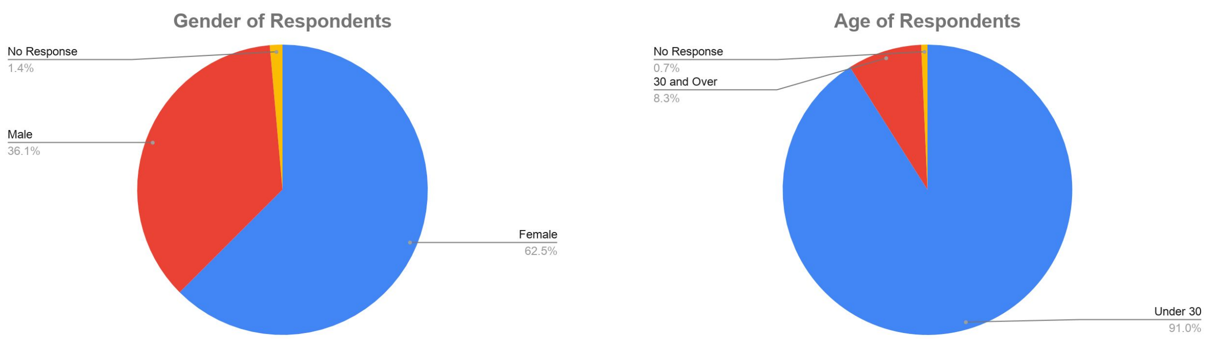

Figure 8. Gender and age composition of all 144 respondents.

Building Overall

Upon graphing the mean values of the "building overall" variables of the BUS Methodology questionnaire, as displayed in **Figure 9**, "image of building" and "suitability of storage arrangements" were identified as variables that distinctly required an in-depth analysis. These variables achieved the highest and the lowest mean values, respectively.

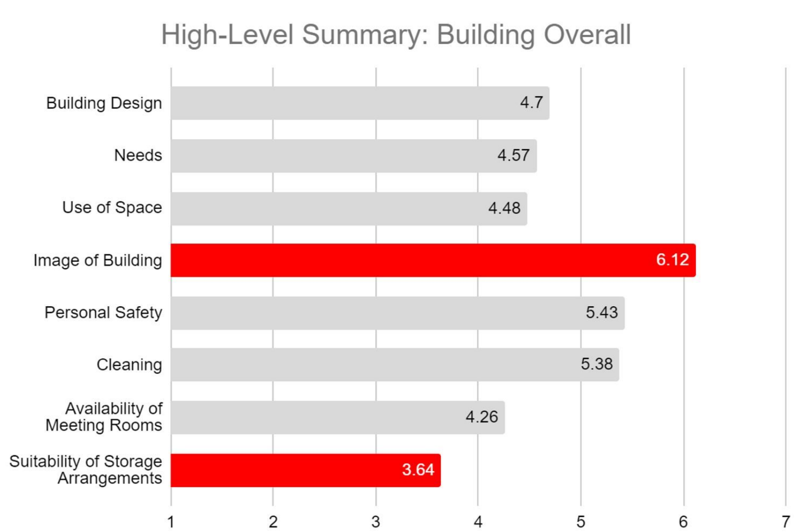

Figure 9. High-level summary of the building overall characteristics of the BUS Methodology questionnaire, showing mean scores for each. Red bars indicate variables of interest.

Image of Building

Image was assessed using the following question: ***"How do you rate the image that the building as a whole presents to visitors?"***. The question was rated by respondents on a Likert scale ranging from 1 (poor) to 7 (good). In analyzing the distribution of the results from all 144 respondents, the findings show that overall, 92% of respondents fall within the high-level satisfaction categories of the Likert scale for image overall, as displayed in **Figure 10**. Moreover, the mean score for image overall is 6.12 and falls above the upper limit of the critical region of the BUS benchmarking graph, thus achieving a green score, as shown in **Figure 11**. As a result, the Daniels Building performs quite well relative to the other buildings in the BUS benchmark dataset.

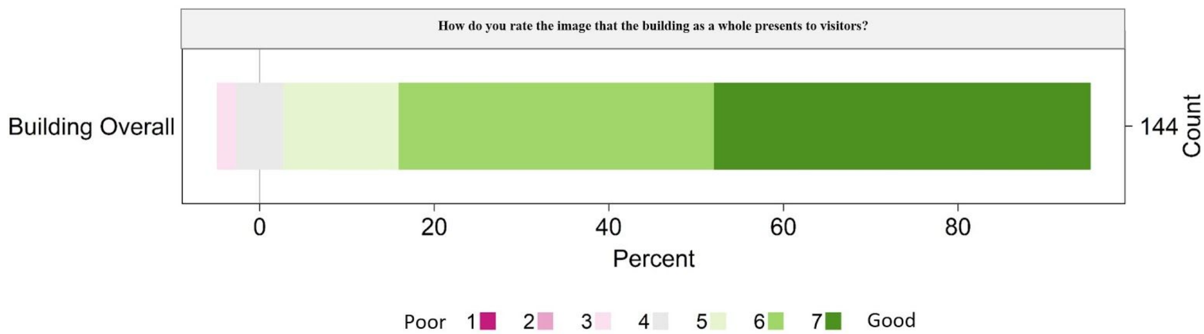

Figure 10. Diverging stacked bar chart for image overall in the Daniels Building. The bar is 100% wide and displays the distribution of responses for each category of the Likert scale.

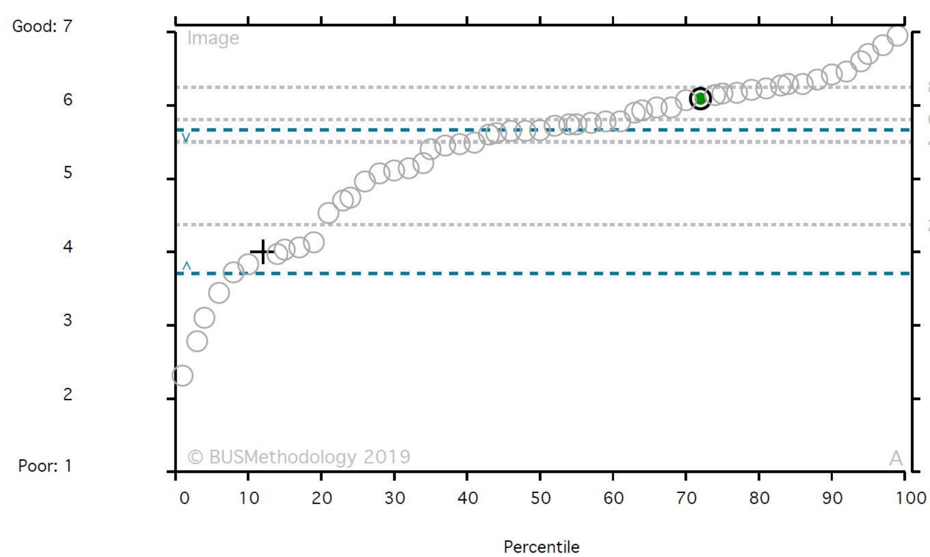

Figure 11. Graph of benchmark results, generated by the BUS administrators. The grey circles represent the mean values of other buildings in the benchmark dataset, the blue lines represent the upper and lower limits of the critical region, and the Daniels Building is represented by the green circle.

Suitability of Storage Arrangements

The ***suitability of storage arrangements*** was rated by respondents on a Likert scale ranging from 1 (unsatisfactory) to 7 (satisfactory). In terms of the suitability of storage arrangements for the building overall, 49% of all respondents fall within the low-level satisfaction categories of the likert scale. Conversely, 33% of all respondents fall within the high-level satisfaction categories, as displayed in **Figure 12**. The Daniels Building received a mean score of 3.64, and a red score, as it falls right below the lower limit of the critical region of the benchmark dataset, as seen in **Figure 13**. While the distribution of the results is quite variable across the Likert scale categories, the mean score suggests that relative to the other buildings in the benchmark dataset, the Daniels Building performs poorly in terms of the suitability of storage arrangements.

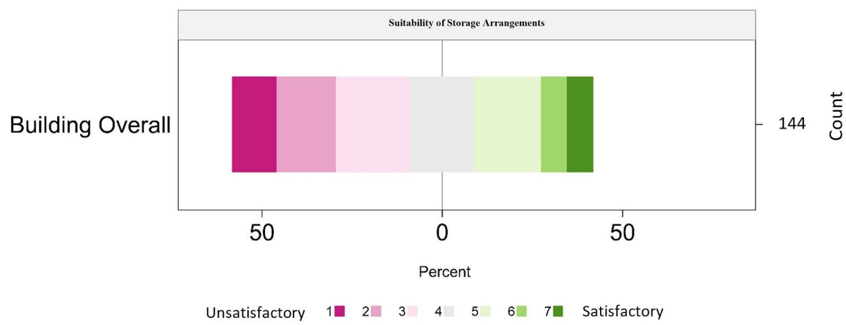

Figure 12. Diverging stacked bar chart for the suitability of storage arrangements overall in the Daniels Building. The bar is 100% wide and displays the distribution of responses for each category of the Likert scale.

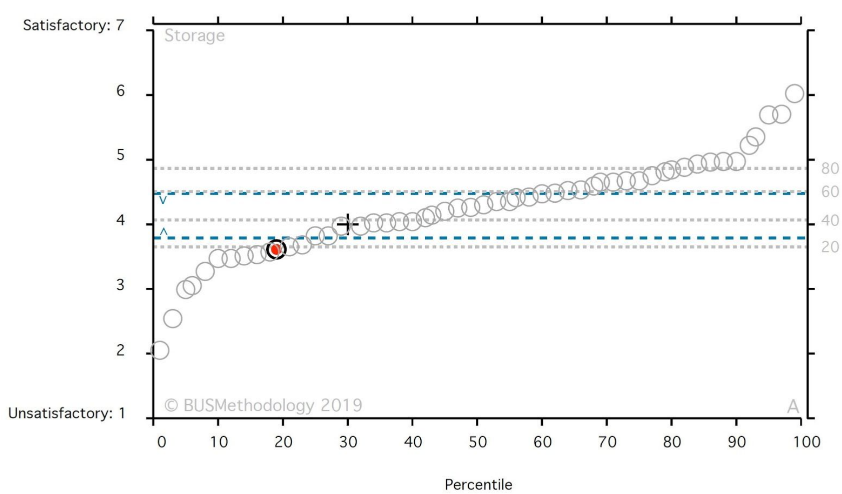

Figure 13. Graph of benchmark results, generated by the BUS administrators. The grey circles represent the mean values of other buildings in the benchmark dataset, the blue lines represent the upper and lower limits of the critical region, and the Daniels Building is represented by the red circle.

Spaces of Focus Comparison

Thermal Comfort

Seasonal thermal comfort was assessed using the following two questions: ***"How would you describe typical working conditions in this space in SUMMER?"*** and ***How would you describe typical working conditions in this space in WINTER?"***. The questions were rated by respondents on a Likert scale ranging from 1 (too hot) to 7 (too cold). **Tables 1** and **2** display the mean scores for each space in summer and winter, and the respective coloured score that was assigned through the BUS benchmarking analysis.

Table 1. Summary of BUS benchmarking outputs for typical working conditions in summer, including mean scores and colour scores for the Daniels Building overall, and for each space of focus. Green represents good, amber represents cautionary, and red represents poor.

Location	Mean Score	Colour Score
Building Overall	4.19	●
Lecture Hall	4.17	■
Undergraduate Studio	4.20	◆
Graduate Studio	4.48	◆
Café/ Atrium	4.40	◆
Staff and Faulty Work Areas	2.62	◆

Table 2. Summary of BUS benchmarking outputs for typical working conditions in winter, including mean scores and colour scores for the Daniels Building overall, and for each space of focus.

Location	Mean Score	Colour Score
Building Overall	4.22	●
Lecture Hall	4.55	●
Undergraduate Studio	3.37	◆
Graduate Studio	4.95	◆
Café/ Atrium	3.54	◆
Staff and Faulty Work Areas	6.12	◆

In analyzing the distribution of the results for thermal comfort, the results varied greatly by space. In summer, as displayed in **Figure 14**, results for the Lecture Hall (LH) were quite evenly distributed across the three groupings of the Likert scale, with 27% falling within the "warm" to "too hot" categories, 36% falling within the "cool" to "too cold" categories, and 38% in the "comfortable" category. In Staff and Faculty offices and work areas (SF), 75% of respondents fall within the “warm” to “too hot” categories, whereas 40% of respondents fall in the comfortable category, and 44% in the “cool” to “too cold” categories for the Café/Atrium (CA) . In terms of the Undergraduate Studio (US), 72% of respondents fall within the “comfortable” category, whereas in the Graduate Studio (GS), 34% of respondents fall within “comfortable” category and 49% in the “cool” to “too cold” categories.

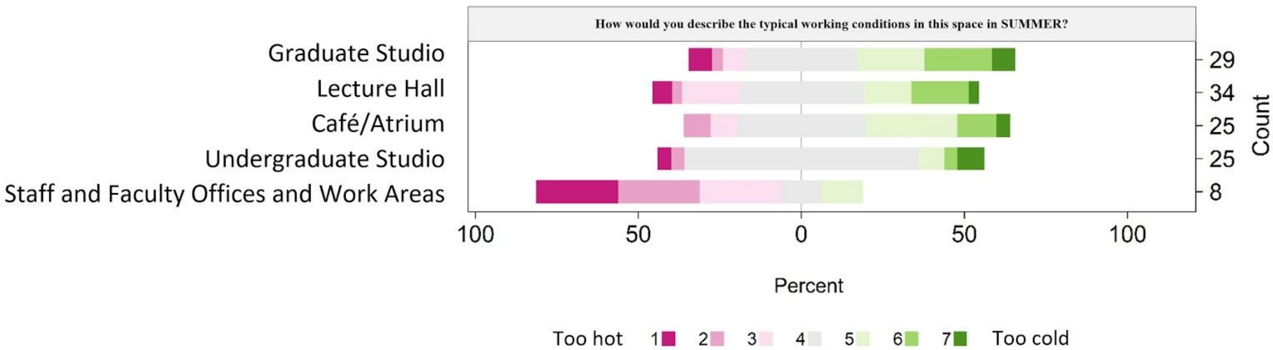

Figure 14. Diverging stacked bar chart for the thermal comfort in summer in each respective space. Each bar is 100% wide and displays the distribution of responses for each category of the Likert scale.

In winter, as shown in **Figure 15**, 45% of respondents fall within the “comfortable” category, and 46% in the “cool” to “too cold” categories for the LH. In the SF, all respondents fall within the “cool” to “too cold” categories, with 38% of them falling within the “too cold” category. For the CA, 36% of respondents fall within the “warm” to “too hot” categories, and 52% in the “comfortable” category. In terms of the US, 50% of respondents fall within the “warm” to “too hot” categories and 38% in the “comfortable” category, whereas in the GS, 66% of respondents fall within the “cool” to “too cold” categories.

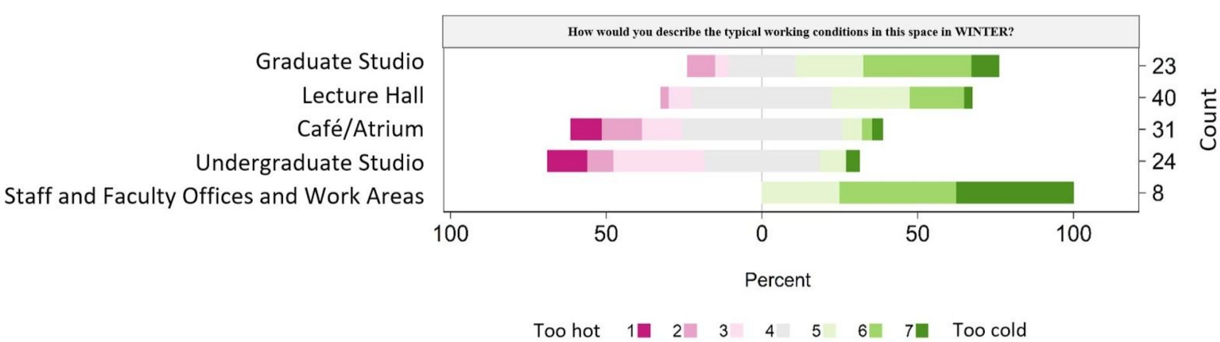

Figure 15. Diverging stacked bar chart for the thermal comfort in winter in each respective space. Each bar is 100% wide and displays the distribution of responses for each category of the Likert scale

Space at Desk

Space at desk was assessed using the following question: ***"Do you have enough space at your or work area in this space?***". The question was rated by respondents on a Likert scale ranging from 1 (too little) to 7 (too much). **Table 3** below displays the mean scores for each space in the building, and the respective coloured score that was assigned through the BUS benchmarking analysis.

Table 3. Summary of BUS benchmarking outputs for space at desk, including mean scores and colour scores for the Daniels Building overall, and for each space of focus.

Location	Mean Score	Colour Score
Building Overall	3.39	◆
Lecture Hall	3.11	◆
Undergraduate Studio	4.25	●
Graduate Studio	2.45	◆
Café/ Atrium	3.80	◆
Staff and Faulty Work Areas	4.00	■

In analyzing the distribution of the results for space at desk, as shown in **Figure 16**, 60% of the respondents for the LH fall within the "little" to "too little" categories, with almost 25% of respondents falling within the "too little" category. In SF work areas, 50% fall within the "neutral/enough" space category, whereas in the CA, a greater amount of variability was identified, with 39% of respondents in the "little" to "too little" categories, 29% in "neutral/enough" category, and 32% in the "much" to "too much" categories. In terms of the US, 46% of the respondents fall within the "neutral/enough" category and 40% fall within the "much" to "too much" categories, whereas in the GS, 75% of respondents fall within the "little" to "too little" categories.

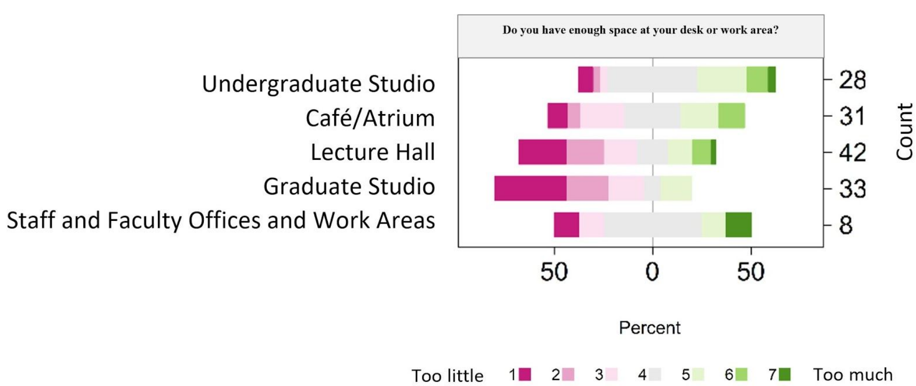

Figure 16. Diverging stacked bar chart for the space at desk in each respective space. Each bar is 100% wide and displays the distribution of responses for each category of the Likert scale

Lighting

Lighting was assessed using the three following questions: ***"How would you describe the quality of the lighting overall?", "How would you describe the quality of the natural light?"*** and ***"How would you describe the quality of the artificial light?"*** . The questions were rated by respondents on a Likert scale ranging from 1 (unsatisfactory) to 7 (satisfactory), and 1 (too little) to 7 (too much), respectively. **Table 4** below displays the mean scores for each space in the building, and the respective coloured score that was assigned through the BUS benchmarking analysis.

Table 4. Summary of BUS benchmarking outputs for lighting overall, including mean scores and colour scores for the Daniels Building overall, and for each space of focus.

Location	Mean Score	Colour Score
Building Overall	4.98	●
Lecture Hall	4.15	●
Undergraduate Studio	5.67	■
Graduate Studio	5.09	●
Café/ Atrium	5.20	●
Staff and Faulty Work Areas	5.28	●

In terms of lighting overall across the individual spaces in the Daniels Building, there was variability in the results, as displayed in **Figure 17**. For the GS, 71% of respondents fall within the high-level satisfaction categories of the likert scale for lighting overall. The results suggest that the GS respondents are generally satisfied with this variable. More specifically, user satisfaction rates highly for artificial lighting US as 83% of US respondents fall within the mid-level category between "too much" and "too little". Conversely, natural lighting seemed to be a key issue for the LH and SF spaces. While LH respondents noted that there was too much natural lighting, SF respondents reported there was not enough. In terms of the SF offices, 63% of respondents fall under the "too little" category of the likert scale for natural lighting and received a mean score of 2.21. These results show that the SF space performs poorly compared to the buildings in the benchmark dataset. For the LH, 42% of respondents fall within the "too much" categories of the likert scale for natural lighting. Finally, the CA respondents demonstrates greater satisfaction for lighting overall.

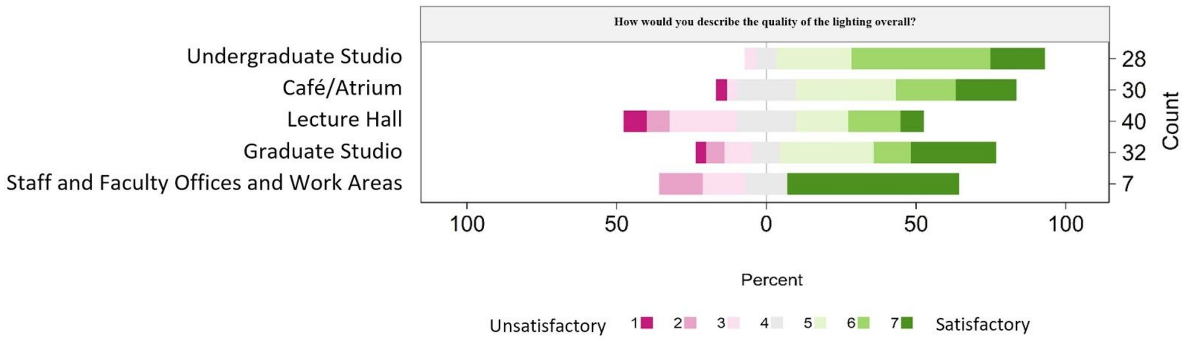

Figure 17. Diverging stacked bar chart for lighting overall in each respective space. Each bar is 100% wide and displays the distribution of responses for each category of the Likert scale

Noise Overall

Noise overall was assessed using the following question: ***"How would you describe noise overall?***". The question was rated by respondents on a Likert scale ranging from 1 (unsatisfactory) to 7 (satisfactory). **Table 5** below displays the mean scores for each space in the building, and the respective coloured score that was assigned through the BUS benchmarking analysis.

Table 5. Summary of BUS benchmarking outputs for noise overall, including mean scores and colour scores for the Daniels Building overall, and for each space of focus.

Location	Mean Score	Colour Score
Building Overall	3.20	◆
Lecture Hall	3.47	◆
Undergraduate Studio	3.42	◆
Graduate Studio	2.63	◆
Café/ Atrium	3.58	◆
Staff and Faulty Work Areas	2.00	◆

Noise overall was a key issue for respondents across the separate spaces in the Daniels Building. In terms of the GS, 75% of respondents fall within the low-level satisfaction categories of the likert scale, as displayed in **Figure 18**. Similarly, SF respondents rated noise overall quite poorly, with 88% of respondents falling within the low-level satisfaction categories. Notably, the US respondents seemed to be less concerned about noise pollution and distractions in comparison to the GS respondents, as only 47% of respondents fall within the low-level satisfaction categories. The distribution of low-satisfaction and high-satisfaction responses is more evenly distributed for the CA and the LH.

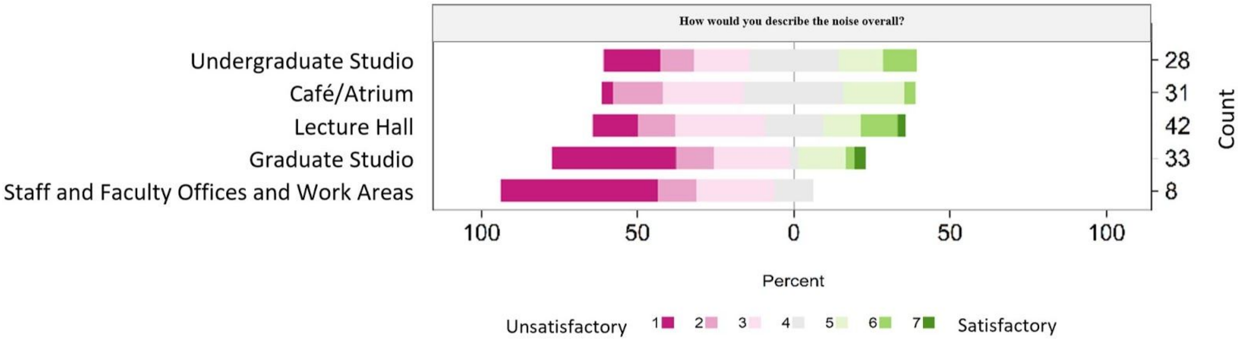

Figure 18. Diverging stacked bar chart for noise overall in each respective space. Each bar is 100% wide and displays the distribution of responses for each category of the Likert scale

DISCUSSION

Characteristics of the Internal Environment

Three characteristics of the Daniels Building's internal environment were assessed, namely lighting, noise and thermal comfort. Upon considering lighting overall, there is high-to-mid level satisfaction in the various spaces of focus in the Daniels Building. The balance between natural and artificial lighting is a standout feature for the spaces and contributes to the image overall. More specifically, the clerestory windows in GS were commended by building users, as they are aesthetically pleasing and provide satisfactory levels of natural light. The following quote from a CA user illustrates their satisfaction with lighting overall: "I love the north glazed wall - you get the right amount of natural and artificial light all day long." However, issues with lighting arose specifically in the older part of the building for the LH and SF spaces. The disconnect of user satisfaction between the old portion of the building and the new part reveals how issues with lighting overall have not been addressed in the old portion.

In terms of thermal comfort overall, the results varied drastically across the spaces of focus in the Daniels Building and across the winter and summer seasons. When looking at the benchmark results for each space, the LH was the only space that performed well relative to the other buildings in the benchmark dataset, with all other spaces achieving cautionary to poor scores. SF reported some of the most compelling results showing that it is far too hot in these spaces in the summer, and far too cold in the winter, which is reinforced by a respondent's statement: "there was very little heat in winter, no cooling in summer, and no ventilation ever". The variability in thermal comfort that is seen across these spaces is likely a function of their location in the building. Staff and faculty offices and work areas are located predominantly in the older, heritage portion of the building, where the thermal characteristics of the heritage building's materials likely differ from those used to construct the new addition. However, the variability in thermal comfort that was identified in the CA, US and GS, all of which are located in the new portion of the building, point to there being large-scale issues with the HVAC system across the building.

In terms of issues with the noise overall, upon considering the open-concept design of the studio spaces in our personal observations, this was to be expected. The Undergraduate respondents seemed to be less bothered by issues with noise in comparison to the Graduate respondents. Through our observations of the spaces, we found that the US had mobile spatial separations which could likely affect the acoustics of the space. Conversely, the GS the high ceilings and the lack of physical barriers may cause greater issues with noise pollution. However, the variability in the levels of dissatisfaction for noise overall were likely a function of the location within the building. For example, upon considering our own observations of the CA, conversations between transient users and building users are to be expected for a cafe space. As a result, users of this space seemed to be less bothered by increased noise levels and noise disruptions. In contrast, the long hallway outside of the Faculty and Staff spaces causes noise pollution as students walk by the space and stop to have conversations. Based on our observations, there are no physical separations which likely affects the acoustics and increases noise disruptions.

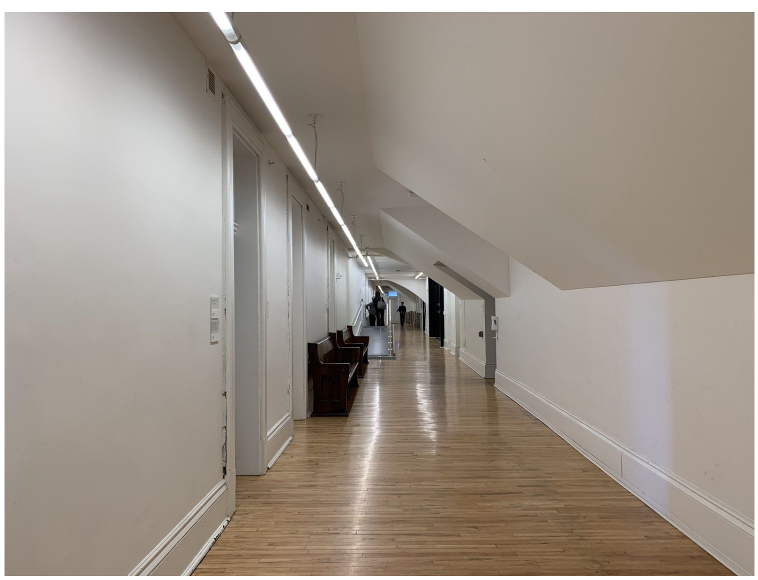

Figure 19. Image showing the long hallway outside of Faulty offices

Needs

Architecture students complete a lot of specialty work, namely, the creation of scale models. Such work demands a lot of space, materials/resources, and storage. Accordingly, storage at desk and suitability of storage arrangements were further explored. The results for space at desk for the US and GS clearly demonstrate the disconnect between the building's functionality and end-user needs and satisfaction. Respondents of the US are reportedly satisfied with the amount of space at desk that they have for completing their work, where 40% of respondents even reported that they have too much space. Contrastingly, in the GS, the results strongly indicate that not enough space at desk has been provided for users, an imbalance that needs to be addressed. In exploring the results for space at desk for the CA, the distribution of results is quite variable across the categories. Upon considering the comments from the questionnaire and our observations, it appears that these results are likely a function of the various types of work spaces that are available in the CA, and the general use of the space. Firstly, some work areas range from high-top, cruiser tables with minimal space and surface area, whereas some have large surface areas that provide users with more space to complete their tasks (**Figure 20**). Therefore, we would naturally expect there to be some variability in terms of space at desk. However, the use of the space may also factor in, as users use this space for a variety of activities, such as eating, socializing, completing schoolwork, and meetings. Thus, space at desk requirements would likely vary based on the activity.

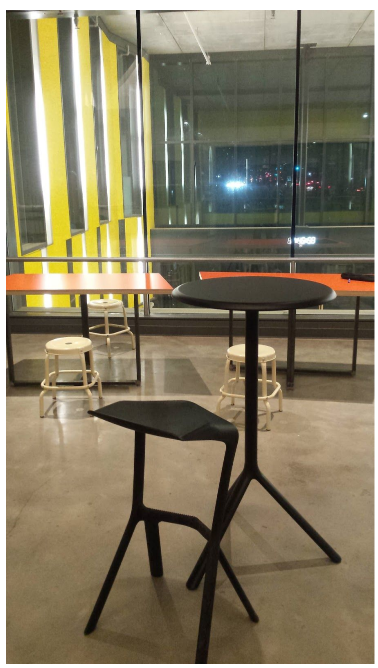

Figure 20. Image showing the work areas in the Café/Atrium

Moreover, the varying results for storage are likely a function of the various types of spaces across the building that require storage. For example: CA and LH users may not require storage, whereas GS and US users and SF users likely do. In considering our own observations and the qualitative results provided by the US and GS respondents, we found that the storage options provided in the US and the GS were not large enough for the purposes of architecture student work. Architecture models, materials, and other supplies require large, flat storage solutions. One user indicated that they could not store their models physically in the space and as a result, they had to throw away their architecture models due to a lack of storage. The lack of suitable storage options demonstrates that the needs of the building end users were not fully considered in the design process.

Image of Building

The Daniels Building users recognize that the image of the building is aesthetically pleasing but it is not functional. From our quantitative results, we found that there is a disconnect between the satisfaction of the image overall and the varying needs of the users, the internal characteristics, and the overall functionality of the space. The reoccuring needs include: increased outlets for computer use, increased amount of washrooms which are easily accessible from the studio spaces, increased flat storage for architecture materials, and addressing comfort needs, such as air circulation and thermal comfort. One building user conveys the general sentiment expressed for the image overall: “It is aesthetically pleasing but there are major issues stemming from functionality.” The results show that there is a disconnect between the building's functionality and end-user satisfaction and in order to create an environment that satisfies the needs of it users, this connection must be addressed.

RECOMMENDATIONS

As previously discussed, there is a clear disconnect between the building’s functionality and how this affects the user experience of the building. To address this concern, three main recommendations have been devised:

Firstly, seeing as user feedback can be useful to incorporate initiatives that promote wellness when designing a building, we recommend that the University of Toronto establishes a system where POEs must be conducted for all new buildings across campus. Doing this would help the university recognize common mistakes that are made in relation to building design, in order to prevent repetition in the future. This would also help them gain an understanding of the aspects of the buildings that were designed correctly so that they can be implemented in future buildings. Thus, these feedback mechanisms would be very valuable in informing future projects across the university's campuses. User-feedback systems also provide a platform for students and faculty/staff to voice their concerns, thus promoting a positive building-user experience.

In addition to the creation of a user-feedback system, we also recommend small-scale solutions to address some of the common problems that were mentioned. Where implementation of long-term solutions such as completely overhauling the HVAC system or redesigning classrooms to address acoustic failings would require significant financing and user disruption, there are low-tech options to improve user satisfaction in the spaces we analyzed. One example of this is in the Atrium where the geometric designs of seating and tables were deemed aesthetically interesting but not ergonomic. Thus, replacing them with more practical and comfortable furniture would increase the satisfaction and productivity of users. Furthermore, the addition of plants within this space would improve air quality, aesthetics and well-being and the implementation of which would cause minimal disruption. Another example of a minor modification is the addition of better, more functional work tables to help mitigate the lack of storage in the Graduate Studio. We recommend introducing new work tables that are specifically designed for architecture purposes, such that they have storage drawers and shelving built-in. This would greatly increase the amount of storage available to students without having to drastically change the building.

However, now that this POE has identified storage and space at desk as main issues among building users, the Daniel's faculty should conduct assessments of user storage and space needs to understand the root cause of these problems and arrive at true long-term solutions. This relates to our final recommendation which calls for further assessment of the Daniels Building in relation to the aspects that this POE has deemed unsatisfactory. Professional evaluation of building characteristics such as thermal comfort and noise through HVAC performance tests, and acoustics testing, would help to develop a comprehensive understanding of what truly causes the building-user disconnect described in this report. With this information, the university can arrive at powerful long term solutions that will improve the human experience of the building.

CONCLUSION

Prior to this research project, the performance level of the recently renovated Daniels Building was largely unknown. Although these renovations introduced both elements of sustainable design and an extension of space for the students, faculty and staff of the department, the human experience of the building had not been explored and evaluated in a formal setting. By conducting a POE with the BUS Methodology questionnaire, our group was able to address this concern. We collected 144 questionnaires across five different spaces within the building and analyzed the data using BUS benchmarking, diverging stacked bar charts, and our personal observations. Our results show that there is a clear disconnect between the building's functionality and end-user needs and satisfaction. While respondents overwhelmingly confirmed that they were satisfied with the overall image of the Daniels Building, they reported being unsatisfied with the ways in which the building functions to meet their needs and its overall effect on their well-being. While lighting overall was found to be satisfactory in general across the spaces in the Daniels Building, issues related to the specific needs of architecture students, such as storage and space at desk, in addition to thermal comfort and noise, were widespread and variable. Furthermore, this disconnect can be addressed through the implementation of a University of Toronto-wide user-feedback system, minor, small-scale modifications, and long-term data gathering and performance testing, all of which can work to improve the building-user relationship of the Daniels Building and other buildings across campus.

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