

4 Results, Reports & Discussions

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*Space for architecture students to spread out and collaborate at Queens University, Belfast
(www.flickr.com/photos/46719649@N02/4466133494/)*

4.1 CHAPTER OVERVIEW

In this chapter, the implementation and results of the field research are reported. The data are interpreted using I-P matrixes, data tables, and graphs. A discussion of the results is included with each attribute category. First, the combined responses from all the schools are discussed by attribute category. After the overview of the combined data, the responses from the four schools are presented as Case studies A to D. Extensive use is made of graphs to illustrate trends and patterns; and photographs are used to explain contexts.

4.2 OUTCOMES OF SURVEY: COMBINED DATA

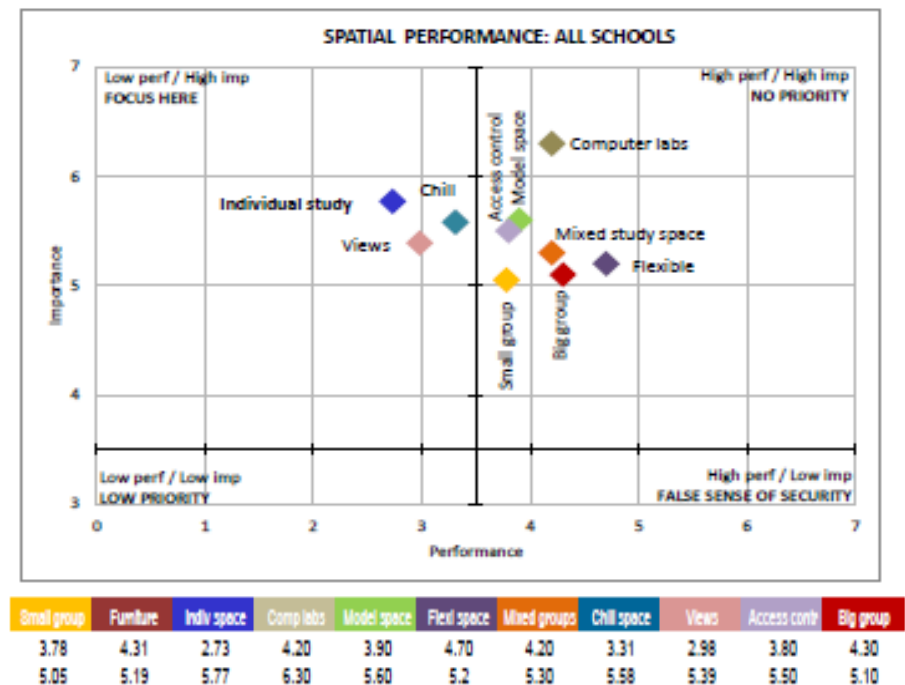
The purpose of this study is to identify those patterns (if any) that occur in the perceptions of architecture students, of their learning environments. There is no intention to compare the performance of the different schools. For that reason, the universities are coded as A, B, C and D in order of the date of evaluation. Any comparisons in the discussion are not intended as criticism, but to explain and discuss results. The discussion of each graph includes a general overview of results; the significant findings (e.g. biggest performance gaps, and outstanding performers) are identified, and comparisons drawn with precedents in the literature review. For a review of I-P matrix principles, refer to 2.6.2: Importance-Performance Analysis.

The study does not present a detailed analysis of descriptive statistics; however some descriptive statistics are tabled in Annexures G1 and G2.

Section 1 (Design and physical layout of your school), is divided into two parts: 1) General school layout and spatial performance, and 2) the performance of studio facilities. The attributes assessed through these rating scales are discussed in detail on the following pages.

Discussion: General school layout and spatial performance - all

Graph 1: General school layout and spatial performance - all



Graph 1 is a combined I-P matrix for the general interior layout of the four schools of architecture. The following conclusions can be drawn:

- In general, the attributes that require strategic response are 'Individual / quiet learning space', 'Chill space', and 'Views to the outside'.
- Model building space, 'Access control' and 'Small group space' are positioned close to the boundary between quadrants A and B and should be carefully monitored for continued satisfactory performance.
- An interesting result is that of 'Computer Labs', which is discussed in more detail later in this section (Graph 6).

Similar to the findings in the majority of the IPA precedent studies (see 2.6.2: Importance-Performance Analysis), the Importance factors are rated high (>5.05) – although this could be due more to judicious attribute selection, than to a lack of discrimination by the respondents (see Lewis, 2004). The relatively good spread of Performance ratings (2.73 – 4.72) indicates that there is discrimination in Performance responses. To further investigate the Performance- and Importance responses for the individual attributes, these are illustrated in Graphs 2 and 3. These line diagrams illustrate a common characteristic of the responses: except for Graph 2a: Small group learning space performance, none of the curves follow a normal distribution. As one commentator observed: “That’s architecture students for you!”

Working spaces for small groups (of less than 5)

Graph 2: There is a small but marked difference between the requirement for breakaway spaces for groups up to five members (graph 2b, Importance, peaks at 5.3) and the satisfaction with provision (graph 2a indicates that more than 75% of respondents rate the performance of this attribute at 4.1). This indicates that students require more spaces that are supportive of working in small groups, or for the use of study groups.

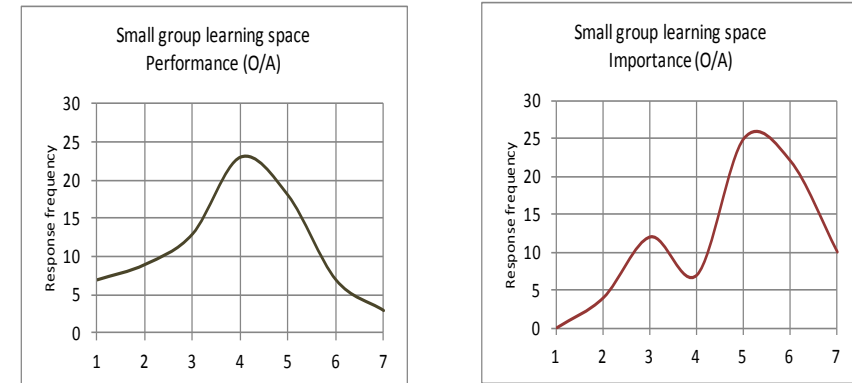
As explained under “Group working spaces” (see 2.4.1: Interior layout and spaces), providing groups with supportive ‘club’ space encourages desired learning behaviour, collective effort and optimised space usage.

Where there is not enough space to erect permanent partitions, movable partitions can multi task by providing much needed pinning space, acoustic- and visual privacy, and a sense of group community.

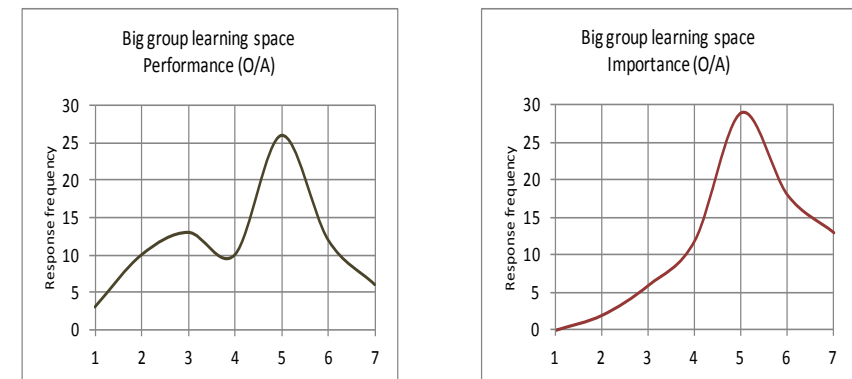
Working spaces for big groups (of more than 5)

Graph 3: Performance and Importance are better matched for larger group spaces – in effect general studio spaces – with both graphs peaking at 5 although performance lags slightly behind performance.

Graph 2a & 2b: Responses - Small group learning space (all)



Graph 3a & 3b: Responses - Big group learning spaces (all)

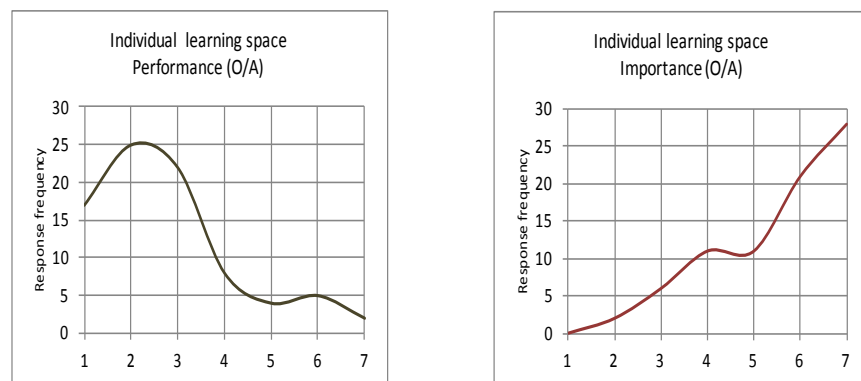


Individual / quiet work places

Graph 4: Despite being very important (4b peaks at 7), quiet space for individual learning is (together with outside workspace), the worst provided for (4a peaks at 2.2, for the vast majority of respondents). As discussed in the literature review, focussed tasks that require writing and analysis are best achieved in places that are conveniently placed, comfortably furnished, prevent distraction, and are available at all hours. It seems that the ubiquitous nature of the communal studio as the “heartbeat” of the school, as well as the public nature of assessment crits, may cause school designers to overlook the importance of private and dedicated creative

spaces (see Jankowska & Atlay, 2008:273). The lack of fit between the curves is marked and significant, indicating that there is common agreement between students from all the schools surveyed about both their need for such spaces or the lack thereof.

Graph 4a & 4b: Responses - Individual learning space (all)

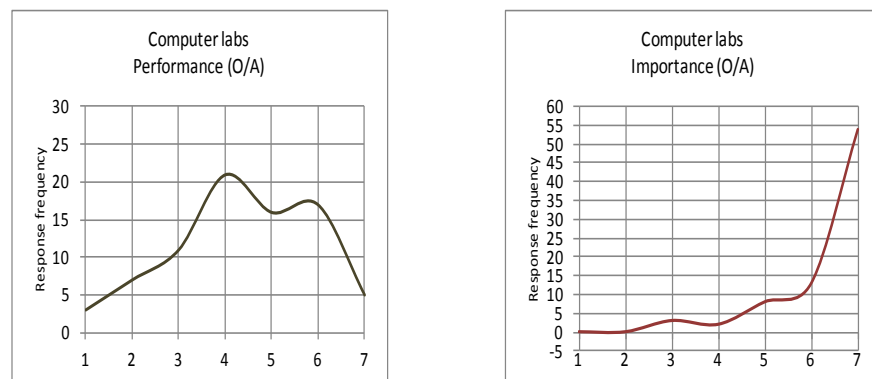


Well-equipped computer laboratories

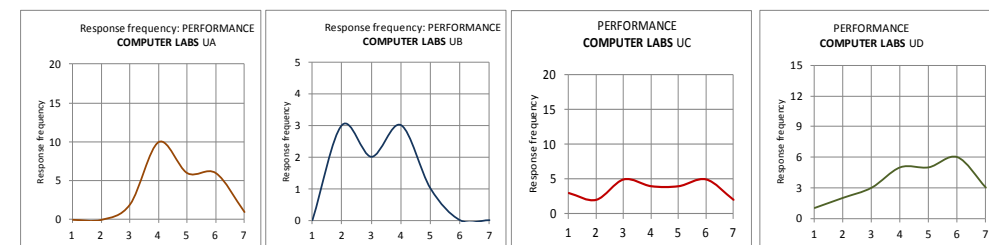
Graphs 5 - 6: The need for well equipped computer laboratories is so overwhelming that the scale for the Importance graph (5b) has to be doubled to accommodate the number of 'Extremely important' (7) ratings.

Graphs 6a – 6d show that satisfaction levels vary significantly between schools. UC students are the most differentiated in their opinion with an even spread across response categories. UB students are in general agreement about the poor level of service with two marked peaks at 2 and 4, and none for 6 or 7.

Graph 5a & 5b: Response - Computer laboratories (all)



Graph 6a – 6d: The performance of computer facilities at UA – UD

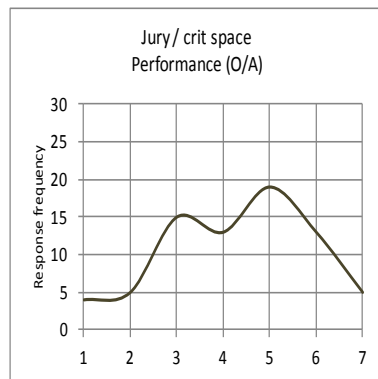


Universities A, C and D should not be complacent about the positioning of this attribute in the I-P matrix (Graph 1). While this attribute generally falls comfortably within the 'No priority' area, its particular position should be more carefully considered. When comparing the Performance and Importance curves in Graph 5 it is clear that there is a large performance gap: the difference between Performance and Importance is on average 2.18 (31%). Schools should carefully investigate student needs in detail to find out whether this is a "must-be", or a "one-dimensional" attribute (Table 10) to strategise on how this gap can be closed. If it is a must-be then spending too much will not have the desired effect, but if it is a one-dimensional attribute, investing a high level of resources can have a very positive result. Refer to Deng (2008:256) and Tontini and Picolo (2010:566) for a detailed explanation of the concept of "excitement attributes (2.7 Data analysis & Disconfirmation theory).

Crit / jury spaces

Graph 7: Feedback on performance of jury / crit spaces is varied, but more positive than anticipated, with the highest peak at 5. (In the interest of reduced questionnaire length, Importance data were not collected, as jury space is critical to the functioning of a school of architecture.) It can be argued that nowhere is psychological safety more under threat than in the critique space, where work is assessed in the presence of peers and often respected professionals. Subsequently, the performance feedback for critique spaces is likely to be influenced by personal psychological considerations. An in-depth evaluation of this type of space should include many additional attributes and considerations. The principles and requirements for 'psychological safety' have been reviewed in this document (see 2.4.1: Interior layout and spaces - Safety: a place of free of threat, fear, or anxiety).

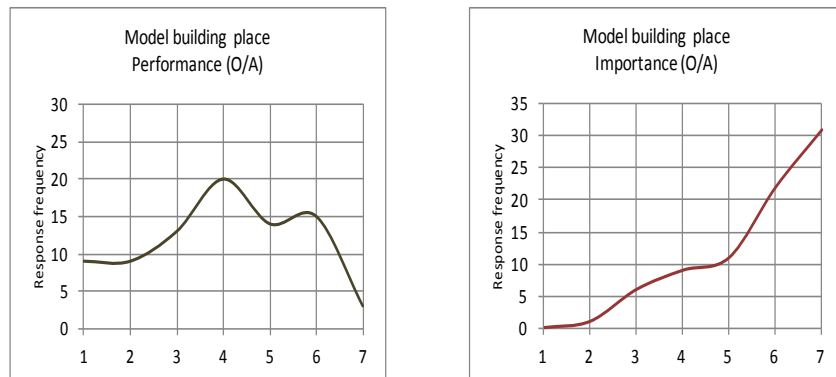
Graph 7: Performance -- Jury / crit spaces (all)



Model building spaces

Graph 8: The performance of model building spaces generally falls above the midway point of 3.5 (8a peaks at 4 and at 6) which indicates that the performance gap is not unacceptably large, even considering the unanimous high importance level (8b peaks at 7).

Graph 8a & 8b: Responses - Model building space (all)



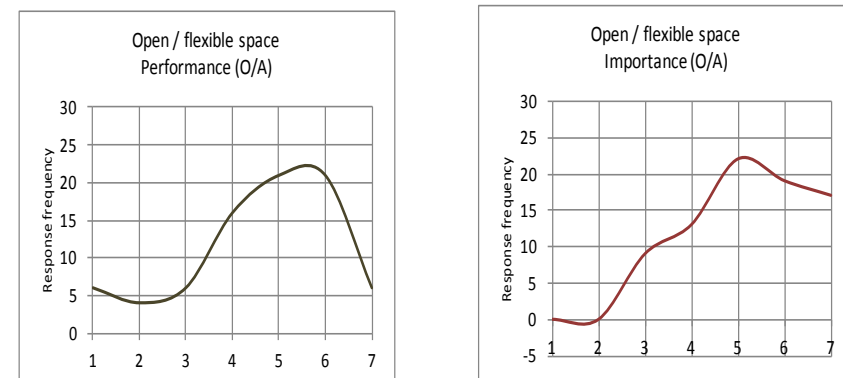
Open spaces for adaptable use

Graph 9: This attribute entails the provision of open spaces that can be used for different functions as the need arises. Provision is generally appropriate for its level of importance (both graphs peak at approximately 5.5), although performance falls off dramatically after 5, while importance retains a high rating. As formal space is an expensive resource, most

schools spill over onto the surrounding campus and installations in varying stages of decay are a common (if not institutionally popular) sight on campuses that accommodate schools of architecture. The AA in London uses these as a method of raising the profile of the school, and contributing to the quality of surrounding urban open spaces (Fig. 64), an approach that may be implemented with success by other schools.

Two salient comments are made by students at University C: “first floor becoming no-man’s land”; and “new too multifunction - no spatial ownership”. These comments indicate that where studio space is limited, too much open space may be resented.

Graph 9: Response - Open / flexible space for mixed use (all)

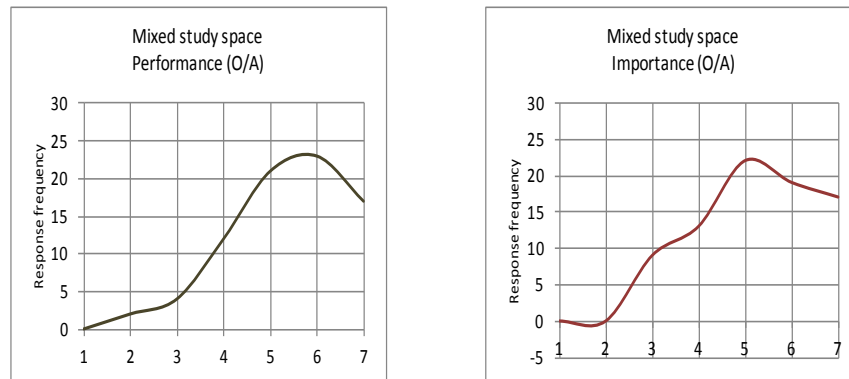


Places where students from different years can work together informally

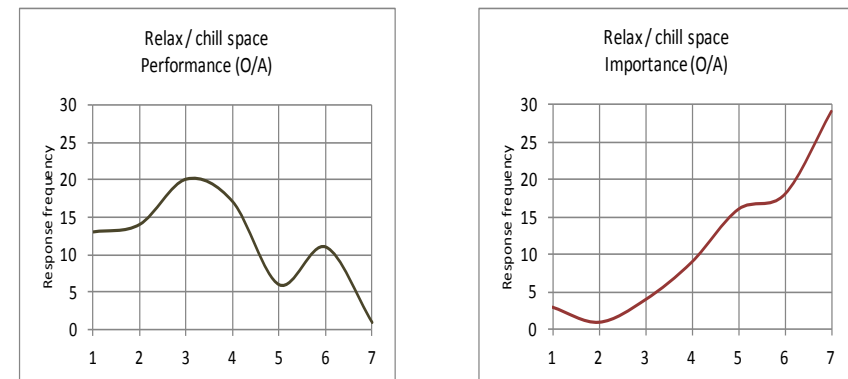
Graphs 10 - 11: The graphs for the combined data (Graph 10) indicate general satisfaction with the provision of spaces where students from different years of study, can work together informally. It is interesting to note however, that while the graphs for combined Importance data (Graph 10a & b) are similar, the individual situations (Graph 11a – 11h) are somewhat different.

At UA, graph 11a & e and UB, graph 11b & f, performance and importance responses are similar. At UC however, performance falls much short of importance-related requirements. At UD, all studios are mixed, so that no spaces are set aside for specific groups, with the high Importance rating (graph 11h) indicates that students prefer this arrangement.

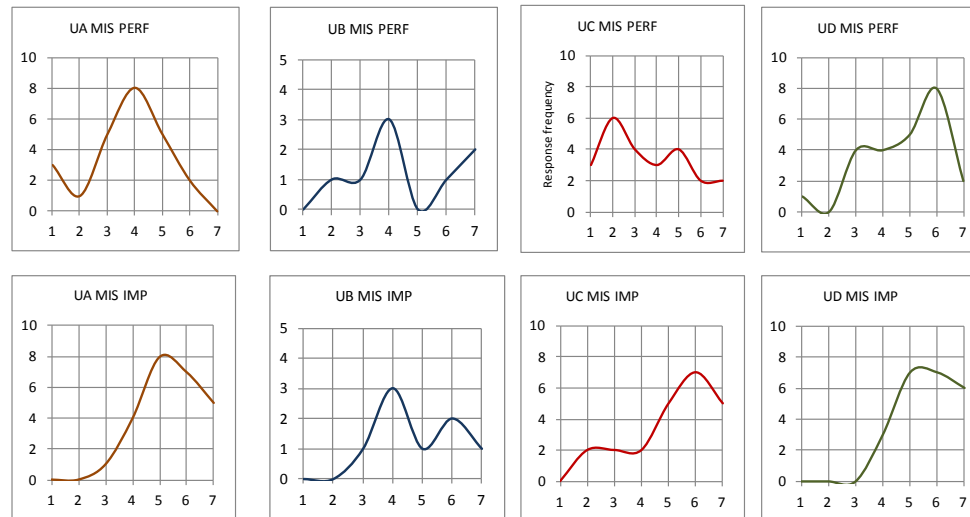
Graph 10a & 10b: Responses - Mixed informal study spaces (all)



Graph 12: Responses - Chill space for students (all)



Graph 11a - 11h: Mixed informal learning space - Importance and performance - all



Spaces where students can relax together

Graph 12: A comparison of the importance and performance graphs for student 'chill' space indicates a significant discrepancy. The performance graph (12a) peaks at 3, with a steady fall to 2, while the importance graph (12b) steadily rises to peak at 7. This attribute is linked to that of 'Informal learning spaces' and most schools have unused spaces that can easily be converted to extremely effective informal spaces. Nasar *et al* (2007:81) observe that gathering spaces near major circulation routes and near main entrances are most popular.



Figure 64: Unused spaces such as under a stair at UC can easily be converted to informal relaxing spaces (Author, 17.11.2011)

Preferred studio format

The final question in the series on 'spaces and places', asks respondents to study photos of three studio formats (Fig. 65), and identify which one of these (1) the extremely formally arranged University of Hong Kong Faculty of Architecture Study Centre; 2) the smaller more intimate spaces within larger studios at Washington University, or 3) the large, open, communal space at the Illinois Institute of Technology) appeals most to them.

The purpose of this question was twofold: the first was to include an image on the first page that will attract the attention and interest of architecture students. From this, the first question developed: how can students' responses to what they are satisfied with and is important to them, be used to gather useful data? The result was mostly supportive of the balance of the data, with one less expected twist.

Not surprisingly, the most popular format (53%), at Washington University, allows students to create a personal territory, while still being in convenient contact with other students. The results also show that 27% prefer the open, communal studio of Crown Hall, IIT, leaving a surprisingly large percentage – 20% – selecting the pristine condition of the Architecture Study Centre at the University of Hong Kong (Graph 13).

Graph 13: Studio formal preference (all)

STUDIO ORGANISATION PREFERENCES (ALL)

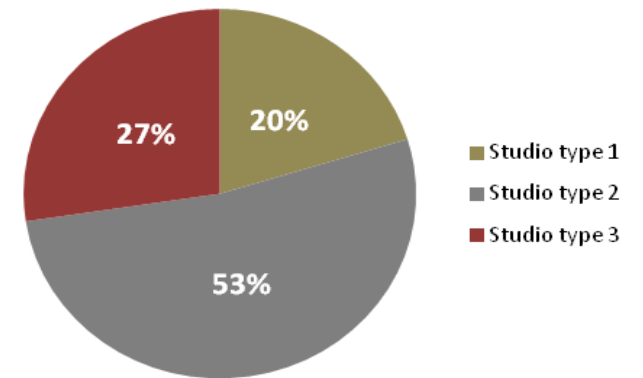


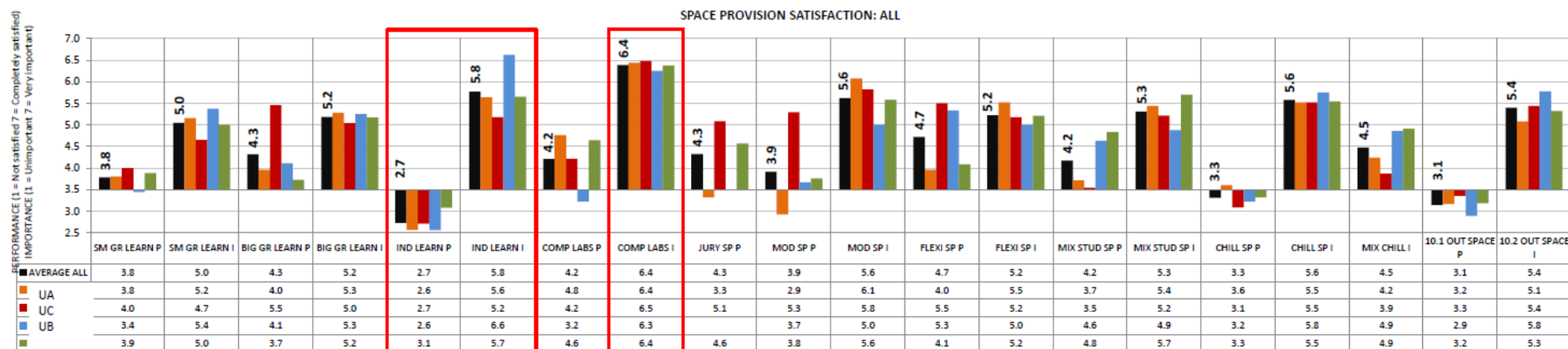
Figure 65: Three different studio formats:

Figure 65a (left): Hong Kong University school of architecture study centre (<http://rocker-lange.com/blog/?p=241>);

Figure 65b (middle): Architecture Studio at UW, Seattle (<http://www.flickr.com/photos/jimmyarch1861/2669608919/>);

Figure 65c (right): Third year studio at Illinois University of Technology (<http://www.flickr.com/photos/iitugadmission/5352679400/>).

Graph 14: Bar chart and data table - Space provision satisfaction - all schools



Discussion: Spatial standards

Graph 14 is a bar chart with data table that illustrates the combined Importance and Performance data for the general spatial attributes of the four schools. The particular differences have been analysed with an I-P matrix (Graph 1) and line graphs (Graphs 2 to 12). This graph supports the hypothesis in the following ways:

- **There is a low standard deviation (sd) between the ratings for Importance**, per attribute: all the attributes are rated as relatively important and there is not much variation in the importance ratings at each school.
- **There is a much greater standard deviation in the Performance ratings** both per attribute, and between ratings at schools for each attribute: the performance ratings are much lower than the related importance ratings, and the variations between schools are greater.
- **The performance gaps per attribute for Importance and Performance are marked.** Some attributes (e.g. Group learning space, and Flexible space) perform relatively well, while Individual learning space, Chill space and Outdoor space have universally low ratings.

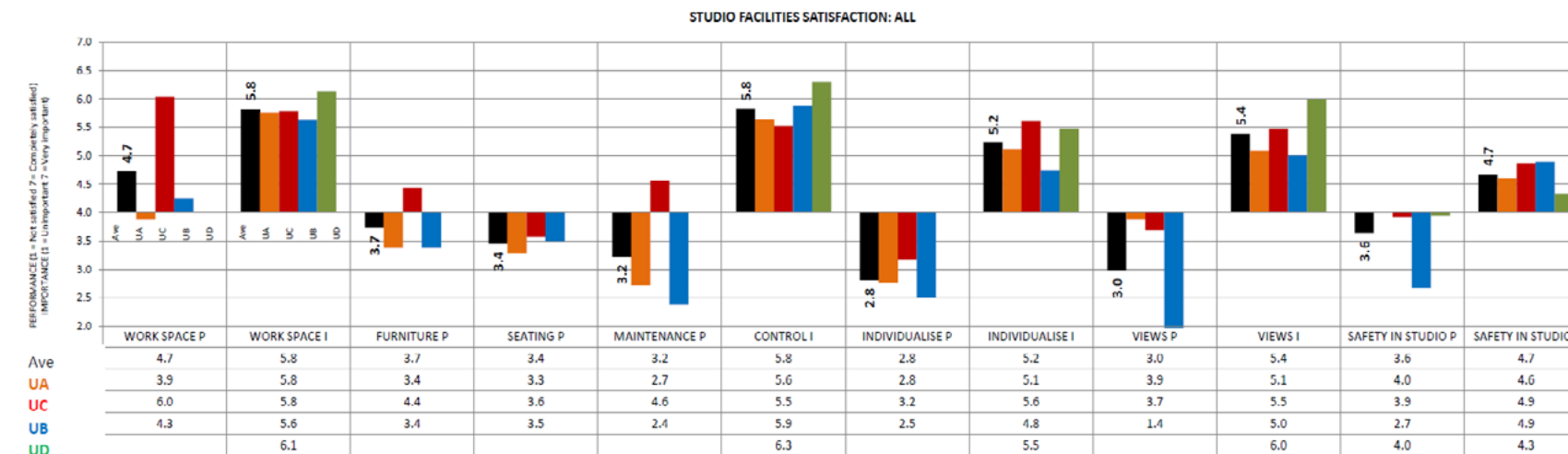
The variations in Performance ratings between schools is encouraging, because this indicates that respondents are carefully considering their ratings and that there is little evidence of satisficing.

Discussion: Studio facilities

Graph 15: The second block of rating scales in the first section of the trial questionnaire focuses in more detail on the particular characteristics of the target groups' studios: the amount of work space ('elbow room'); the quality of furniture and the comfort of seating; the ability to individualise spaces; views to the outside; and personal safety. As Importance data were not collected for the attributes 'furniture and seating', and 'maintenance', the results of this category is also presented as a bar chart and not an I-P matrix.

Once again, one of the purposes of this study – to determine if there are clear patterns in the Importance ratings – is clearly satisfied in this graph. The Importance responses for 'Workspace' (ave = 5.8; sd = 1.05), 'Control' (institutional control over studios to prevent damage to furniture, etc.) (ave = 5.8; sd = 1.48), 'Individualisation of spaces' (ave = 5.2; sd = 1.4) and for 'Safety' (ave = 4.7; sd = 2.08) are closely clustered. The high standard deviation for 'Safety' is the result of the large difference in results between UB and UD.

The variations in responses for Performance attributes once again, indicate that satisficing is not taking place (see 3.2.2: Data collection for an explanation of this phenomenon). The average performance rating for 'Work space' (4.7) implies general satisfaction with the amount of space available per student, but closer investigation indicates that UC puts the other two schools evaluated (UA and UB), in the shade. The performance gaps for the



Graph 15: Bar chart and data table - Studio facilities satisfaction - all schools

other schools are significant (as discussed in detail in the individual school case studies that follow). The Importance rating for ‘Workspace’ is relatively consistent, with a high average of 5.8.

The condition and maintenance of furnishings in the studios is generally not satisfactory. A surprising factor, given the general state of disorganisation in studios is the high level of desire for control over studio usage (average 5.8). The question reads: “How important are the following to you, in relation to your studio? - Control over the use of the studio, to prevent damage and abuse of equipment”. Reference has been made to Studio Regulations at the schools at Montana State University (MSU, [sa]), Hawaii (University of Hawaii, [sa]), UC Berkeley (CED:[sa]) and the University of Liverpool (UL, [sa]) (see 2.4.4: Infrastructure and services). Indications are that schools may implement such regulations with the support of students. See also the discussion of Graph 13: Studio organisation preferences.

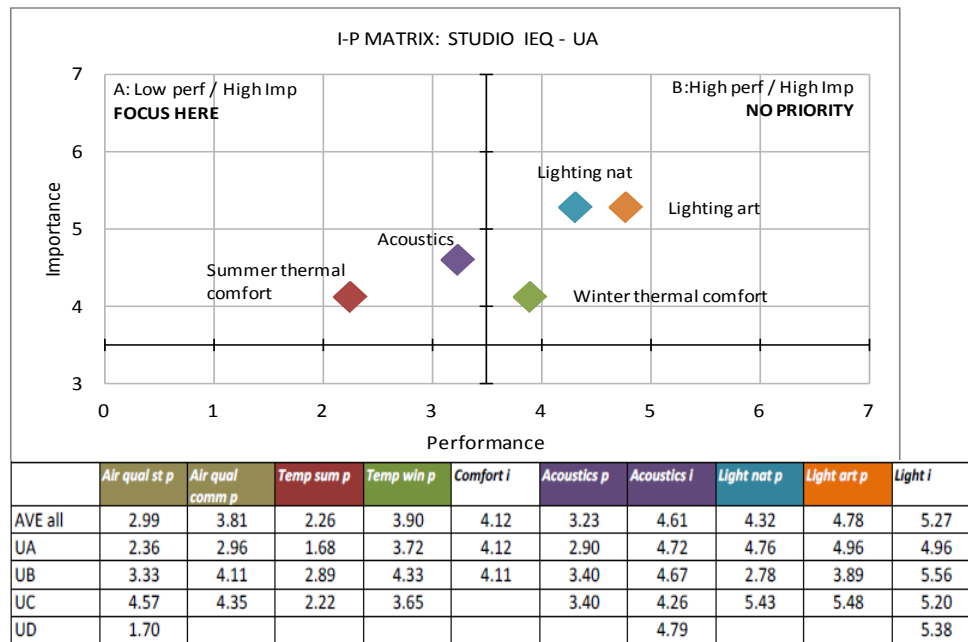
Section 2: Indoor environmental conditions

Graph 16: The data table for Studio IEQ, similar to Graph 14, indicates that there are consistent patterns in attribute importance. Importance values for ‘Acoustics’ is clustered around an average rating of Imp = 4.61 (sd average = 0.23; sd all = 1.92), while ‘Lighting’ is considered at all schools as even more important, average = 5.28 (sd ave= 0.25; sd all = 1.50). While the standard deviation of the overall response values per school are relatively

large (i.e. student opinions vary), the deviation between the averages of the schools is much smaller (i.e. there is little variation between school averages). The values for performance for this category of attributes are so disparate, that the average for each attribute cannot be considered as useful data. In addition to this, the abbreviated questionnaire administered to University D severely reduced the data available for this category. This category should be evaluated again, and more quantitative data gathered through direct quantitative measurement of for example temperature levels. Despite the shortcoming of the data gathering process some deductions can be made from Graphs 15 and 16 (Infrastructure and Services):

- Summer temperatures in the studios are uncomfortable (ave = 2.3). On the day of assessment at UD, the air conditioning system in an examination venue was out of order and heat, smell, and air change conditions approached the unbearable. The evaluation was done in summer, and should be repeated in winter for more balanced feedback;
- Acoustic performance is consistently poor (3.27) despite being consistently important (4.61) (see 2.4.3: Acoustics and noise for a detailed discussion);
- Lighting conditions are generally satisfactory (perf natural = 4.32; artificial = 4.78) considering its high importance (5.28). The poor performance ratings for ‘natural lighting’ at UB are reflected in ‘views to the outside’, both as a result of large trees and buildings close to studio windows.

Graph 16: I-P matrix - Studio Indoor environmental quality - all

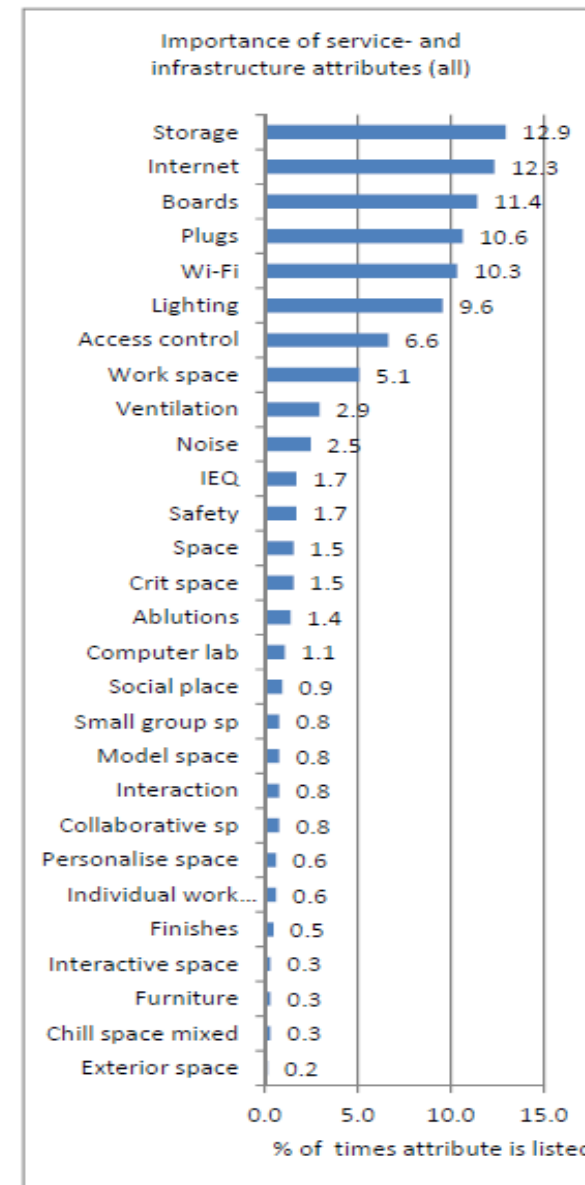


Section 3: Infrastructure and services

Graph 17: To obtain qualitative data to crosscheck the quantitative rating scale method of response (see Lewis, 2004; Kasim & Dzakiria, 2011), students were requested to list the five most important service- or infrastructural attributes as listed in the questionnaire, in order of personal importance. These were recorded, and attributes weighted according to position (e.g. those mentioned in position 1, most important, were weighted 5x, those in position 5, fifth most important, were not weighted). The results are illustrated in Graph 17.

Of the 28 attributes listed, the top five (Storage, Internet, Pinning boards, Plugs, and Wi-fi) together make up 57.3% of the total. If Internet and Wi-fi access are combined (23.6%), Lighting at 9.6% is also a significantly important attribute. Some respondents included spatial types in this list, and in the final questionnaire proposal (Annexure H), the question has been made more specific: "From all the factors listed in this section about facilities, services and infrastructure, please select those FIVE that are most important to you. List these five below, in order of importance:-".

Graph 17: Overall importance of service- and infrastructure attributes



Discussion: Time spent in studio after hours and studio hours - all

Graph 18: This group of questions was included in the questionnaire to test the claims that architecture students spend such inordinately long hours in the studio that it becomes a "home from home" (see 2.4.6: Space- and time management: legend or myth?).

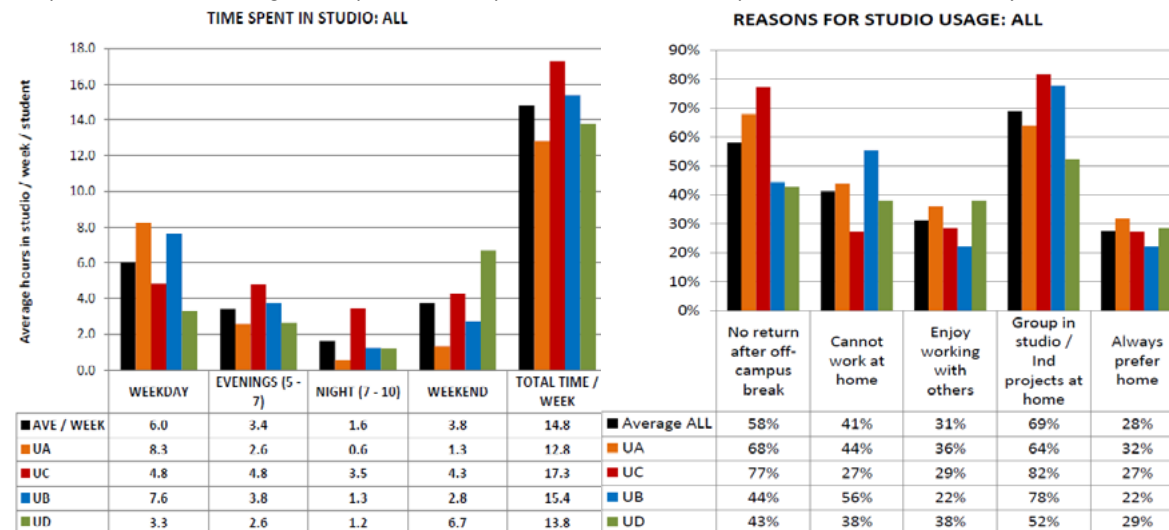
Despite anecdotal evidence of the high importance linked by teachers to long hours spent in studios, the importance to students of having access to studios at all times varies, and is in general surprisingly low. In most cases, the hours that make up the totals and averages for schools are ‘clocked’ by a small number of students at each school (see Annexure G1 for raw data).

While students were required to depend on memory for answering this question, It is unlikely that they would have understated the hours they spend in studio. A suggestion by Krosnick and Presser (2009:43) that diaries be kept of studio hours for the purpose of research; or the type of activity mapping used to assess studio usage by Zimring (1983) at FAMU school of architecture and Salama (2009a) at the University of Qatar should result in more valid and dependable data.

Section 4: General campus environment

Graph 19: Performance feedback in this category for the attributes ‘Placing on campus’ (4.48), ‘External appearance’ (4.57) and ‘Relationship with campus surroundings’ (4.5) is consistently favourable. Students are generally satisfied with the positioning of their school building on campus; its appearance and ‘fit’ with the campus surroundings; and its relationship with the campus surroundings. ‘Relationship’ refers to positioning of access points, and ease of interaction with the greater campus environment.

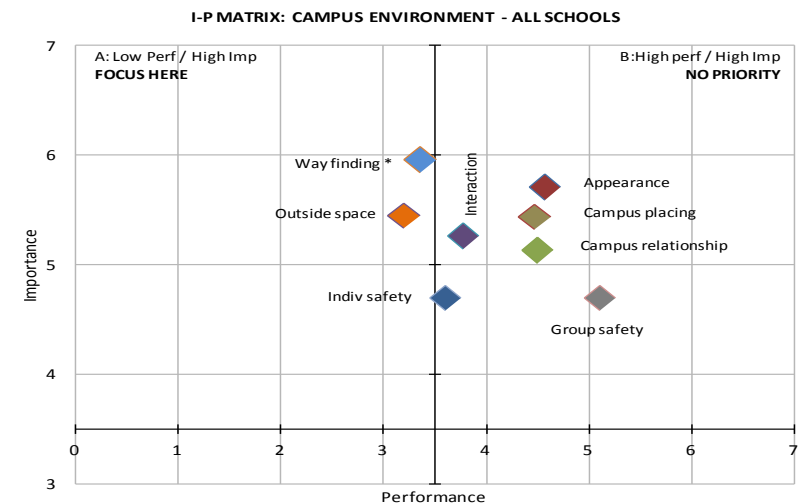
Graph 18a and 18b: Average time spent in studio per week - all schools; Importance – Studio availability



There is on average, no desire for greater opportunity to interact with students studying in other disciplines. This presents an interesting contrast with the feedback received to Nasar *et al's* (2007) study, which surveyed the opinions of casual passers-by about the external appearance of several architecture schools. Respondents often saw the buildings as among the ugliest on campus, and not fitting their surroundings.

Attributes that are consistently rated of high importance and yet low performance, are ‘Outside workspace’ and ‘Wayfinding’. These topics are discussed in detail, in Chapter 2 (2.4.2: Beyond the building: outside spaces, and 2.4.5: Access, signage and wayfinding).

Graph 19: I-P matrix - Campus environment - all



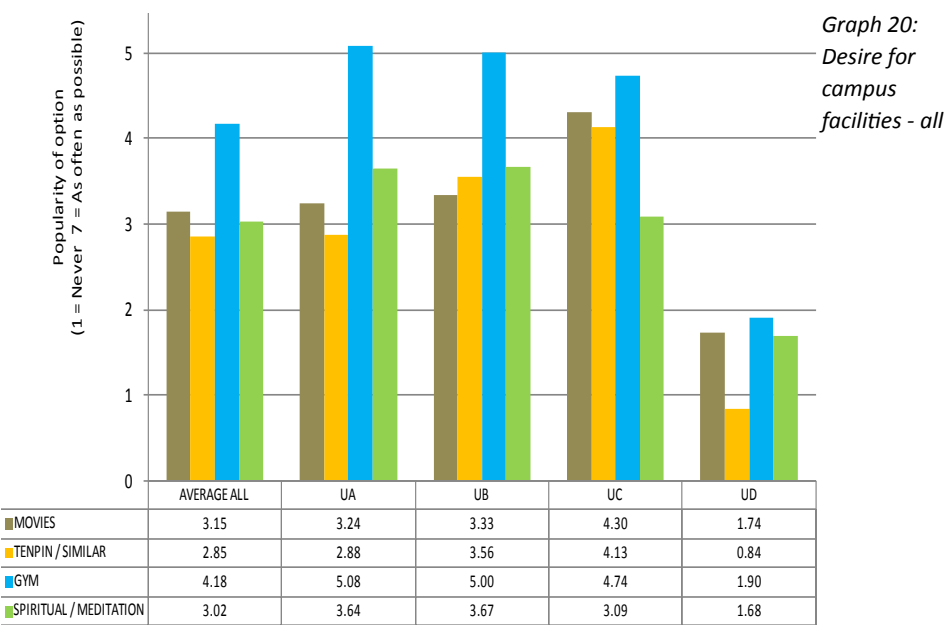
UA Campus environment attributes	Performance	Importance		Performance	Importance
Relationship w/ campus	4.50	5.13	Outside workspace	3.20	5.45
Placing	4.48	5.44	Appearance	4.57	5.71
Wayfinding outside*	3.36	5.96	Interaction with others	3.77	5.26

* Not measured at Universities C and D

Graph 20 illustrates the desire for a variety of on-campus activities. The question is “Should the following facilities be available on your campus, how often would you be likely to use them”? The 7-point rating scale is anchored between 1 = Never, and 7 = As often as possible. The average score per activity, per school is indicated in the graph.

Results for ‘Movies’ (3.2), ‘Tenpin or similar’ (2.9) and Meditation space’ (3.0) are relatively close on overall average, but vary somewhat between schools. It is interesting to note, that at three of the universities, the need for a spiritual / meditation space is greater than that for a cinema, and social activities such as tenpin-bowling. UC is located in a relatively remote location and the need for such facilities are likely to be a general one, rather than specifically campus-related. The most desired facility by far, is a gym (ave = 4.2). While schools A, B and C generally reflect similar results, school D has a significantly lower requirement for on-campus social facilities, possibly because it is located on the outskirts of the city and the students prefer to socialise closer to where they live.

The strategic significance of this information is that schools should make a concerted effort to provide / improve the quality of outside spaces where students can work outside of the school building but on campus, to attract students to spend longer hours on campus.



4.3 CASE STUDY 1: UNIVERSITY A

4.3.1 Survey participant information

The participants in the survey were the third year class group ($n = 48$). The survey was administered during a free period, on 26 October 2011. Students returned the forms to a submission box at the end of the period. It became immediately clear that despite having been asked not to discuss their responses, students did so, which tended to influence responses. Table 16 provides a summary of the demographic information for this group.

Table 16: UA respondent data

Response rate	Handed out	Returned (usable)	Gender	Female	Male	Physical disability	No
	40	25 (62.5%)		8	17		25
Transport	Own car	University organised	Public transport	Drop-off	Lift club	Other	
	16	0	3	1	1	2 (walk)	2
Abode	Residence (on campus)	Live off campus					
	3	22					

4.3.2 Context of survey: building information

The campus is located close to the inner city of a major African city. This is one of the four campuses of University A, and three faculties are located on the premises, as well as several high-rise student residences, a small student center, a research village and logistics facilities. A major arterial road runs along the boundary of the campus, approximately 10m from the façade of the school building (and the third year studio windows).

The school forms part of a faculty that includes nine design disciplines. The faculty occupied a new, dedicated building in 2006. Three levels of classrooms, studios, workshops, and

offices overlook a central atrium, and are connected with a central stair (Fig. 67) and a largely unused ramp. The majority of the architecture school facilities are situated on the same level as the atrium floor, making it possible to “spill over” when more space is needed for activities such as examinations and exhibitions. There are three primary studios (first, third and fourth year) in the main school area, and another suite of spaces for fifth and sixth year students nearby. (For a floor plan and north-east elevation, see Fig. 76a and 76b.) Informal names such as “the fishbowl” and “the sauna” indicate student opinions of some of the spaces.



Figure 66: Aerial view of campus, UA. The school building is located at the top centre, entrance from south east. (Google Earth)



Figure 67: Main interior circulation stair, UA (Author, 07.02.2012)



Figure 68: Main entrance to school building, UA (Author, 07.02.2012)

4.3.3 Descriptive analysis: UA quantitative data

Discussion: General school layout and spatial performance - UA

Graph 21: Two attributes fall within quadrant A (‘Focus here’), and for the best strategic results, should be addressed before any others:

- The greatest improvement gap exists for ‘Model building space’ (gap = 3.16).
- The lowest performance rating is for ‘Individual learning space’ (2.6).

The two highest performers are ‘Group learning spaces’ and ‘Computer Labs’:

- The smallest improvement gap is for ‘Group learning places’ (1.32).
- ‘Computer labs’ (Fig. 69) shows both the highest importance and performance values.

Except for ‘Computer labs’ which falls well within quadrant B, many attributes are clustered close to the boundary between quadrants A and B (e.g. ‘Chill space’, 3.6,5.52). The school should take care that performance is not reduced in these areas.

Graph 21: I-P matrix – General school layout and spatial performance – UA

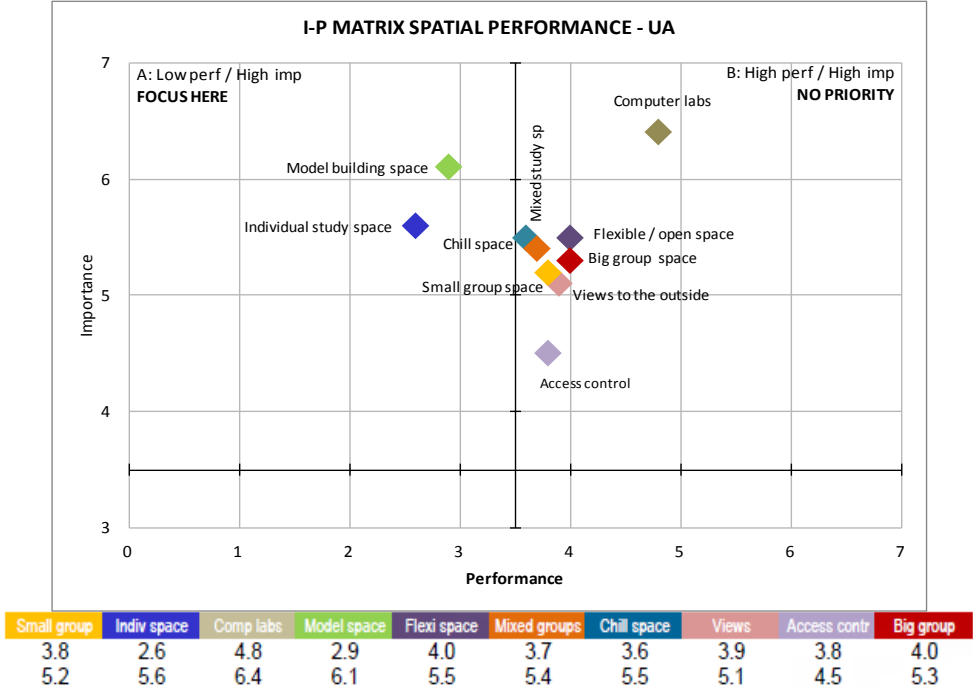
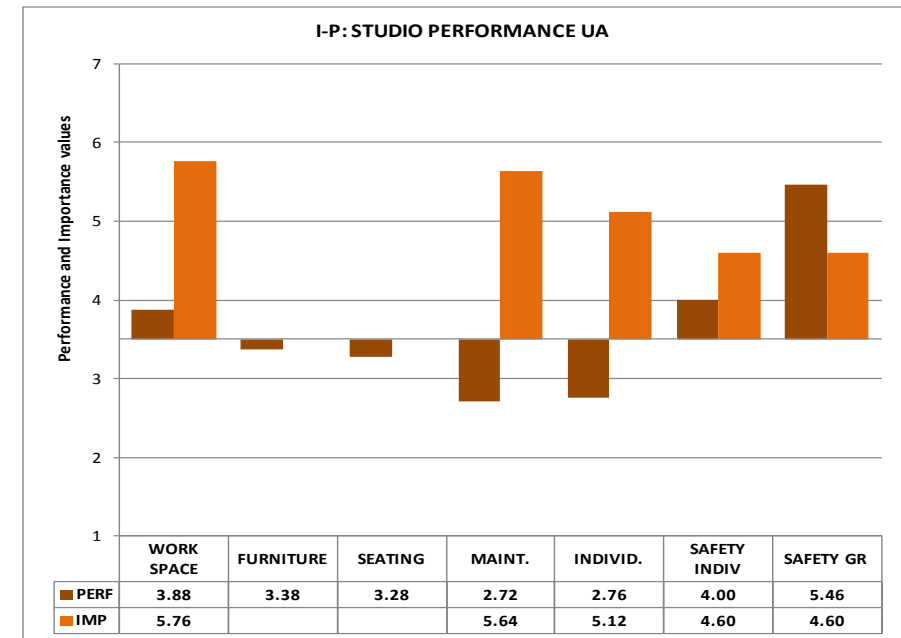




Figure 69: Computer Laboratory at UA (Author, 07.02.2012).

Graph 22: Studio facilities - UA



Discussion: Studio facilities - UA

Graph 22: As Importance data were not collected for items considered essential such as studio furniture and seating, an I-P matrix is not generated for this performance category.

- The greatest improvement gap (gap = 2.9) exists for 'Studio maintenance'.
- The least improvement gap (gap = 0.6) exists for 'Individual safety'; Group safety' performance in the studio exceeds importance (gap = -0.9).
- The highest Importance is attached to 'Work space' (the amount of workspace per student). As the performance gap is relatively large (gap = 1.88) this may also be an attribute to consider for attention.
- The least importance is attached to 'Safety'. It could be argued, based on Tontini and Picolo's (2010) Improvement Gap Analysis theory, that safety is rated unimportant because of the high performance for this attribute and that should a security-related incident occur, the importance ratings will increase.

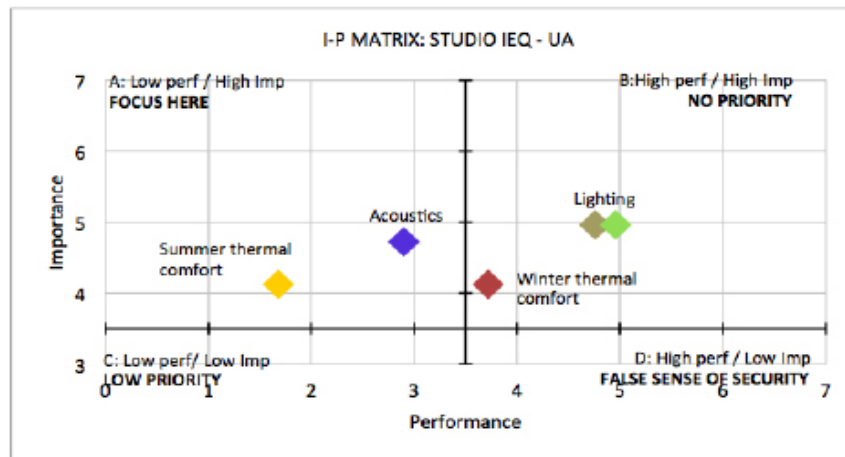
Discussion: Studio IEQ - UA

Graph 23: Studios bordering the north east façade of the building benefit from more daylight than those with no direct access to the outside of the building, but they suffer from severe traffic noise problems, and from glare and overheating in summer. Those studios that are not placed on the outer façade of the building suffer from poor ventilation and visual exposure, although they are well lit through atrium skylights.

- The greatest improvement gap (2.44) exists for 'Summer thermal comfort', which also reflects the lowest performance rating (1.68). This attribute therefore falls within quadrant A of the I-P matrix (Graph 23).
- Despite dissatisfaction with thermal performance, it is rated as least important. Gorgievsky *et al* (2010:221) however make a salient observation: "It should be taken into account that the ... response may be coloured by the moment of evaluation". The survey was implemented on a warm summer's day, but complaints in winter will certainly reflect in surveys done during that season.

- ‘Acoustics’ falls in the same quadrant with a Performance value well below 3.5 (Perf = 2.90) and an Importance value of 4.12.
- No improvement gap (0.00) exists for ‘Artificial lighting’, which together with ‘Natural lighting’ (Imp = 4.67) attracts the highest importance rating.
- The first year studio is narrow and long with windows on one short side, so that natural ventilation and heat overload creates severe discomfort in this overpopulated space (Fig. 72).

Graph 23: I-P matrix – Studio IEQ - UA



Air qual	Temp sum	Temp win	Acoustics	Light nat	Light art
2.36	1.68	3.90	2.90	4.32	4.96
	4.12	4.12	4.72	4.96	4.96



Figure 70: Studios that adjoin the north east-facing exterior façade receives ample natural light, but suffers from noise pollution and overheating in the afternoon. (Author, 07.02.2012)



Figure 71: Studios that do not adjoin exterior facades receive borrowed light through the central atrium in UA. (Author, 15.08. 2011)



Figure 72: The rectangular shape of a UA studio, with windows on the short side, results in poor natural lighting, insufficient ventilation, and thermal discomfort. (Author, 07.02.2012).

Discussion: Studio infrastructure - UA

- **Graph 24:** 'Ceiling finish' performs best (4.92), although a related attribute, 'Acoustics' (see Graph 23) has a low performance rating (2.90). This indicates that dissatisfaction may be the result sound pollution (*Fig. 70, 73*) rather than poor acoustics within the studio, and requires appropriate attention.
- The poorest performing attribute is 'Wi-fi access', and as qualitative feedback indicates that it is perceived as a very important attribute (*Fig. 75*), this should be addressed immediately. At University B, where Wi-fi is available across campus, students do not rate this attribute as particularly important (*Fig. 85*).

Graph 24: Performance - Studio infrastructure - UA

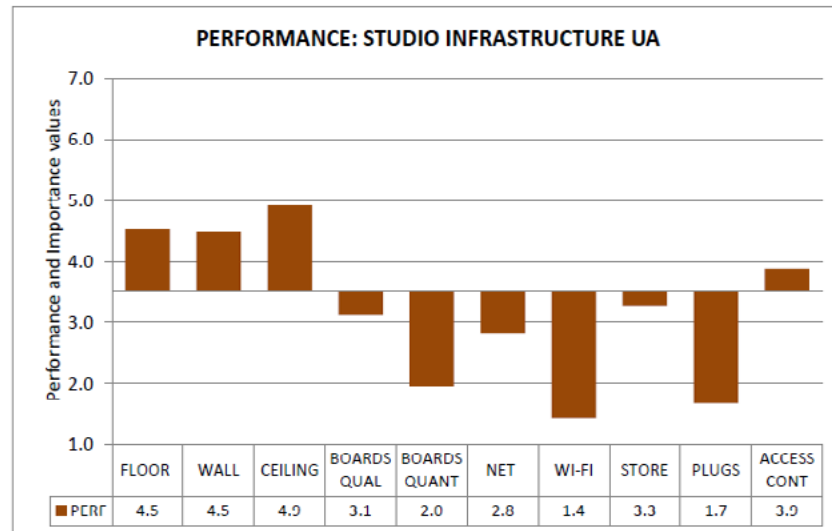
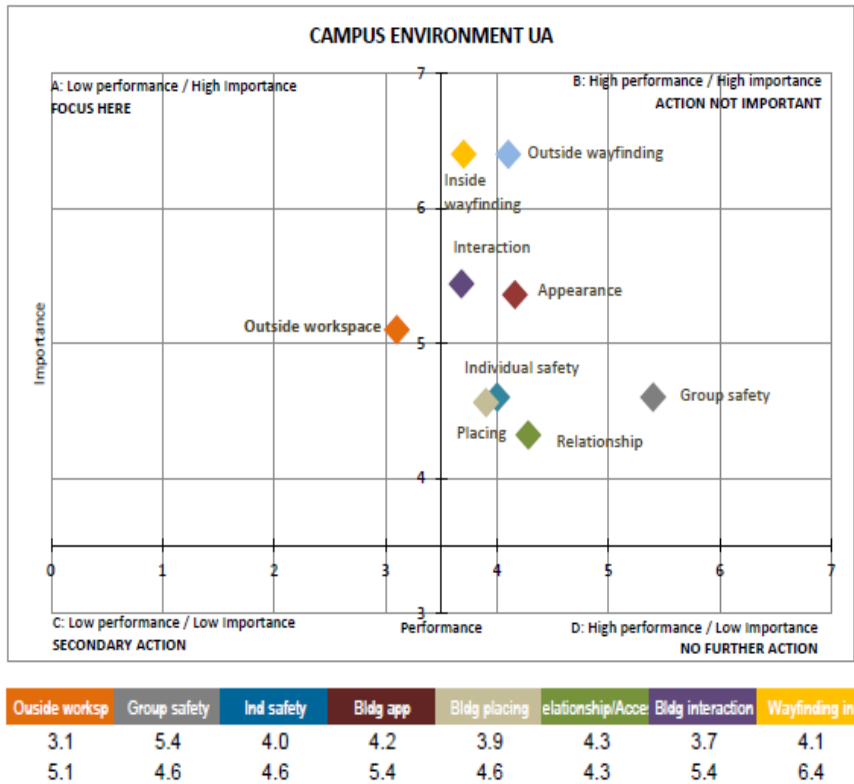


Figure 73: Exposed and oversized ventilation ducts cause noise pollution, UA (Author, 14.06.2009)

Discussion: Campus environment - UA

- **Graph 25:** The greatest improvement gap (gap = 1.92) exists for 'Outdoor workspace', which also reflects the lowest performance rating (3.1). This attribute falls within quadrant A of the I-P matrix, indicating that although its importance rating is less than many of the other attributes, the poor provision for this requirement requires immediate attention. (This situation did receive some attention directly after the evaluation had been completed (*Fig. 74a-b*) The evaluation by students and the independent action by campus facilities managers indicate the accuracy of the research method.)
- The least improvement gap (gap = 0.04) exists for 'Relationship to campus', which also attracts the lowest importance rating (*Fig. 66, 68*).
- The highest Importance is attached to 'Access and wayfinding' (6.4). This attribute was, like 'Outdoor workspace', addressed immediately after the evaluation process, at least inside the school building (*Fig. 74c*).

Graph 25: I-P Matrix - Campus environment - UA



4.3.4 Discussion of qualitative feedback: UA

Most important infrastructural attributes - UA

An effective method of representing the relative importance of text-based feedback is ‘word clouds’ (Fig. 75). These clouds give greater prominence to words that appear more frequently in the source text. (Word clouds can be generated using an online application).

The word cloud for UA infrastructure attributes shows that the most important attributes are ‘Pinning boards’, and ‘Plugs’.

‘Internet access’ (cabled internet access, for internet access using university computers) and ‘Wi-fi’ (wireless internet connection for use with personal laptop computers) were measured separately as not all students own laptop computers with access to Wi-fi, but depend on institutional access provision. As both keywords appear prominently in the word cloud it is clear that combined, this is the most important / most desired infrastructural attribute at UA.

Word clouds are primarily a graphic tool, and not suited for finely-differentiated analysis. They should be read together with other reporting instruments.



Figure 74a (left): The ‘piazza’ at the main entrance to the school at UA, at the end of 2011 – an unwelcoming space unsupportive of outside activity; Figure 74b (right): Shaded seating has been installed by February 2012 (Author, August 2011 and February 2012).



Figure 74c: New signage, school building, UA (Author, 07.02.2012)



Figure 74d: Access control at main entrance, school building, UA (Author, 07.02.2012)



Figure 75: Word cloud - Infrastructure – UA

4.3.5 Lessons learned: Discussion of IPA questionnaire and revisions

As the implementations at UA and UB were almost simultaneous, only minor and mostly administration-related changes were made before the questionnaire was administered at University B. The most important lesson learned, was that discussion of responses during completion of the questionnaire should be discouraged, as this leads to cross-influencing and arguably less valid data.

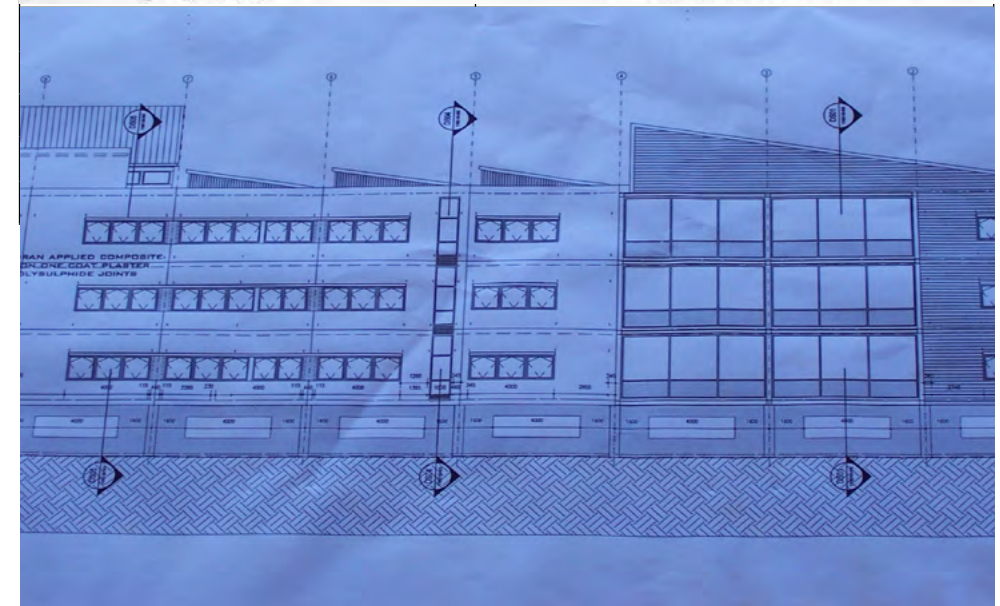
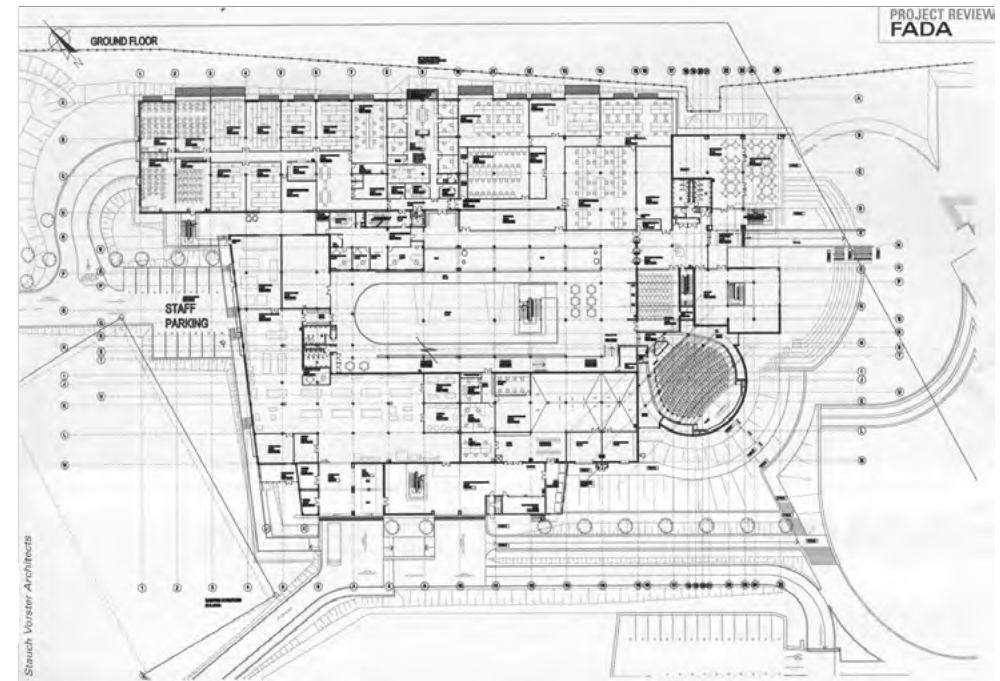


Figure 76a (top): Floor plan, school building, University A

Figure 76b (bottom): North east / street elevation

4.4 CASE STUDY 2: UNIVERSITY B

4.4.1 Survey participant information

The third year class group at University B participated in the survey. A very small sample ($n = 9$) was obtained (Table 17), however a discussion of the results with teachers at the school showed that the results are accurate and therefore the data is considered valid and usable.

The small sample size was not the only matter of concern. As the researcher could not gain direct access to the group, a master survey document was delivered for copying and distribution. When the completed questionnaires were collected, there was a very small number of completed forms. One was also substantially incomplete as the questionnaire document had been incorrectly collated, so that a page was missing (this page was found to be duplicated in another questionnaire). The quality of the copies was also poor, so that graphics were not clearly visible. See ‘Lessons learned’ at the end of this case study report for further discussion.

Table 17: Participant data, UB

Response rate:	Handed out	Usable:	Gender:	Female	Male	Physical disability:	Back ache
	20	9 (42.5%)		3	6		1
Transport:	Own car	University organised	Public transport	Drop-off	Lift club	Other	N/R
	7	0	1	1	0	0	0
Abode:	Univ res	Off campus					
	0	9					

* Data re. age groups not included in survey

4.4.2 Context of survey: building information

The campus of University B is divided into two parts, East and West, by a major arterial motorway (Fig. 77a & b). The school building is located on the older, eastern portion of the campus which borders on the inner city area of the same city as University A. The campuses of University A and University B are located close to each other and are in places, across the road from each other.



Figure 77a (left): Campus overview including the motorway which separates the two sections of the campus.

Figure 77b (right): Aerial view, school building UB (centre, T-shaped structure) (Google Earth, 2011).

The school of architecture of the Transvaal Technical Institute was the first in South Africa, and the forerunner of the schools at both University A and University B. Classes took place in the “Tin Temple”, a dusty, leaky building on the corner of Rissik and Plein Streets in central Johannesburg (Bryer, 1977) (Fig. 78). Rex Martienssen, a member of the class of 1923, gleefully referred to the school at that time as having “the atmosphere of something new to be discovered” and that “the enthusiasm for the intricacies of an exciting art” prevented students from being intimidated by these “minor physical disabilities” (*ibid.*:4). In 1939 the School moved to the Central Block building on the then ‘new’ campus and in 1959 the Faculty of Architecture and the Department of Fine Arts were housed in their own

building (Fig. 79). The school still resides there today, but now forms part of the faculty of Engineering and the Built Environment (EBE).

According to the internet website of the school, “The School’s core activity is the provision of an excellent learning environment towards accredited professional degrees in architecture and in planning, and towards qualification in related fields such as housing, urban design and wider urban studies” (School of architecture [sa]:[sp]). From this statement, it can be deduced that the school of architecture at UB perceives the “learning environment” to be fundamentally linked to the academic goals of the school, although not specifically in a physical context.

The studio spaces evaluated are situated in the annex building (Fig. 80a & b).



Figure 78: The ‘Tin Temple’, ancestral home of both University A and University B (Brink, 2009:18)

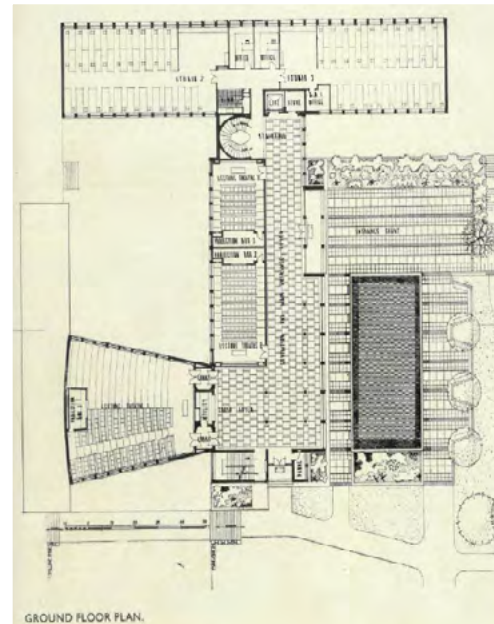


Figure 79: Ground floor plan, original John Moffat school building, UB (Associate architects J Fassler, WD Howie, G Herbert, JM Shunn, U Tomaselli & J Morgenstern) (The John Moffat, 1959:19)



Figure 80a: The annex to the main school building (Herbert Prins) visible behind the new building for the Department of Construction Economics and Management (Michael Scholes, 2011) (Author, 17.02.2012)

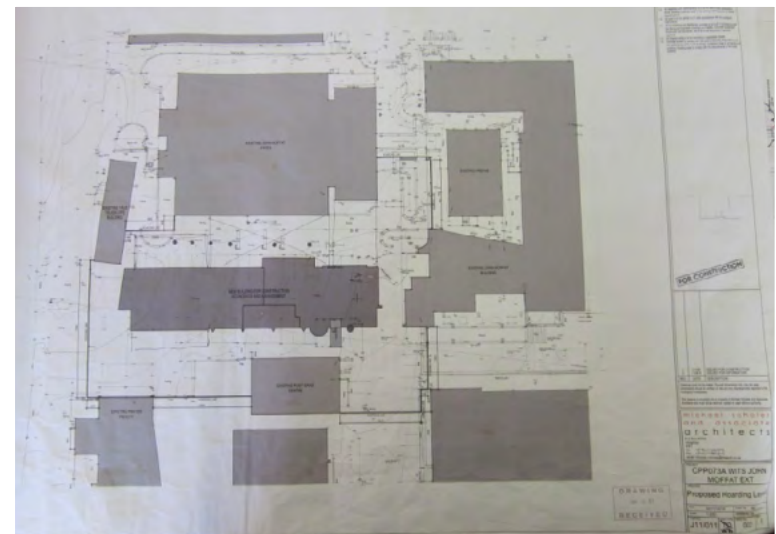


Figure 80b: site plan indicating the various EBE buildings in 2012 (Author, 17.02.2012)

4.4.3 Descriptive analysis: UB quantitative data

Discussion: General school layout and spatial performance - UB

Graph 26: The performance of the attributes in this category is generally poor, with six out of 10 attributes falling in quadrant A:

- The biggest performance gap (gap = 4.07) is indicated for ‘Individual learning space’, which is also rated as the most important attribute. A significant gap also exists for “Views to the outside” (gap = 3.62).
- ‘Flexible space’ attracts the highest satisfaction rating, where performance exceeds importance (gap = -0.33).
- Of all the schools, UB respondents are the only to indicate a significant requirement for spaces where teachers and students can interact on an informal basis (‘Mix chill’, Imp = 4.9), in addition to student relaxation spaces away from studios (‘Chill space, Imp = 5.75).

Graph 26: I-P matrix General space allocation UB

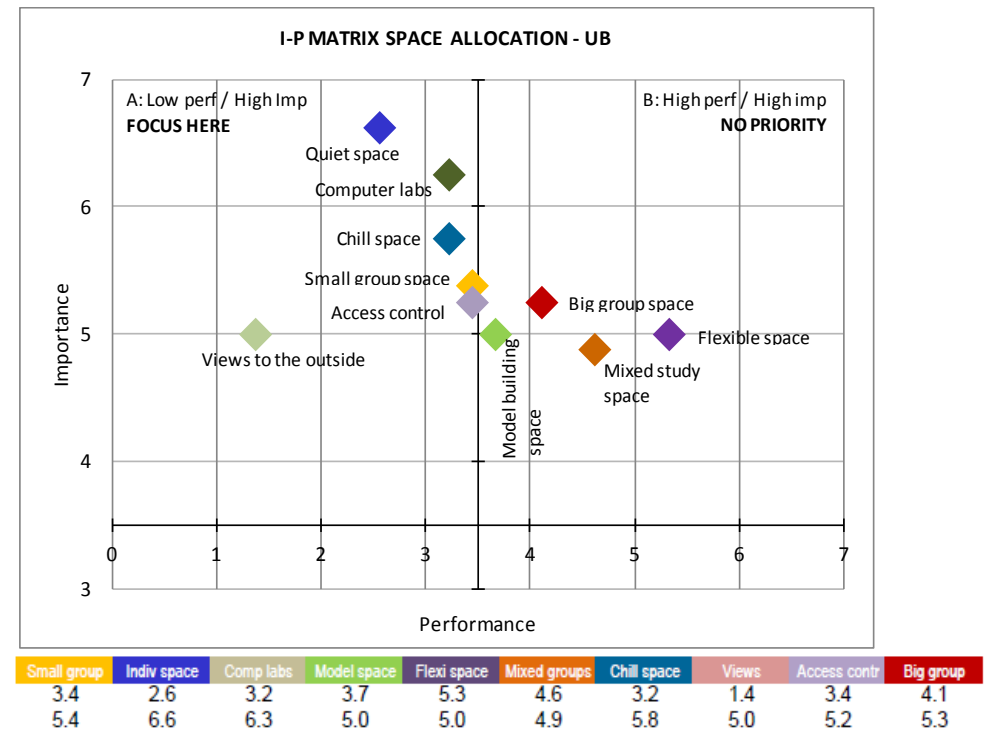


Figure 81: This image illustrates some of the environmental shortcomings identified by UB students, such as awkward spaces under ramps, large open spaces with poor acoustics, and a need for more power outlets. (A Janse van Rensburg, 12.02.2012)



Figure 82a: UB - both ‘Natural light’ and ‘Views to the outside’ are rated low, most likely the result of trees growing very close to studio windows (Author, 19.12.2011);

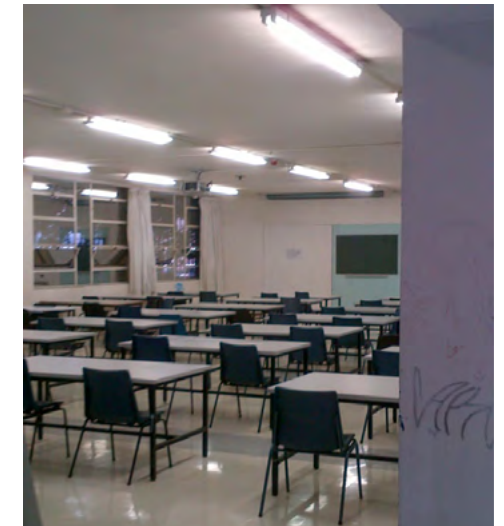


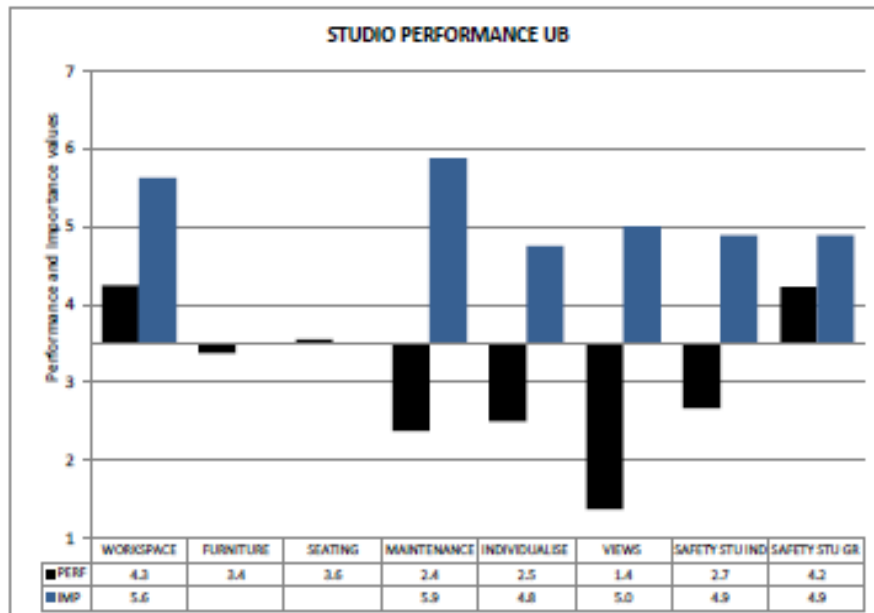
Figure 82b: Poor natural lighting conditions in John Moffat Annex, UB (A Janse van Rensburg, 12.02.2012)

Discussion: Studio facilities - UB

Graph 27: In general, a large overall performance gap is indicated, showing that urgent attention to studio performance attributes is required.

- The largest performance gap, with also the poorest performance, is 'Views to the outside' (3.63) (Fig. 82).
- The safety of students while working in the studios - particularly when on their own - is a concern (perf = 2.67). When working as a group in the studios, students feel significantly safer (performance gap = 0.67, compared to gap = 2.22 for individuals). Along with UC, safety has the highest Importance rating (UB Imp = 4.89; Ave Imp = 4.7)). Students spend on average only 1.3 hours per week in studios after 19:00 (Graph 28).
- The highest importance rating (5.88) is for maintenance, which also performs poorly (2.38) (gap = 3.50).

Graph 27: Importance and performance - Studio facilities UB

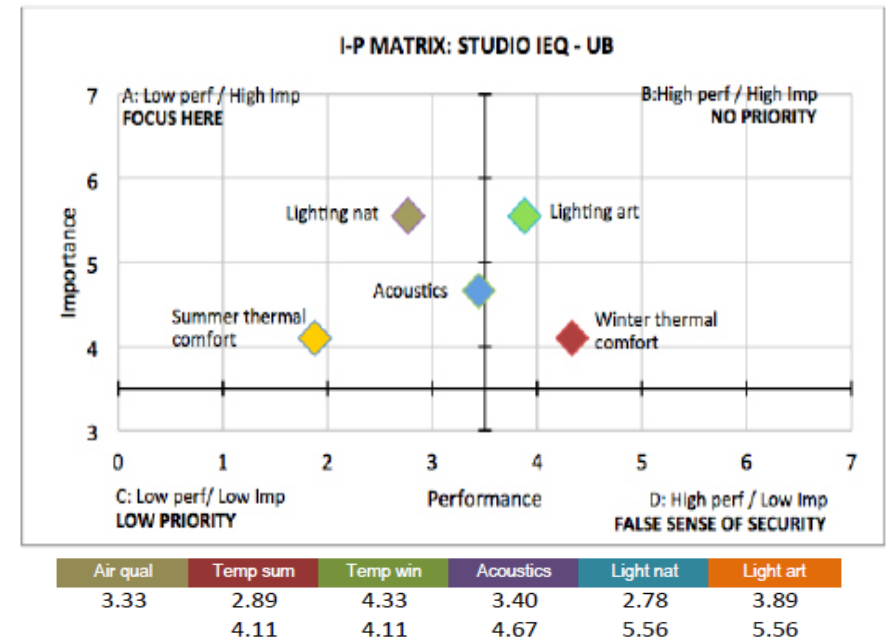


Discussion: Indoor environmental quality - UB

Graph 28 underlines the general dissatisfaction with studio conditions:

- The negative influence on performance attributes by the trees and other buildings positioned close to the windows of the studios on the north side of the John Moffat extension is once again reflected in dissatisfaction with the results for 'Natural light' the greatest improvement gap (gap = 2.8), and the poorest performer (2.8).
- The best performing attribute is 'Winter temperature' (4.3), for which a negative performance gap (= -0.22) is recorded. This ironically, may be the result of the proximity of the trees which protect openings from direct wind.
- The three best performing attributes are not studio specific ('Common area lighting' [4.25], 'Internet' [4.75] and 'Wi-fi' [4.25]).
- The poorest performing attribute is 'Storage space for personal belongings' (1.3). Storage facilities have been upgraded since the evaluation – similar to 'Outside seating' at UA which had been improved since the evaluation, this is an indication that student responses to the IPA questionnaire are valid.
- Dissatisfaction with the quality and availability of pinning boards is also evident (1.63 and 2.13 respectively).

Graph 28: I-P matrix - Studio IEQ - UB



Discussion: Campus environment - UB

- The largest performance gap (= 2.89) exists for 'Outside working space' while the poorest performer is 'Inside wayfinding' (2.4) just barely ahead of 'Campus wayfinding' (2.7).
- The smallest importance gap (= 0.78) is recorded for 'Campus fit', the attribute that also shows the best performance. This is an interesting opinion by the students, for at a panel discussion in 2009, Hansen and Fitzgerald [sp] claimed that

a variety of challenges and problems can be easily identified when studying the [UB] campus, such as, poor common spaces, motor vehicle dominance, poorly integrated campuses, poor connectivity to the city, at the heart of the matter is the fact that the spatial environment of the University is of relatively poor quality. Campus planning has an ever-lessening concern for the communal space and the making of public space, a short-term attitude to buildings, infrastructure and landscape, primarily due to an ad hoc decision-making process.



Figure 83: Building entrance courtyard, 1956 (John Moffat Building, 1956)

Graph 29: I-P matrix - Campus environment - UB

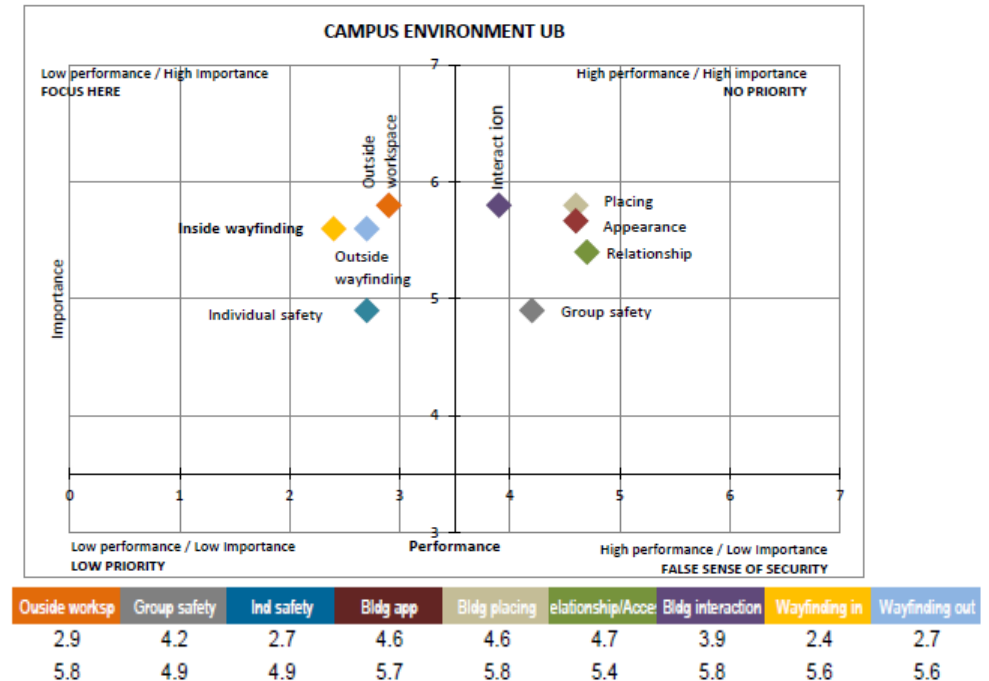


Figure 84: Main entrance and court yard, school building entrance and court yard, 2012 (Author, 17.02.2012)



Figure 85: Word cloud - qualitative data, UB

4.4.4 Discussion of qualitative feedback : most important attributes – UB

In the word cloud for University B (Fig. 85), 'Pinning boards' and 'Storage' are the factors that are mentioned most often in the "5 most important attributes" list. This correlates with Graph 27 which indicates that these are the poorest performers in the category Studio infrastructure.

4.4.5 Lessons learned: Discussion of IPA questionnaire and revisions

Experience gained from the implementation at University B indicates that the primary researcher should retain as much control as possible, over the administration of each application of the questionnaire. To ensure consistency of conditions and proper quality control, Reardon (2006:20) suggests that when researchers cannot administer the questionnaire personally, they should include a detailed set of notes to guide administrators, and if possible provide hardcopy of questionnaires to ensure consistent quality between applications.

In an effort to reduce the length of the questionnaire certain questions that had not presented significant feedback, were omitted:

- The question on "To what degree are you willing to give up comfort, for the sake of saving energy?" had been included to assess the importance of energy efficiency but was found to also provide insight into the importance of thermal comfort. Unfortunately by the time this value had been discovered, the questionnaire had been implemented at UB and UC.
- Are there any other environmental conditions, which apply to your studio (e.g. humidity)? Please list.
- What are the hours during which you have free access to your studio?

The importance of careful question selection was emphasised by the amount of information that was lost because questions were omitted.

4.5 CASE STUDY 3: UNIVERSITY C

4.5.1 Survey participant information

The fourth year, B Arch Honours class completed the questionnaires at University C. Survey forms were made available during the year-end portfolio examinations (over three days, 8 – 10 November 2011), and completed forms were placed in an envelope provided for the purpose. Teachers were supportive, and encouraged students to participate. The introduction information made it clear that the researcher was also one of the external examiners, which did not seem to have any negative effect on the response rate.

In preparation for administration of the questionnaire at UC, an introductory paragraph in Afrikaans was included, as this is the first language of most students in the school. The balance of the questionnaire was not translated, as this may have changed the meaning of some of the questions. Such inconsistencies can potentially have a critical impact on the cross-validation of data between schools.

Table 19: UC respondent data

Response rate	Handed out	Usable	Gender	Female	Male	Physical disability	No
<i>n</i> = 40	24= 60%	23		11	12		22 + 1 N/R
Age	18 – 20	21 – 24	25 – 30	31+	N/R		
	0	18	3	0	0		
Transport	Own car	University organised	Public transport	Drop-off	Lift club	Other: walk / scooter	N/R
	15	0	0	0	1	3 / 1	3
Abode	Parents' home	Own home/ flat	Univ residence	Commune / digs			
	9	10	3	1			

4.5.2 Context of survey: building information

The Department of Architecture at UC opened its doors in 1955 with Professor George Quine Lay as first head. There were 27 students, of whom 17 were students of Architecture and 10 of Quantity Surveying.

The Department of Urban and Regional Planning separated from the Department of Architecture in 1975, and the Department of Quantity Surveying in 1980 (Joubert, 1997:50). The number of architecture students reached 240 in 2012.

At the time of the evaluation, the school had recently re-inhabited a newly renovated and much upgraded building (architect: Henry Pretorius, 2011) (see Fig. 86, 92a and 92b) after temporarily spending some time in very uncomfortable and unsuitable quarters elsewhere on campus. The “new” building layout is reminiscent of the University of New Mexico, by Antoine Predock (Fig. 24), as it is arranged around a similar ‘critique bridge’ on the mezzanine floor with views into the crit space on the ground floor (Fig. 87).



Figure 85: Aerial view of the school building before extensive renovations (centre), UC (Google Earth)



Figure 86: Street / west elevation of the renovated school building, UC (Author, 17.11.2011)

4.5.3 Descriptive analysis: UC quantitative data

Discussion: General school layout and spatial performance - UC

- **Graph 30:** The greatest improvement gap exists for 'Individual learning space' (gap = 2.5), closely followed by 'Chill space' (gap = 2.4), reflecting the twin needs for both dedicated study space and socialising space. The I-P matrix permits decision makers to differentiate between lower performance ('Individual / quiet study space') or higher importance ('Chill space'), and strategise accordingly.
- The lowest performance rating (perf = 2.56) is for 'Individual learning space'. The highest performers are flexible space and space for large groups. The least improvement gap is for 'Big group learning places', where there is performance exceeds expectation (gap = -0.4).
- 'Computer labs', as is typical for this attribute, shows the highest importance values but still a relatively high improvement gap (perf = 4.74; imp = 6.44; gap = 1.70). Small group space is the least important attribute (4.0).
- For a transcript of student feedback in the question on "General comments on interior planning and design", refer to Annexure G2.

Graph 30: I-P matrix - General school layout and spatial performance - UC

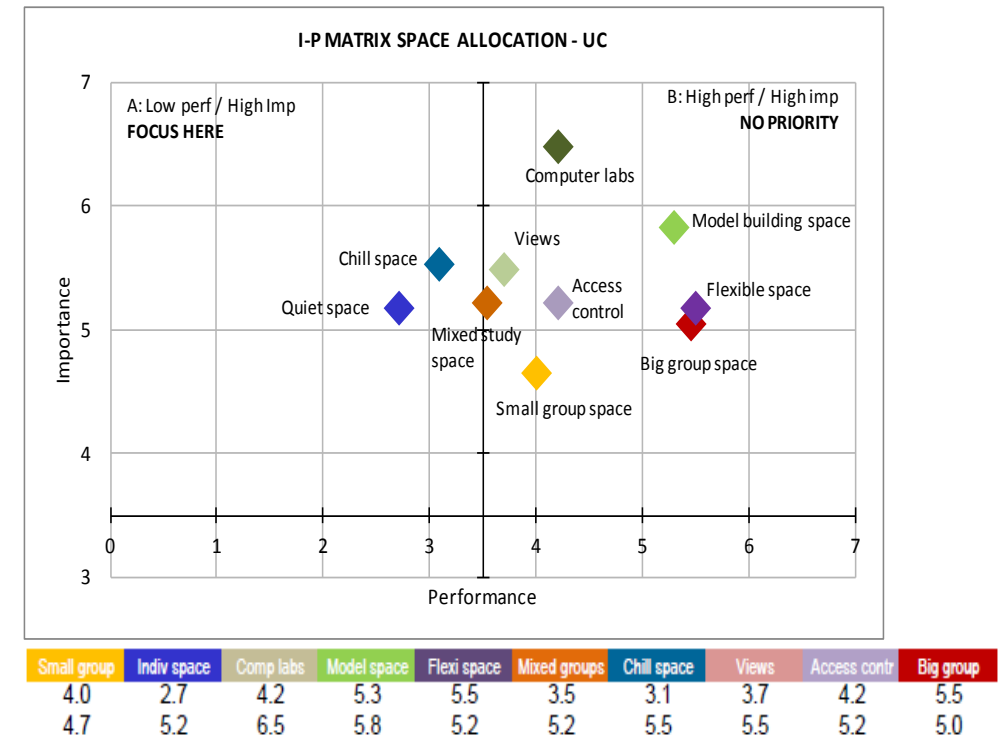


Figure 87: The double volume crit space with semi-private cubicles
(Author, 16.11.2011)



Figure 88: The B Arch (Hons) studio, UC
(Author, 17.11.2011)



Figure 89: Natural lighting and air ventilation via light wells in large studios
(Author, 17.11.2011)

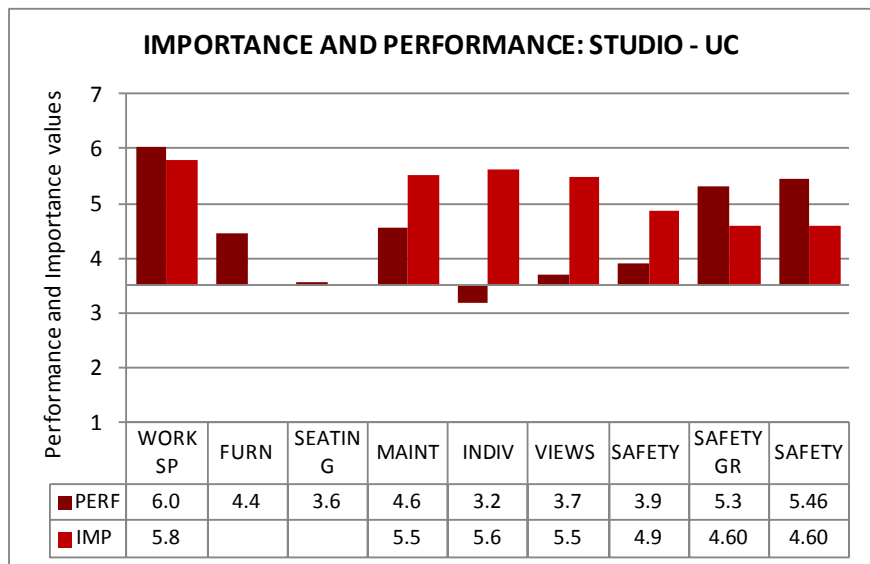


Figure 90: Satisfactory artificial lighting conditions in studio deep space
(Author, 09.11.2011)

Discussion: Studio facilities - UC

- **Graph 31:** The greatest improvement gap exists for 'Individualising of space' (gap = 2.4). The lowest performance rating is also for the opportunity to 'Individualise learning space' (3.2). As the school had recently reoccupied their extended and renovated building, many of the written comments on 'General school layout and design' (see Annexure G2) relate to this attribute, for example: "structuring of intimate / personal space inadequate"; and "need to be able to personalise spaces otherwise it's still foreign to us".
- No improvement gaps exist for the workspace available per student (Imp = 5.8; Perf = 6.0; gap = -0.2) or for personal safety in studios (Imp = 4.60; Perf = 5.30; gap = - 0.7) as performance values are greater than importance needs.

Graph 31: Studio facilities - UC

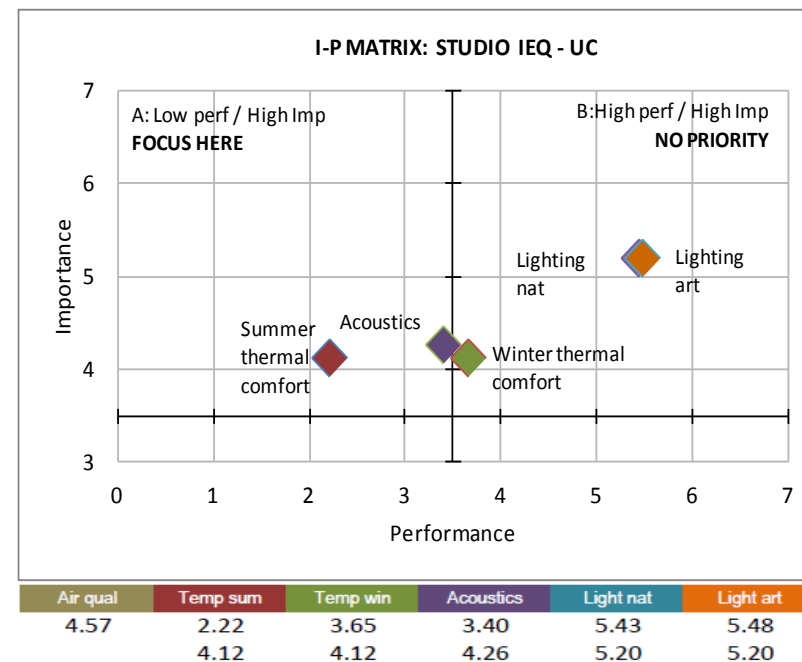


Discussion: IEQ - UC

Graph 32: As Importance ratings were not measured for several of the IEQ attributes, the average values for these attributes ('Thermal comfort' and 'Air quality') were used. No significant improvement gaps can therefore be determined.

- The poorest performance (2.2) is for summer temperature, much lower than winter temperature. This may be the result of the survey being administered on a particularly hot day, and the mechanical ventilation system in the new building was not yet fully operational. When the system was switched on, it was quite noisy which will likely lead to complaints about acoustics.
- Satisfaction ratings for lighting and air quality are the highest of all four schools (see Fig. 91).

Graph 32: I-P matrix - Studio IEQ - UC

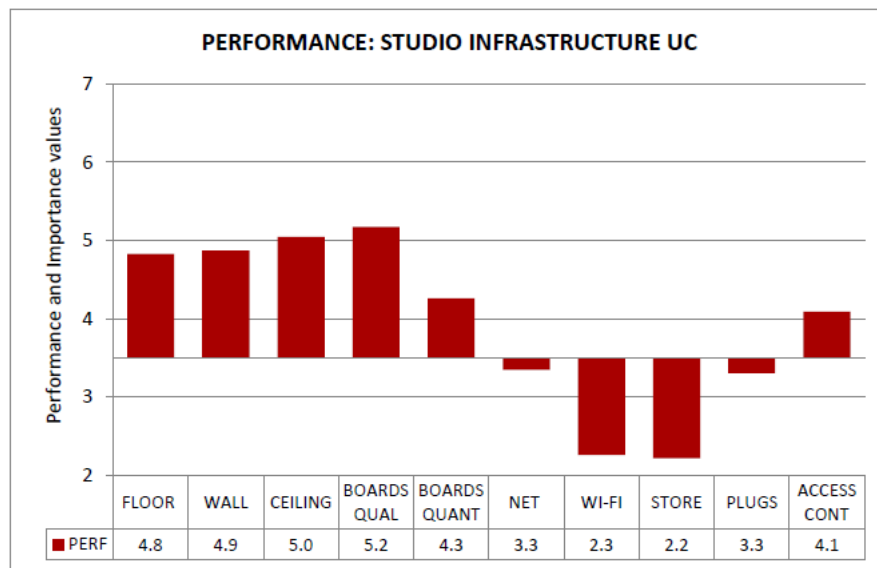


Discussion: Studio infrastructure - UC

Graph 33: Similar to findings for IEQ attributes, studio infrastructure appears to be generally satisfactory, except for the ubiquitous demand for Wi-fi access.

- The low performance rating for storage (2.2) is possibly the result of a theft incident shortly before the evaluation, although access control received a relatively high performance rating (4.1).
- The high satisfaction with finishes are likely, as for Outdoor Appearance attributes, the result of recent renovations. The pristine conditions may not be long lasting, as one of the comments under 'General comments' was "not student friendly - no graffiti allowed!"

Graph 33: Performance - Studio infrastructure - UC

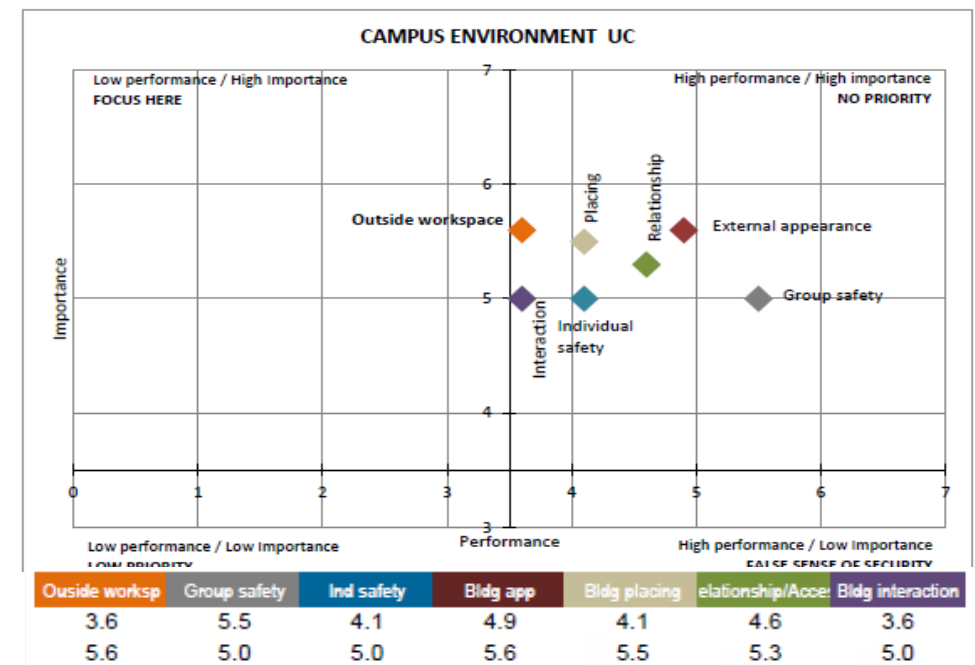


Discussion: Campus environment - UC

All the attributes fall within quadrant B, indicating general satisfaction with this category.

- Two attributes – 'Outside workspace' and 'Interaction' (perf = 3.6) fall very close to the boundary with quadrant A, indicating that performance should be monitored in these areas.
- The greatest improvement gap exists for 'Outdoor workspace' (gap = 2.09); this attribute also attracted the lowest performance rating (perf = 3.6) together with 'Interaction'. The provision of some outside furniture on a suitable space next to the building (Fig. 85) may improve the satisfaction with both of these attributes by allowing students to work outside, as well as attracting social use and improving interaction with students from other disciplines.
- The highest performance rating and lowest improvement gaps are for 'Appearance' and 'Campus fit', which should be gratifying to campus managers and designers, as the building has undergone a major upgrade immediately prior to the survey.

Graph 34: I-P matrix - General campus environment - UC



4.5.4 Discussion of qualitative feedback: most important attributes

The word cloud for UC (Fig. 91) supports the quantitative rating-scale based indications: 'Storage' has lowest performance and is represented as the most-included factor in the "Five most important attributes" list. Lighting is also mentioned often, but is rated as performing at high levels of satisfaction. This result highlights a weakness of word clouds in this context: it can identify importance, but not explain the reasons for it.

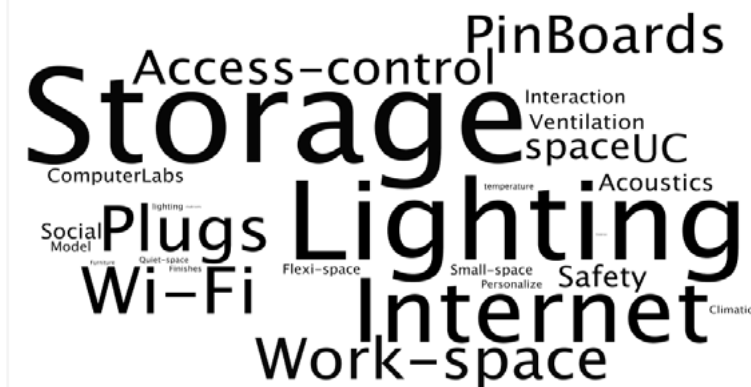


Figure 91: Word cloud - infrastructure - UC

4.5.5 Lessons learned: Discussion of IPA questionnaire and revisions

In an effort to reduce the length of the questionnaire (and improve the response rate), certain rating scales and questions were removed (see 4.4.5: Lessons learned, UB), particularly in relationship to Importance data. This was not a good decision, because when intending to use the data for IPA, it is necessary to collect both Importance and Performance rating for as many attributes as possible, even if the latter appear to be redundant. Rather than compromising on the data collection, the time and method of administering the questionnaire should be optimised.

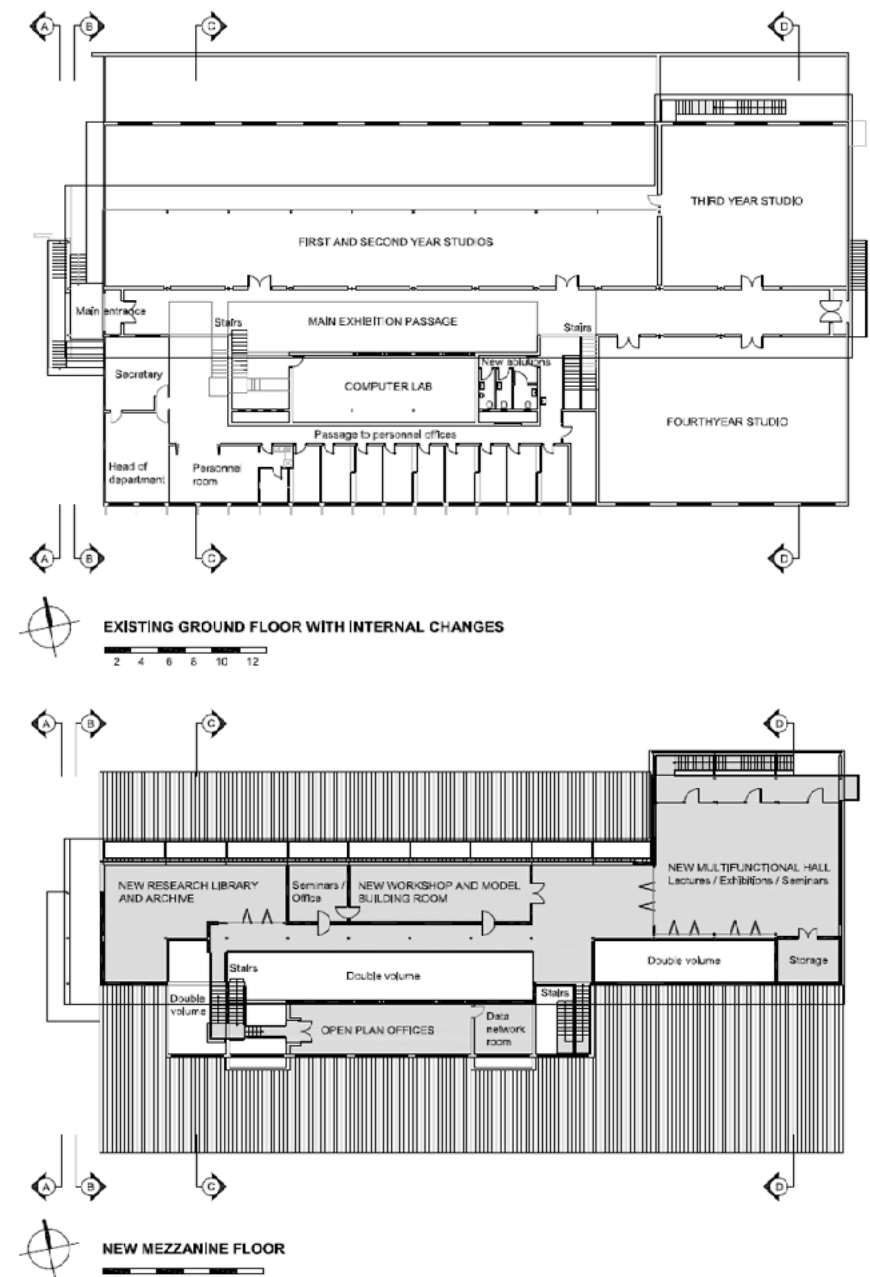


Figure 92a (top): Ground floor plan, renovations to school building at University C (H Pretorius, 08.02.2012)

Figure 92b (bottom): New mezzanine floor plan (ibid.).

4.6 CASE STUDY 4: University D

4.6.1 Survey participant information

The third year students at UD completed the questionnaires during the portfolio examinations on 28 to 30 November 2011. The same process was followed as that at University C: questionnaire forms were placed in a central location for students to collect, complete, and return to a marked envelope. Students were made aware of the questionnaire and requested to complete it, but were not monitored. Despite the questionnaire being of reduced length, a large number of questionnaires were not completed in full.

Table 19: UD respondent data

Response rate	Handed out	Returned Usable:	Gender	Female	Male	Physical disability	No
	40	22 (55%)		7	15		22
Age	18 – 20	21 – 24	25 – 30	31+	N/R		
	1	16	3		0		
Transport	Own car	University organised	Public transport	Drop-off	Lift club	Other walk / scooter	N/R
	17	0	0	1	0	0	5
Abode	Parents' home	Own home/ flat	Univ residence	Commune / digs			
	11	6	3	2			

4.6.2 Context of survey: building information

The campus of University D is positioned on the outer edge of a medium-sized city, far from amenities, and poorly served by public transport systems (*Fig. 93*). This seems to have a major influence on the habits of students and on their requirements of the school. The school currently occupies uncomfortable spaces in a building not originally designed to house a school of architecture. Fulton (1992:2) comments on this particular phenomenon, that much of adult education activities take place in places that have been designed for other activities, or even when in educational facilities, spaces aimed at teaching children. More specifically, most learning is expected to take place in areas that were originally generically designed for “education”, not for discipline-specific education.

The existing building, despite being positioned on a potential campus ‘landmark’ site, makes no statement – in fact, the opposite is true: the main building entrance is difficult to find, and hidden behind the institutional fire fighting vehicle (*Fig. 94*). Thanks to a large institutional donation, an additional 1 560m² building (*Fig. 95*) could be constructed adjacent to the existing building in 2011-12. The new building makes a more specific visual statement, and alleviates the current shortage of space and facilities. In addition to studio space, a model-building workshop, a materials research laboratory and an extensive exhibition space are included (De Ruyter, 2009:[sp]).



Figure 92 (left): Aerial view of the school building, lower left of the complex in a potentially landmark location and Figure 93 (right) Aerial view of the campus of University B visible at the top left of the image (Google Earth).



Figure 94: The approach to the existing school of architecture building, UD
(Author, 19.11.2011)

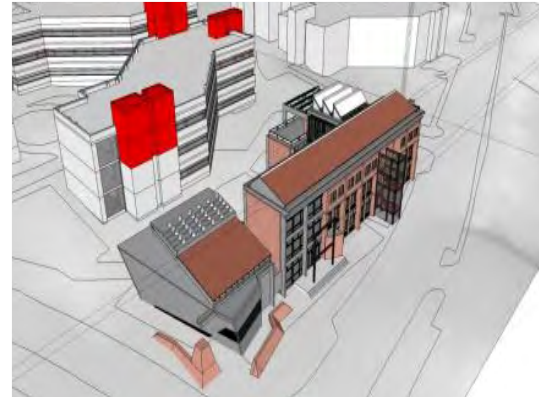


Figure 95: The proposed new extension to the school building (Architects Crafford & Crafford)
(www.fe.tut.ac.za/NewsContent.aspx?id=223)



Figure 96: Computer lab, UD
(Author, 29.11.2011)

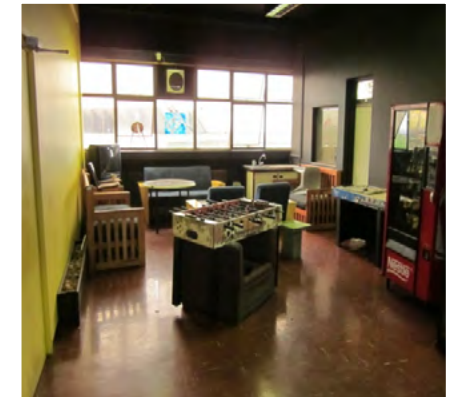


Figure 97: Student chill space, UD
(Author, 29.11.2011)

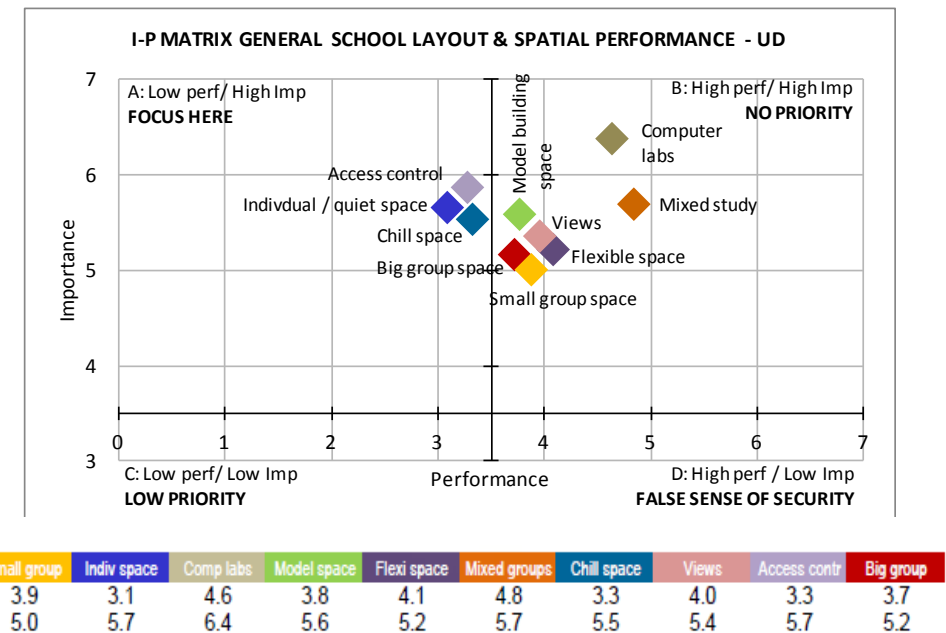
4.6.3 Descriptive analysis: UD quantitative data

Discussion: General school layout and spatial performance - UD

There are apparent inconsistencies in the responses to studio conditions. While “Workspace” - the provision of enough workspace per student - receives a high performance rating, “Quiet workspace” - places where students can work individually - receives poor ratings. Several written comments refer to noise as a problem, as well as problems with dedicated space (or the lack thereof). It appears that while there is enough workspace, it does not have the desired attributes. Further research is required to ascertain the exact conditions and the reasons for dissatisfaction.

- **Graph 35:** The biggest improvement gap is recorded for ‘Individual learning space’ (gap = 2.6). In line with other schools, this attribute also shows the poorest performance rating (3.08).
- The smallest improvement gap is indicated for ‘Mixed study space’ (gap = 0.9). This is possibly because studios at UD are not dedicated to specific groups, and space in the studio is available at a ‘first come first served’ basis. This policy may have a negative impact on studio attendance, for as one respondent remarks, “Usually because we can’t get a good studio position ... if we had [a good position] someone next day would’ve taken over” (see Table 20 and Annexure G2).
- The most important space is ‘Computer Labs’ (6.38) which, with a satisfaction rating of 4.64 still indicates a performance gap of 1.74.

Graph 35: I-P matrix - General school layout and spatial performance - UD



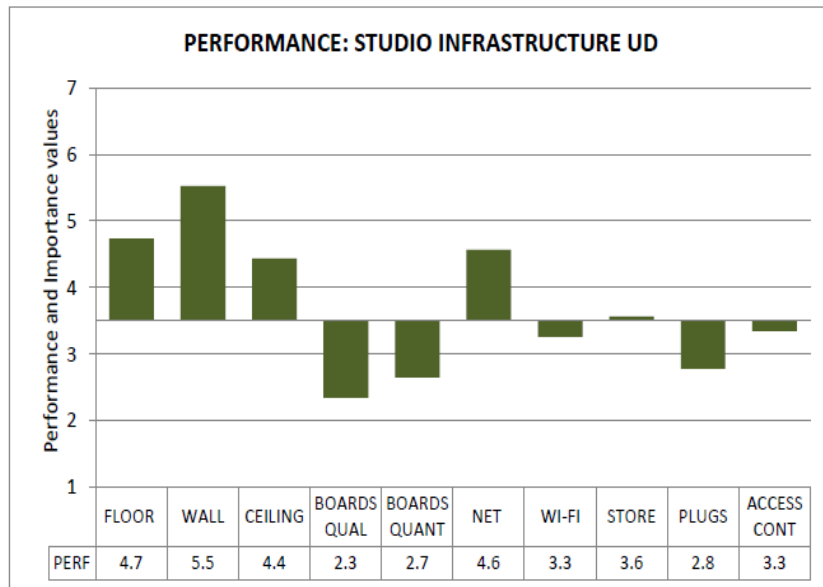
Discussion: Studio conditions - UD

Because of the limited time that respondents had to complete the questionnaire, even more questions were removed before implementation of the questionnaire, on the assumption that enough indicative data had been collected in previous implementations of the questionnaire. This was a mistake, as it makes IPA for UD more difficult. Studio conditions are described, based on a table, bar charts, and a word cloud.

Graph 36 - 37: The following deductions can be made from available data:

- The improvement gap between performance measures and importance measures is significant, with performance values (except for safety), below 3.5.
- Pinning boards, as at schools A and B, are not satisfactory (Perf. quality = 2.35; quantity = 2.65).

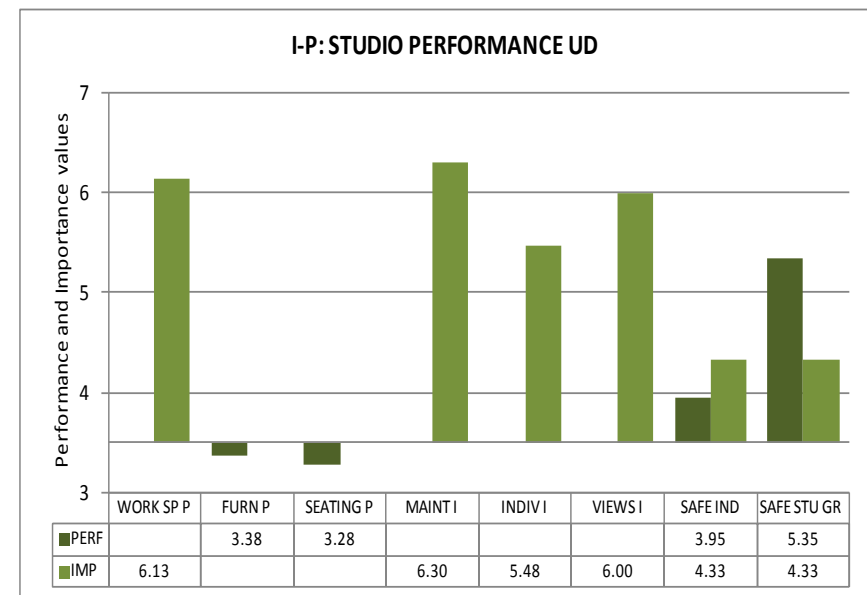
Graph 36: Performance - Studio infrastructure - UD



The qualitative data collected can shed light on the results. An investigation of comments (see Annexure G2) reflects negatively on studio conditions, as seen in Table 20.

- “Time” features prominently, in phrases such as “Find time to work alone [at home]; Repeating is expensive and time consuming; Never spend time over weekends; Spend more time near exams ‘hell no’”.
- ‘Noise’ occurs in phrases such as “The noise levels during the day make it hard to work; Cannot work in noisy environment - depends on what I am doing; Noise gets too much”.
- The positive advantage of social interaction and mutual support are reflected in “Friends want to work together; Group projects - informal crits; When group of friends are working)together”.
- A poignantly pragmatic “Repeating is expensive and time consuming” indicates the true value of working consistently in the presence of a community of learning.

Graph 37: Importance and performance -Studio performance - UD



Discussion: Campus environment - UD

- The I-P matrix for the UD Campus Environment attributes indicates that 'Outside space' and 'Way finding' fall within quadrant A. The grouping of the other attributes within quadrant B is satisfactory, although 'Individual safety' as the poorest performer in this group should be addressed.
- The biggest improvement gap exists for 'Outdoor work space' (gap = 2.09), the attribute that also attracted the lowest performance rating (3.18).
- The highest performance rating and lowest improvement gaps are for 'Appearance' and 'Campus fit', which should be gratifying to campus managers and designers, as the ratings are based on the positioning and appearance of the building (the latter attribute relates to the new building under construction at time of evaluation, *Fig. 95, 101*).
- The biggest performance gap exists for 'Access and wayfinding" (gap = 2.6).



Figure 101: New building for school of architecture under construction, UD (Author, 19.09.2011)

Graph 38: I-P matrix - Campus conditions - UD

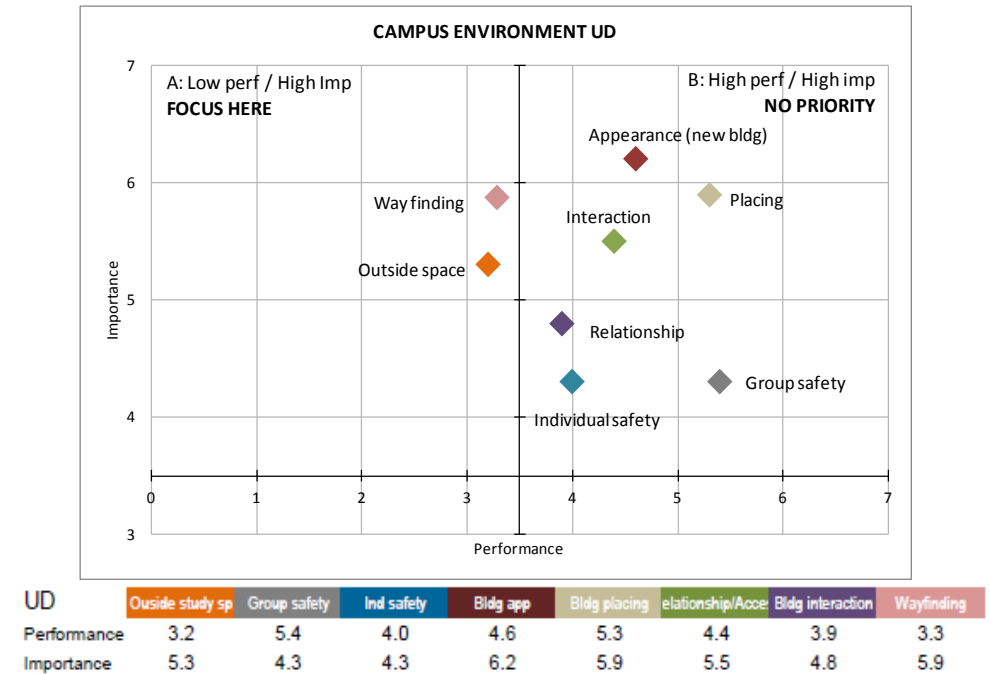


Figure 102: View across campus grounds towards the city center, UD (www.tut.ac.za)

4.6.5 Lessons learned: Discussion of IPA questionnaire and revisions

Due to the process and conditions under which the questionnaires were completed (during the year-end portfolio examination process), many of the forms were started but not completed in full. This underlines the importance of following the advice of Lewis (2004), O'Neill and Palmer (2004) and Silva and Fernandes (2010) and to administer the questionnaires in a controlled classroom setting.

The experimental approach to gathering data for the “Most important five” list (refer to Annexure B4) required a much too complicated a cognitive process and without being able to discuss the requirements with respondents, such methods should be avoided. This question format is not used in the final questionnaire.

4.7 CONCLUSIONS DRAWN FROM THE DATA

In Chapter 4, conclusions were drawn from data relating to specific conditions, and within narrow contexts. In Chapter 5, conclusions were drawn about the overall success of the study. The following conclusions are specifically applicable to the data that were gathered, and the interpretation of the “patterns” that became evident in analysis.

4.7.1 There are identifiable patterns in the data

The results of the graphic conversion of the quantitative data collection of importance- and performance ratings into graphic representations such as scattergrams and column graphs, indicates that there are definite patterns in the needs of architecture students, and the shortcomings of service provision.

By using I-P matrixes as first proposed by Martilla and James (1977), the categorisation of outcomes into sections that require urgent attention (quadrant A: Focus here), and quadrant B: No Priority is simple. In not one of the I-P matrixes did results fall into quadrant C (No priority) or quadrant D (False sense of security). This can be seen either as evidence

that respondents were insufficiently discerning in their assessment of the importance of attributes (Lewis, 2004:1); or that they tend to overstate the importance of attributes in particular when performance is considered poor, as proposed by Tontini and Picolo (2010); or it can be an indication that the process of attribute selection was effective and that no unimportance attributes were included in the questionnaire. The consistency in the results of Importance ratings is taken to be proof of the last option.

4.7.2 There is a non-linear relationship between importance- and performance ratings

There is evidence that supports Tontini and Picolo's (2010) hypothesis that when an attribute is very important to a respondent, it is rated higher in Importance and/or lower for Performance than if it is not of particular importance. Further analysis of the raw data through paired sample t-tests is necessary to prove this indication conclusively. An example of this phenomenon in the current study, is the importance linked to 'Wi-fi'. At University A where it is not freely available ($perf = 1.44$), it is mentioned more than any other attribute in the list of most important attributes; while at University B where Wi-fi is available campus-wide and performance is rated at 4.25, it is mentioned much less often.

At the outset of the study the decision was made to use Martilla and James' (1977) original Importance-Performance Analysis model for data analysis. While this model has served the purpose of identifying patterns in the data, there are clear indications that the “Attractive quality and must-be quality” theory introduced by Kano et al (1984; see footnote, 2.7: Data analysis: disconfirmation theory) should be further investigated for application to data analysis and reporting in this context.

4.8 CHAPTER SUMMARY

In this chapter, the implementation of the questionnaire/s at the four schools of architecture selected for evaluation was discussed. First, an overview of the data was presented, followed by an in-depth analysis of each case study. The framework of each case study included:

- Survey participant information
- Context of survey and building information
- A descriptive analysis of quantitative data
- Discussion of qualitative feedback
- Lessons learned and revisions to the questionnaire.

Finally conclusions were drawn about patterns in the data, the linear relationship between importance and performance ratings (or rather, the lack thereof), and the quality of the on-campus learning environments at South African schools of architecture.

The next chapter, 5: Summary and conclusions, presents the final conclusions of the study. These are supported by an overall review of the research process, and proposals for further study and improvement of the process. Suggestions for the use of research findings to improve conditions at South African schools of architecture are provided.