

Towards a satisfactory learning environment: Importance-Performance Analysis of the on-campus requirements of architecture students

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A dissertation submitted to the Faculty of Engineering and the Built Environment,
University of the Witwatersrand, in fulfillment of the requirements for the degree of
Master of Architecture by Research.

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Declaration

I declare that this dissertation is my own, unaided work. It is submitted for the degree of Master of Architecture by Research at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this, or at any other university.

Annemarie Wagener 472384

At _____

on the _____ th day of _____ 2012.

Acknowledgments

Research is a 'lonely journey', and those who help to smooth the path for the weary traveller deserve to be acknowledged:

Without the help of the students at the schools of architecture who participated in the survey, this study would not have been possible. Their hard work and dedication towards their learning, often under difficult conditions, was the true inspiration for this study.

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Abstract

The on-campus learning environment often falls far short of the expectations of architecture students. One reason is that these students are seldom given a voice in how their schools are designed, or how the facilities are managed. This study tested the use of Post Occupancy Evaluation (POE), and Importance-Performance Analysis (IPA) as a strategic method of addressing this shortcoming.

To do this research, a POE questionnaire was developed, based on the theoretical underpinnings of good design of places for adult learning, questionnaire design, POE, and IPA. After implementation of the questionnaire at four South African schools of architecture, the collected data were processed using standard spreadsheet software.

Once the results were presented in an IPA matrix format, it was clear that there are several commonalities in the needs and desires of architecture students from the different schools. Some requirements, such as that for well equipped computer laboratories were not surprising. Others, such as a universal need for quiet, separate spaces in which to work; and outdoor places where they can gather to work or 'chill' away from their studios and classrooms were less expected outcomes. The typically poor quality of indoor environmental conditions was exposed as one of the main reasons why architecture students now often prefer to make use of alternative, off-campus ways of working, and of communicating with each other and with their teachers.

The implication of these findings is that by combining POE and IPA, it is possible to identify and monitor the attributes that are necessary for a satisfactory on-campus learning environment. Where shortcomings are identified with POE, strategic responses can easily be devised using IPA.

The dissertation is concluded with suggestions for future applications of the proposed questionnaire and data analysis method, to enable benchmarking at schools of architecture and improve the on-campus environment of students of architecture.

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Definitions & key terms

Constructivism

Constructivism, as a theory of learning, supports the notion that learners are active participants in the process of constructing their knowledge and reality, rather than passively recording it (Atmodiwirjo & Andri Yatmo, 2004; Karagiorgi & Symeou, 2003:18; Paavola, Lipponen & Hakkarainen, 2004:572).

Formal learning spaces

The use of formal learning spaces are completely under the control of the academic institution and subject to scheduling, set hours of use, seating, and predetermined learning activity patterns such as lectures or discussions (Johnson & Lomas, 2005:16).

Importance

A reflection by consumers of the relative value of different quality attributes (O'Neill & Palmer, 2004:43).

Importance-Performance Analysis (IPA)

IPA is a model for reporting customer satisfaction, and for identifying the primary service attributes that a service provider should focus on. The outcomes of an analysis are presented on an I-P grid.

Informal learning

Adult learners learn informally by debating, discussing, observing, and asking for help (Acker & Miller, 2005:5). This type of learning “results from serendipitous interactions among individuals” (Oblinger, 2006b:1.1).

Learning

“The process whereby [personal] knowledge is created through the transformation of experience, or a relatively permanent change in knowledge, behaviour or understanding that results from experience” (Kolb & Kolb, 2005:194). Learning is the result of “synergistic transactions” (*ibid.*) between learner and environment.

Learning environment

An “intrinsically fuzzy and ill-defined” (Gruenewald, 2003:622) concept, described by Strange (2000:20) as the setting in which the learner acts, and where learners meet, interact, and share experiences. The on-campus learning environment is created by the interaction between physical, human, organisational, and social factors.

Performance

“The level of service delivered to clients against agreed standards and targets set out in the service specifications and service level agreements” (Atkin *et al*, 2000 in Kwok & Warren [2005:5]).

Post-Occupancy Evaluation (POE)

“[A] systematic study of buildings in use to provide building designers with information about the performance of their designs, and building owners and users with guidelines to achieve the best out of what they already have” (RIBA Research Steering Group, 1991, cited in Tanyer & Pembegül, 2010:241-242).

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Quality and functionality

Quality: Fitness for purpose.

Functionality: The fit of a product with the function it is designed to serve (Rasila *et al*, 2010:147).

School of architecture

A division of a university's faculty, devoted to the academic discipline of architecture. The delineation of such an entity as 'department' or 'school' or 'faculty' varies from institution to institution and therefore, in this document the term "school" or "school of architecture" is used throughout to describe such an organisation.

Space and place

In this document, learning 'space' denotes the Euclidian concept of an 'ordinary two- or three dimensional space' within which learning takes place.

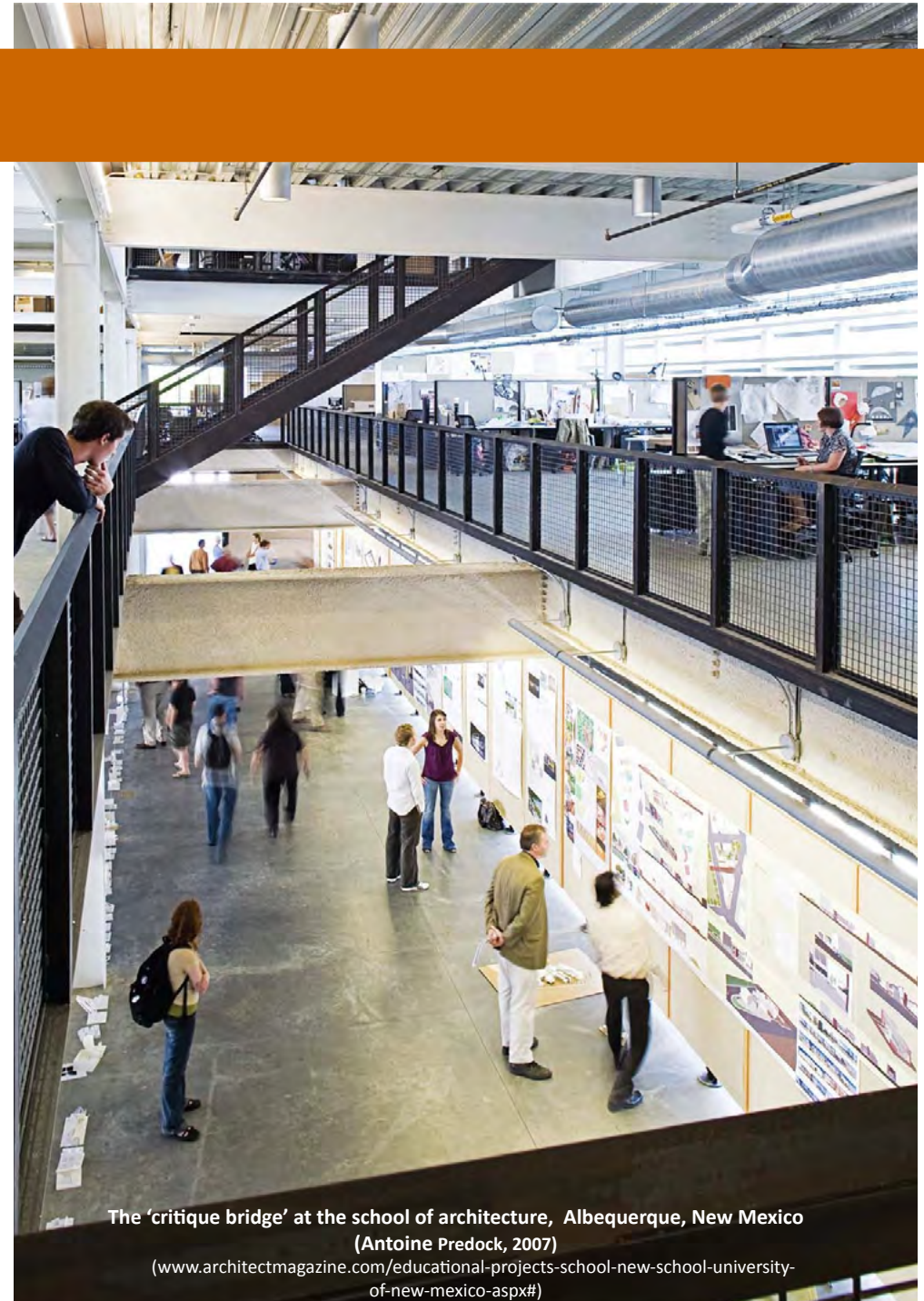
'Place' denotes the multi-dimensional environment (physical, virtual, and conceptual) that supports the learning process.

Studio culture

The American Institute of Architecture Students defines it as "the experiences, behaviours, habits and patterns found within the campus-based architecture design studio" (AIAS, 2010).

1 Introduction

- 1.1 Background to the problem
- 1.2 Problem statement
- 1.3 Research goal and objectives
- 1.4 Research methodology
- 1.5 Research scope and limitations
- 1.6 Research deliverables
- 1.7 Chapter overview



1. INTRODUCTION

This chapter presents the research problem and the context within which it occurs. The role of the academic institution as service provider of the on-campus learning environment is discussed. Importance-Performance Analysis combined with Post Occupancy Evaluation is presented as an effective method of data collection for evaluation of student satisfaction, and for interpreting, and presenting evaluation data. Its value in strategic planning is illustrated. The research methodology, limitations, and scope of the study are outlined.

1.1 BACKGROUND TO THE PROBLEM

Students expect that universities will provide the best possible on-campus learning environment for their specific needs. Facilities managers and schools of architecture want to provide students with the best possible physical learning environment. There is however, a knowledge gap between typical facilities design strategies on the one hand, and understanding of the needs and preferences of architecture students on the other. Previous studies have evaluated schools of architecture, both in terms of the quality of the curriculum of and the physical facilities in which the curriculum is implemented. None of the studies found, has attempted to find out what architecture students want of their learning environment. The 'learning environment' is considered here to be the setting in which the learner acts, and where learners meet, interact, and share experiences (Punie, 2007:191; Strange, 2000:20; Wilson, 1995:3). This broad construct includes several 'sub environments' such as academic, social, physical, and personal. This study focuses on the physical on-campus learning environment as it is experienced by students of architecture.

Institutions of higher learning understandably pay close attention to their academic standards and systems, but research indicates that these are often over-emphasised at the expense of the physical components of the learning environment (Gallifa & Batallé, 2010:158; Price *et al*, 2003:212; Salama, 2009b:37). A basic premise of this study is that the physical (or built) environment is inextricably linked to the academic, social, and personal environments and that it forms the all-encompassing stage for teaching and learning

activities. There is no lack of multidisciplinary research and support for the facilitation of teaching and optimising teachers' activities (cf. Brown, 2005:3). The facilitation of learning however, is often low down on policy makers' agendas and it should not be assumed that all those involved in its provision necessarily understand the importance of space and place. When designers and campus directors do not fully understand the importance of a holistic approach to evaluating student satisfaction, this imbalance often goes unnoticed.

It may be somewhat unfair to censure academic managers for failing to understand all the complexities of such an "intrinsically fuzzy and ill-defined" (Gruenewald, 2003:622) concept. Less forgivable is that the very professionals who aspire to improve the quality of the built environment - architects - should often have to learn their craft in poorly designed and maintained buildings. Unfortunately, as Clark and Maher (2005:1) observe, many designers of learning environments see rooms as places for teaching, but are unable to envisage them as places where learning is experienced. Bentham (2008:73) – with specific reference to teaching space – observes that when training professionals, it is important to "practice what we teach". Kolb (1981:252) agrees that "we must closely scrutinise any [teaching] strategy that requires students to do what we ourselves cannot or will not do".

Architecture is however not the only profession to overlook those needs that learners may have outside the boundaries of its sphere. Publications about 'learning environments' such as *Powerful learning environments: unravelling basic components and dimensions* (De Korte *et al*, 2003) make no mention of the physical space in which that learning takes place. Books on improving learning and the student experience (e.g. Upcraft *et al*, 2005) only mention it in passing. And even though research into the influence of the physical environment by adult educators, psychologists and architects has been steadily increasing, most teaching still takes place in classrooms that are poorly suited for learning (Graetz & Goliber, 2002:13). Many teachers adopt teaching approaches such as constructivism (see 'Definitions'), but do not adapt the physical environment to suit these new methods. Fortunately, some pedagogical theorists (for example Jankowska & Atlay, 2008:276;

Zandvliet & Buker, 2007:[sp]) are now starting to consider the physical environment to be one of the most important influences on effective learning (Fig. 1).

Rasila, Rathe & Kiroso (2010) have found that users experience buildings as “holistic entities” (*ibid*:143) that either hinder or help them in carrying out their tasks and activities. In other words, users do not separate the factors that influence how they experience their environment into categories such as social, technical, or virtual. If satisfaction lacks in one of these environments, it can negatively influence users’ overall perception of quality (*ibid*). Therefore, even though an institution may deliver excellent social and technical services, a poorly designed physical environment will negatively influence overall student satisfaction. Universities should therefore, as Price *et al* (2003:213) believe, treat physical facilities as having a distinct influence on the quality of the complete student experience and subject them to appropriate analysis. There are several instruments available for measuring student satisfaction variables: from the general such as SERVQUAL, the Noel-Levitz Student Satisfaction Inventory, and the Student Satisfaction Approach (SSA), to the building-specific such as Post Occupancy Evaluation (these are discussed in more detail in Chapter 2).

An initiative at the School of Architecture at the University of the Free State in South Africa, the ‘Centre for People and Building (South Africa)’ (CfPB-SA) set out to “initiate and undertake research pertaining to person-environment issues” and also to “sensitise students of architecture to the potential benefits thereof to the architectural and Facility Management (FM) professions” (le Roux, 2009:68). Unfortunately this initiative did not

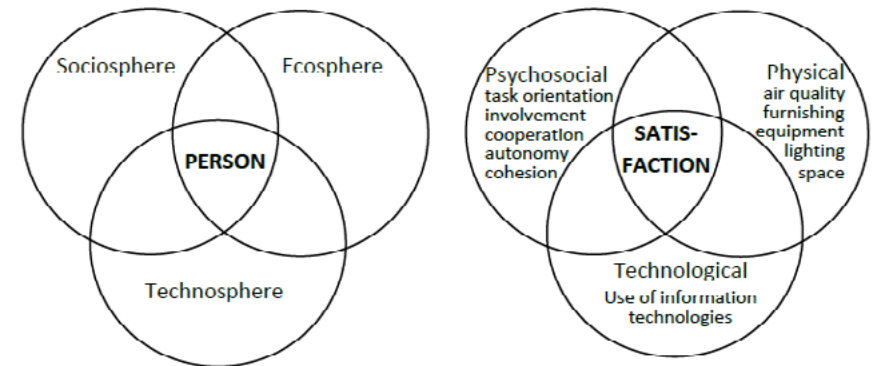


Figure 1: The person as the core of the learning environment; and Figure 1b: Satisfaction at the core of environmental factors (After Zandvliet & Buker, 2007:[sp]).

bear long term fruition. Apart from this unsuccessful project, no evaluation programs have been implemented (or published) at South African schools of architecture.

1.2 PROBLEM STATEMENT

University campuses in general and the premises of schools of architecture in particular are often poorly designed, or even downright unpleasant, places for learning. The student survey at four architecture schools in South Africa (Fig. 2 – Fig. 5) largely supports this observation. It is not surprising then, that to the chagrin of their studio masters, architecture students are avoiding the use of unsatisfactory on-campus resources. Students attend formal teaching activities when those are on the timetable and “vote with their feet” (Duggan, 2004:71) at other times.



Figure 2: Tightly packed first year studio, UA
(Author, 29.11.2011)



Figure 3: First year studio, UB
(A Janse van Rensburg, 12.02.2012)



Figure 4: Fourth year studio, UC
(P. Tumubweinee, 22.08.2012)



Figure 5: Over crowded mixed studio, UD
(Author, 19.11.2011)

Numerous studies (e.g. Blythe & Gilby, 2006; Duggan, 2004; Kasim & Dzakiria, 2011; Riley, Kokkarinen & Pitt, 2010) show a link between the learning environment and academic success. This is arguably even more so for professional courses with their “entailed narcissistic identities” (Moore, 2000:198), that require learners to become socialised to the particular norms of their field, and develop a professional identity (Kolb, 1981:233; Pearson, 2003:102). Kolb (1981:233) also found that specific disciplines have particular learning tasks, technologies, products, criteria for academic excellence and productivity, teaching methods, research methods, and methods for recording and portraying knowledge. Kolb’s (*ibid.*) findings are supported by Tucker (2007) who studied the particular learning styles of students in the built environment disciplines. Tucker’s (*ibid.*) research indicates that over time, learning styles adapt to the requirements of the chosen discipline. This indicates that as students become more acculturated to the particularities of their field they will have more specific, discipline-related requirements of their learning environment.

From the above, it can be extrapolated that students in professional disciplines such as architecture have particular requirements of their learning environment. Despite the well known link between learning place and academic success, and the special requirements of students, schools of architecture do not appear to consistently provide suitable learning environments. One reason could be that, as Fulton (1992:2) comments, that much of adult education happens in places that have been designed for other activities, or even in spaces more suited to teaching children. In HE institutions, learning is very often expected to take place in spaces generically designed for “education”, not for discipline-specific education. The ideal learning place is clearly a finely balanced combination of physical and psychological attributes that requires the full support of the institutional organisation. Weaver (2006:118) makes the point that implementing the activities, infrastructure, and cross-disciplinary collaboration needed to support new learning theories requires “a massive cultural change for any organisation”. Existing organisational or disciplinary tradition should be respected but not revered (i.e. it should not be considered sacred or unchangeable) to the point of preventing adaptation to new circumstances (du Toit, 2003:28). Duggan (2004:75) calls for “less talk about the ‘way it was’, or ‘the way it is’, and more about ‘the way we think it could be’” (emphasis in original).

Many studies have also examined occupant satisfaction with educational buildings and even individual schools of architecture (e.g. Nasar *et al*, 2007; Vital Signs Project, 1998; Zimring, 1983), and yet school facilities and designs still do not satisfy their users. The result is that architecture students who often spend very long hours in their university design studios, are expected to do so under much less than ideal conditions. Consider for example, evaluations of the Aronoff Centre for Design, Architecture and Planning (DAAP) (architect Peter Eisenman, 1996). These studies were done both by its own occupants (The Vital Signs project, 1998) and by independent evaluators (Nasar, Preiser & Fisher, 2007), and the results have generally not been positive.

The Vital Signs project (*ibid.*) reports that when users were asked ‘As a student has the building influenced your work or creative process?’ results were Yes: 65%, No: 35%. This seems a positive response, until the reason is given: “It gives me examples of what not to do if I want to design something for people.” When asked to describe in one word the way the building makes them feel, users respond with: trapped, disappointing, inconsiderate, temporary, experimental, lost, conflict, intriguing, ripped off, engaging, crazy, creative, sick, inspiring, demanding, confusing.

The structure of architectural studies demand enormous dedication and sacrifice from students. While schools of architecture cannot influence the over-arching learning environment of their students, they should endeavour to provide the best possible on-campus learning environment. Many schools of architecture provide spaces that are well ventilated, well lit, and equipped with comfortable and suitable furniture and infrastructure. Many, unfortunately, do not. Law (2010:250) makes the salient observation that while institutions often conduct performance surveys, these are usually with the view of meeting demands by external bodies such as accreditation boards; seldom are they driven by academic considerations or student needs. It is only at the “lower” organisational levels of schools and even class groups where the quality indicators change to softer, more student-centred attributes (*ibid*:251). Unless they ask the opinion of students about the quality and important attributes of a learning environment, and then strategically respond to the results, schools cannot provide the learning environment that their students deserve.

1.3 RESEARCH GOAL AND OBJECTIVES

Calls for the knowledge generated through this research project are found in many texts (e.g. Forsyth, 2008; Lützkendorf *et al*, 2005; Narum, 2004; Nasar *et al*, 2007). Langdon (in Nasar *et al*, 2007:xvi) asks “[w]hat should architectural school buildings be? How do we evaluate such buildings?”, and Forsyth (2008:20) asks “What kinds of information are useful in improving program quality?”. This study is an attempt to answer those questions, even if only in part, by teasing out the needs of students.

It is proposed that to answer Langdon’s (*ibid.*) first question – what should the building be? – researchers must ask architecture students what they consider important in their school environment. To answer his second question – how do we evaluate such buildings? – researchers need a specialised data-collection instrument that can measure the quality of the learning environment. Zimring *et al* (2010:[sp]) believe that “in the cases where [Building Performance Evaluation (BPE)] researchers want to reflect a desire to make tight, unequivocal, scientific arguments, and have as much control as possible in a real life situation, they [have to] use field experiments, rather than ... laboratory ones”. Unfortunately, they (*ibid.*) point out, performance evaluation methods often lack significant experimental controls during the data-collection stages even if field data can be tested for compliance in a laboratory for more technically focussed BPE/POEs.

Nasar *et al* (2007:7) found that economic and environmental constraints cause some of the problems encountered in schools of architecture, but also that many are the result of indifference, lack of concern, or lack of knowledge on the part of decision makers and even architects. Many designers do not realise that the intentions of designers and the needs of learners are often not compatible, or as Salama (2008:109) puts it, that “the common sense of the architect is not the common sense of the user”. Such design mistakes, claim Nasar *et al* (2007:33), is in part because of a lack of systematic documentation of user responses to buildings. To stay the proliferation of unsuitable and even unusable educational buildings, (Biemiller, 2008; Fisher, 2008; Greenberg, 2007; Lau & Yang, 2009; Miller, 2004; Salama, 2009a), designers should familiarise themselves with the needs and views of the current

cohort of learners (Miller, 2004:2; Oblinger, 2005:15). Periodic self-assessment to understand the particular needs of their student body (Angell, Heffernan & Megicks, 2008:237) can therefore be an effective strategy to prevent a sense of hubris. Narum (2004:62) believes that campus leaders too can better plan for student needs if they know who the students are, what direction their learning is taking, how they learn, and where that learning takes place. By implementing “a more comprehensive standardised and universal methodology” (Lützkendorf *et al*, 2005:61) of building performance evaluation and user satisfaction analysis, this goal can be achieved. It is a goal of this study to facilitate such processes.

It can be argued that making strategic decisions based purely on ‘subjective’ or relatively short term student needs and priorities can lead to overreaction and the misapplication of resources; and that benchmarking should be included in the evaluation process. National satisfaction-priorities benchmark surveys such as the Noel-Levitz Student Satisfaction Inventory in the US and the Student Satisfaction Approach (SSA) in the UK, offer institutions the opportunity to reliably benchmark their own performance against that of others. Noel-Levitz (2011:1) point out that such external surveys are most beneficial when they are combined with regular, systematic institutional self-assessment. By developing both global and internal benchmarks, schools of architecture can focus their resources and initiatives more precisely to improve learning outcomes and student life. Longitudinal benchmarking is also a valuable indicator of the success of survey-based management decisions (Kane *et al*, 2008:138). The evaluation instrument developed and tested in this study can be used as such a benchmarking tool.

Rasila *et al* (2010:151), after an intense study of usability assessment in the built environment (including educational buildings), comment that “[a]n interesting next step would be to construct a questionnaire and to test [its] categories quantitatively in order to gain a more generalisable understanding of the phenomena in question”. The data gathered through this study can be implemented with good effect for as Narum (2004:63) points out; we cannot hope to improve the learning environment if most plans for solving problems are based on anecdotal evidence about what makes the best learning environment.

It is obvious that every school will have unique attributes¹ to be assessed in addition to those that are common to the majority. A research instrument to be used unchanged at many different schools can either only address generic attributes or become so unwieldy as to be impossible to administer. The more pragmatic aim is therefore to identify those attributes that are most important, and / or least satisfactorily addressed at the majority of schools for inclusion in one, commonly used core. Individual schools can add additional attributes that they specifically want to evaluate.

Importance-Performance Analysis (IPA) is proposed as the most suitable tool to interpret and report the outcomes of on-site evaluations. IPA is explained in more detail in 1.4: Research methodology.

There are admittedly many influences on student success, but isolating one aspect – the physical environment – does not imply that others (e.g. quality of teaching, the curriculum) are somehow less important or even unimportant. It is not possible to assess all these complex attributes in one questionnaire and attempting to do so would be unlikely to deliver useful results. Knight (2002:11) for example points out that research on the influences on academic performance delivers mixed results, and the overall influence of the school environment on individual students is probably no more than 10%. This conundrum is directly addressed in the Vital Signs Project (1998). The students conducting a building evaluation of the Aronoff Center at the University of Cincinnati recognised that “architecture is often greater than the sum of its separate parts” and that context influences the outcomes of any evaluation. (For a detailed discussion of the Vital Signs Project, refer to 2.6.1 Case study 2.)

The variations in the influences on service provision and user satisfaction are so great, that it is practically impossible to know exactly what makes the “best” schools so, and how individual schools can be changed to resemble these paragons. This is however not seen as a reason why the current study cannot isolate one part of the whole and place it under a magnifying glass to introduce a little bit more insight into a vast and complex field of

1 There are several alternative terms that apply to this construct - some researchers prefer ‘variables’, others refer to ‘assessment criteria’. In this document, the term ‘attributes’ is generally used and incorporate those terms.

study. This study does not aim to solve the above problems on a global scale, or produce the “universal methodology” (and it is argued that such a thing is not possible) called for by Lützkendorf *et al (ibid.)*. It does aim to make the architectural academic community aware of the issues that influence the satisfaction and thus the performance of its students.

1.4 RESEARCH METHODOLOGY

This study aims to test whether combining Post Occupancy Evaluation (POE) and Importance-Performance Analysis (IPA) is a suitable method for devising strategic decision-making interventions by architecture schools. POE is a tool used to evaluate the quality of a given built environment from the point of view of its users. Importance-Performance Analysis is easily integrated with POE, by also gathering data on the importance of variables. The outcomes of the evaluation process is then presented in an I-P matrix (*Fig. 7*). Many methods of Building Performance Evaluation (BPE), including Post Occupancy Evaluation, have been implemented at schools of architecture (these are discussed in detail in Chapters 2 and 3). Importance-Performance Analysis has been used as a method of reporting research outcomes in many fields, including that of BPE. No precedent was however found for combining these methodologies to assess the physical environments of schools of architecture.

As these methodologies appear to be complimentary, this study set out to test a combined POE and IPA evaluation method, in the field. The standard approach to POE was adapted to obtain the opinions of architecture students on 1) which attributes of the on-campus learning environment are important to them (Importance), and 2) their satisfaction with how well the institution provides those requirements (Performance).

For the sake of simplifying data gathering and analysis, satisfaction- and importance ratings were gathered using one questionnaire. Respondents were asked to rate an attribute both in terms of satisfaction with service provision, and the importance they attach to that attribute. The questionnaire was administered to third or fourth year students at four South African schools of architecture (labelled UA, UB, UC, and UD). Students in their third or fourth year of study were selected as participants because they are familiar with their

physical school premises as well as the functional and spatial attributes that architecture students require to perform successfully. Students in the first or second years of study are less familiar with the learning environment and may not respond with the same richness of information, particularly in open-ended qualitative questions. Students in masters programs are less readily accessible in groups for the administering of surveys, and may not provide large enough samples to ensure valid data.

The questionnaires for each institution are attached as Annexures B2 - B4. Based on an analysis of feedback, revisions were made to the questionnaire between implementations in an effort to fine-tune the instrument - the research process was therefore interactive and incremental (see Fig. 6).

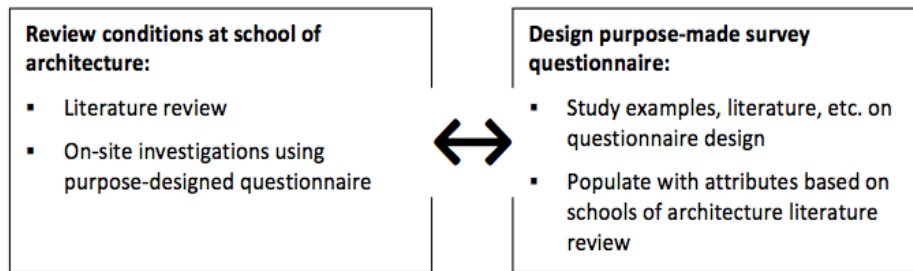


Figure 6: Interactive nature of the research process

The questionnaire data were captured and analysed using Microsoft Excel 2010, with the add-on feature 'Data Analysis Tools' enabled. The PASW / SPSS 18 software program was also assessed for its suitability but as Excel proved to be suitable for the analysis, the much more powerful but also much more complex PASW / SPSS program was not implemented in the final analysis process. The outcomes of the analysis are presented in various formats, the most significant of which is the I-P matrix (Fig. 7).

IPA was first proposed as a method of assessing user feedback by Martilla and James, in 1977. According to them, IPA is a simple, intuitive, and effective method used to interpret and demonstrate customer satisfaction and priorities. This information is then used to develop a response strategy (Bacon, 2003:55; Huan & Beaman, 2005). Data pairs are plotted

on a four-quadrant I-P grid (Fig. 7). Should an attribute be rated as well provided for but not very important, then the institution need not spend additional resources on this. Should it however show to be an important attribute that is poorly provided for, the institution can achieve strategic results by responding to this shortcoming.

IPA methods have been empirically researched (e.g. Arbore & Busacca, 2011; Bacon, 2003; Iacovidoua, Gibbs & Zopiatis, 2009; O'Neill & Palmer, 2004; Preiser, 2002; Preiser & Nasar, 2008) and applied in a wide range of contexts, including assessing the quality of service delivery at institutions of higher learning (Kasim & Dzakiria, 2001; Silva & Fernandes, 2010).

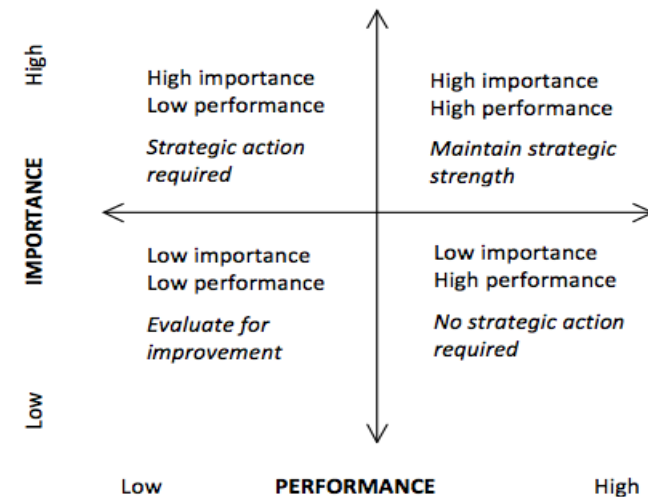


Figure 7: Principles of the IP matrix (after Martilla & James, 1977)

1.5 RESEARCH SCOPE AND LIMITATIONS

To achieve the intended outcomes of this study, it was necessary to aggregate and compare data about the on-campus needs of architecture students from different schools. The study did not attempt to compare or rank schools based on student responses. All comparisons were done to analyse patterns, similarities and differences between institutional results, and not to compare the facilities provided by the four schools of architecture.

Primary stakeholders

Each stakeholder group in the university community has its own unique set of demands and priorities. It was important to clarify exactly which group this particular project aims to serve, as this drove critical decisions about the research process and methodology. In the complex process of designing, providing, and managing learning environments, decisions are made by architects, educationalists, and HE institutions. These entities are often assumed to know what is “best” practice in their fields of influence and responsibility. However, as Gallifa and Batallé (2010:157) rightly remark, “discovering student perceptions of quality may be a quest”. This study focused specifically on the opinions of students of architecture, and not those of their teachers, and/or other stakeholders in the academic environment.

Some POE studies, for example that by Tanyer and Pembegül (2010) and the Commission for Architecture and the Built Environment (CABE) study (2005) include multiple user groups of their target facility. After a fire destroyed the building of the Delft school of architecture in 2008 however, Gorgievsky *et al* (2010) conducted a Post Occupancy Evaluation only of the spatial facilities of the school staff, and not of the student spaces. Kasim and Dzakiria (2011) have however identified a critical knowledge gap, which is that “[o]nly a few studies actually [try] to understand the minds of young adults in [the] context of Institutes of Higher Learning in relation to the quality of university services.” This study addresses that omission.

The setting

It is generally accepted, that the critical elements of a learning environment are learners, and the settings in which they meet and interact, and share experiences. These two aspects:

the physical and the social (Weaver, 2006:112) therefore exist in a dynamic, dialectical link (Fig. 8). An important aspect of the study of social learning is that with the advent of social networking systems, interaction is becoming less anchored to physical space (Gieryn, 2000:463). Wahlstedt *et al* (2008:1029) however believe that because learning is a social and not an individual process, successful online learning places must have the characteristics of popular (physical) social spaces. O’Connor and Bennett (2005:28) compare online learning to raising a child online and believe that only a complete immersion in the learning environment can prevent learning from becoming dull, fragmented, one-at-a-time lessons. Formal and informal learning spaces are generally to be found on or relatively close to the campus, but virtual learning takes place away from the campus.

Thus, while the role of virtual learning is increasing and likely to play a very large part in architectural education in future. At this time however, architectural education is still largely studio-based. As O’Connor and Bennett (2005:29) observe, “the actual physicality of campus life still has no satisfactory substitutes”. Research on virtual teaching and learning in the field will no doubt become the topic of interesting research in the near future. As this project focuses on the physical campus--based learning environment, the virtual domain was not included in the ambit of this project.

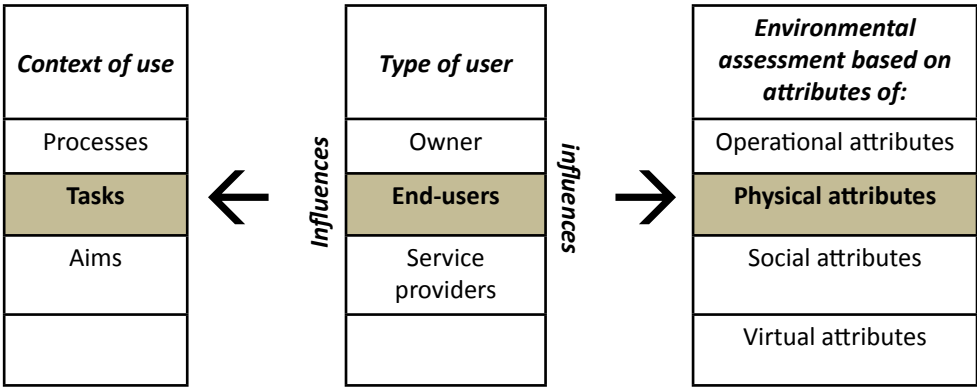


Figure 8: The relationship between context, user, and attributes to be assessed.

1.6 RESEARCH DELIVERABLES

This study had two main objectives: first, to build on and contribute to multi- and interdisciplinary studies into POE. POE has been extensively studied and thoroughly tested in the field in the context of *inter alia* architecture (Nasar *et al*, 2007; Salama, 2009a; Tanyer & Pembegül, 2010), market analysis (Arbore & Busacca, 2011; Preiser, 2002; Preiser & Nasar, 2008), geography (Kraftl & Adey, 2008), education (Spooner, 2008) and environmental psychology (Bechtel, 1996). The second goal was to expand the traditional scope of application of IPA in the HE environment from reporting on student satisfaction with the ‘soft’ service environment (O’Neill & Palmer, 2004; Silva & Fernandes, 2010) to also reporting on the physical learning environment.

The built environment has been proven to either hinder, or help teacher and learner interaction (Graetz & Goliber, 2002:15; Roberts *et al*, 2008:49) and therefore facilities management at HE institutions is becoming part of the overall learning delivery system (Weaver, 2006:110). A somewhat gloomy picture emerges when the quality of the physical learning environment of some schools of architecture are evaluated. This study, through the experimental implementation of the data collection instrument, tested which attributes the students at four South African schools of architecture prefer and require of their on-campus learning environment. Their satisfaction with the service delivered by the institution (‘Performance’) was also compared to the relative ‘Importance’ of the attributes. From this research, a generic template was developed (Annexure H). Widespread application of such a template can result in a central database of student needs and the quality of facilities in South African schools of architecture. As IPA has been proven successful as a tool in strategic facilities management, this can potentially result in both general and specific improvements in the service delivered by those schools.

Survey-based methods can be used to conduct various types of studies, as outlined by Reardon (2006:7-8): a cross sectional study, sometimes described as a ‘snapshot’, is used to gather data about a particular sample group at a particular point in time. A series of such cross sectional studies can form a ‘longitudinal study’ on the changing trends and opinions of a specific group (for example third year students) over time. Longitudinal studies are also used for following the progress of a student cohort (for example the first year group of

2011). “Service quality” according to Yeo (2008:281) “is a continuous pursuit where expectations and perceptions are likely to change with context and time”. Longitudinal studies can help schools to keep their finger on the pulse of these changes. Such studies can focus on one cohort within one institution as they progress through a particular programme, or the study can be expanded to other institutions for purposes of comparison.

Price *et al* (2003:214), admittedly in an ageing study, found the results of studies to be “patchy” and in particular, that no published studies draw institution-specific comparisons. To remedy this situation, the research instrument developed in this study can be used to gather wide-ranging and rich data in a consistent and therefore comparable format (see for example, the template developed by Nasar *et al*, 2007).

A secondary result of the implementation of Importance-Performance Analysis at schools of architecture may be that such schools become sensitised to the importance of self-assessment and include it as part of the curriculum. Salama (2009a:83) has for example found evidence that much of the literature published on POE is being written by staff and students. Figure 9 shows a web-published student evaluation of use patterns of the elevator in the Florida A&M University School of Architecture (FAMU SoA) building (the original web page is no longer accessible). Another example is the Vital Signs Project (1998) at the Aronoff Center at the University of Cincinnati.

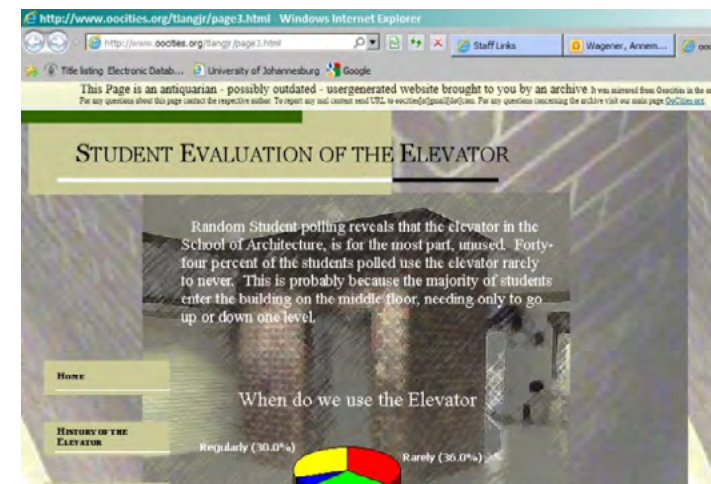


Figure 9: Student POE of lift use in the School of Architecture, Florida A&M University (www.oocities.org/tlangjr/)

1.7 CHAPTER OVERVIEW

Chapter 1 presented the research problem and the context within which it occurs. The role of the university and schools of architecture as responsive service providers was discussed. The research goal was outlined, and Post Occupancy Evaluation (POE) was proposed as an effective method of data collection. Importance-Performance Analysis was then presented as the selected method for the interpretation and presentation of POE results, and its value in strategic planning illustrated. The research method, limitations, and scope of the study were outlined. The role of the on-campus learning environment in academic success and student satisfaction was reviewed, and the importance of identifying and measuring quality criteria was reinforced. Finally, the proposed instrument to assist schools of architecture to optimise the performance of its environment was outlined.

Chapter 2: Literature Review, comprises an overview of the literature on spaces and places in which learning takes place, followed by a review of the preferred attributes of an on-campus learning environment for students of architecture. The impact of physical design on the quality of places of learning is reinforced; debates in the field are addressed; and the principles of Post Occupancy Evaluation and Importance-Performance Analysis are illustrated with the use of precedent studies. Finally, criticism of IPA and alternative models are reviewed before it is concluded that despite some shortcomings, POE and IPA are suitable instruments for achieving the goals of this study.

Chapter 3: Methodology, outlines the process of designing a questionnaire. The reasons for selecting focus group discussions and a literature review as the primary methods for development of the questionnaire are explained, and methods of collecting the appropriate quality attributes for use in the questionnaire are reviewed. The complexities of designing a good questionnaire are explained and strategies to avoid design mistakes that can result in poor data, discussed. The Association of University Directors of Estates (AUDE) questionnaire (Blythe & Gilbey, 2006), and the 'Lessons Learned' questionnaire (Nasar *et al*, 2007) are analysed and assessed for use as a template. Finally, the process of designing the data collection instrument is outlined, including the implementation of a pilot study.

Chapter 4: Results, Reports, and Discussions, discusses the implementation of the questionnaire/s at the four schools of architecture selected for evaluation. First, an overview of the data is presented, followed by an in-depth analysis of each case study. Conclusions are 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.

Chapter 5: Summary and conclusions, reviews what the study did, and did not set out to prove. It explains that the study intended to prove that using Post Occupancy Evaluation and Importance Analysis can be successfully used to systematically collect, process and report data with the aim of generating useful knowledge. It reinforces that the study did not aim to solve problems at schools of architecture on a global scale, or produce a universal methodology of assessment. The chapter also outlines some shortcomings and potential benefits of the study outcomes. Finally, it is concluded that despite shortcomings, the study has proven what it set out to prove, and has therefore succeeded in its goal.

Annexures A and F present the pilot study and questionnaire development process; Annexures B are the questionnaires implemented during the data gathering and field work process; C- E are examples of BPE studies in use in contexts similar to those of this study; G1 and G2 contain the raw quantitative and qualitative data gathered in the field; and Annexure H is the final proposed questionnaire for future IPA studies at South African schools of architecture.

2 Literature Review

2.1 Chapter overview

2.2 Learning space

2.3 The need for performance evaluation of school of architecture buildings

2.4 The preferred attributes of an on-campus learning environment

2.4.1 Interior layout and spaces

2.4.2 External appearance and positioning

2.4.3 Indoor environmental conditions

2.4.4 Infrastructure and finishes

2.4.5 Access, signage and way finding

2.4.6 Space- and time management: legend or myth?

2.5 Debates in the field

2.5.1 Boot camp or school of architecture?

2.5.2 The 'tyranny of the masses'?

2.5.3 The value of rating systems

2.6 Data collection: Building Performance Evaluation

2.6.1 Post Occupancy Evaluation

2.6.2 Importance-Performance Analysis

2.7 Data analysis: Disconfirmation theory

2.8 Chapter summary



Second year architecture studio, Crown Hall, Illinois Institute of Technology.
Ludwig Mies van der Rohe, 1956

(www.acsa100.org/bookcontent.html/)

CHAPTER 2: LITERATURE REVIEW

2.1 CHAPTER OVERVIEW

Conducting this study required both desktop, and empirical research. The desktop research is represented in this literature review. The review is organised into four sections: the first, 'Learning space, is an overview of the principles of 'space' and 'place' as they relate to places of learning; the second is 'The attributes of an on-campus learning environment for students of architecture' and is organised according to the framework of the survey questionnaire (Annexures A1 – B4, & H). The third and fourth sections address the theories, methods, and implementation of Building Performance Evaluation (BPE) models. The implementation of Post Occupancy Evaluation and Importance-Performance Analysis are illustrated with the use of significant examples and case studies. The outcomes of the quantitative research is illustrated with graphs and tables in Chapter 4.

2.2 LEARNING SPACE

Published literature in the field of quality assurance shows that adopting a learner-centred approach to service- and teaching practices is now a priority at many higher education (HE) institutions. The literature also indicates that the majority of research and resource applications are directed towards improving 'soft' services such as student applications and registration, but that relatively little attention is paid to finding out how physical spaces should be designed and adapted to support such practices. Yeo (2008:279) makes the point that learning in HE goes beyond the confines of the classroom, and that all those places where social interaction takes place, from laboratories to cafeterias, ought to be considered when researching learning spaces. The idea of place is so integrated in the general concept of learning that, as O'Connor and Bennett (2005:29) comment, even those learners who do not attend a physical campus, refer to their learning process as "going to college".

Researchers are beginning to pay attention to the features of the physical learning space in an effort to understand the complex relationships between learners, the environment and

learning outcomes (Oblinger, 2005). Burns (2001:4) believes that "the physical design of the campus makes a fundamental contribution to the pursuit of academic excellence". Kolb and Kolb (2005a:205) agree about the value of space-user interaction: "To fully develop the whole person requires an educational culture that promotes diverse learning spaces and locomotion among them". Unfortunately, administrators and policy makers often have little professional understanding of the psychological importance of place and even though the quality of physical facilities makes a "non-trivial, manageable contribut[ion] to educational outcomes" (Roberts *et al*, 2008:48), it receives much less attention than curricular design and teacher preparation (Graetz & Goliber, 2002:15).

Researchers disagree on the level of importance that learners place on their physical environment – Temple (2008:233) for example surmises that it may be important, but "only to a modest extent". There is however, a strong body of work which proves that it is indeed important (cf. Acker & Miller, 2005; Burns, 2001; Oblinger, 2005; Myrick, [sa]; Misencik *et al*, 2005). To address the rapid change in technology and shifts in pedagogical theories today and to anticipate significant changes in the future, institutions are exploring flexible and adaptable approaches to learning spaces.

The life span of technologies, student cohorts, and academic curricula are much shorter than those of the buildings that house them. Those concerned with the making of learning places must plan well and make the most of any opportunities for improvement because the opportunity to make a learning place from scratch – through either new construction or extensive renovation – is particularly scarce (MacPhee, 2007:1; Miller, 2009:5). Considering this, and the cost and time related to construction, there is little room for mistakes by designers (Oblinger, 2005:15). The fact that some studies (cf. Derrick, 2003:5; Kolb & Kolb, 2005a:193; 2005b, slide 13 notes; Misencik *et al*, 2005:16; Temple, 2008) are inconclusive, should not encourage, and not discourage further research or experimentation by designers and educators alike. Planning mistakes are usually the result of budget and time constraints,

space limitations, and a failure to anticipate future usage (MacPhee, 2009:1). An integral part of the design and construction process should be ongoing formative assessment in the form of reviewing the goal (“How does this improve learning?”), and summative assessment (“Has the goal been successfully achieved?”) (Miller, 2009:3).

New experiences expose young adult learners to new environments, many of which seek to acculturate them into particular ways of thinking and acting. While some of these environments may encourage the seeking of knowledge and of learning, the university is the only one of those environments that seeks to inculcate a personal culture of academic learning. The importance of acculturating students to the academic learning environment has been touched upon in the Introduction. Institutional culture is a complex mix of physical, social, and historical context, and management- and support structures, and Salama (2009b:37) warns against the dangers of oversimplifying its dynamics and importance. Organisations such as architecture schools maintain their culture by acculturating its members to its established ways (O’Connor & Bennett, 2005:29) through traditions such as the design studio. The concept of architecture as “space for human activities” (Atmodiwirjo & Andri Yatmo, 2004), and an environment created by buildings is universally accepted by architects.

Whose space is it anyway?

Anthropometrics and ergonomics form an important part of architects’ studies, and yet seldom translate into suitable learning space design. Even if a vast amount of planning and preparation is made, this has no advantage if it is not realised in the physical structure. The impact of physical design on qualitative attributes such as ambience and atmosphere in places of learning is also often underestimated, and architects sometimes over emphasise “architecture” to the detriment of “learning place”. Salama (2009a:86) refers to “a dramatic gap between [architectural expression and user expectations], and Price *et al* (2003:213) to “a wide (and unbridged!) gulf between the architectural and pedagogical approaches”. Salama (2009a:83) believes that such inconsistencies exist because many critiques of architectural projects are essentially superficial, based on the architect’s statement of intent and on form-giving, symbolism, and aesthetic qualities and not on how well they

perform or how well the needs of the building users are met in practice. See for example, this comment by Treib (2012, in print) on Mies van der Rohe’s (1956) building for the school of architecture at the Illinois Institute of Technology (Fig. 10 - 13):

Like most open multi-use spaces, Crown Hall was not without problems. Always on view, students were troubled by the effects of living in a fishbowl, the constant effort required to keep their workplaces tidy, and the lack of vertical surfaces for pinups and other personal use. Order was demanded by both the education to which they submitted themselves and by the architecture itself. Noise from simultaneous reviews, or even normal class instruction, permeated from the lower floor up. No less problematic was heat gain in the warm months—a complaint common in many subsequent buildings by Mies. *Yet as a definitive pedagogical vision and statement about space and structure, the building could hardly be faulted* [emphasis added].

In addition to the ubiquitous shortage of pinup space, the problem of privacy seems to be common at “famous” schools of architecture. An M.Arch student using the open-plan studios in Harvard University’s John Gund Hall comments widely on his blog about the new furniture provided in 2010. Not only is there now less space per student, but the new lower partitions results in “most people lament[ing] the loss of privacy. With large groups of tourists snapping photos in the trays at least a couple times a week, we may as well be starring in our own reality TV show” (see Fig. 37b, where a GSD student has constructed a roof over a workstation) (Chang, 2010:[sp]). The provision of a space which causes severe discomfort in its users is highly questionable at any time, but in a school of architecture this is unacceptable. A loss of privacy – what Nasar *et al* (2007:82) call “[a loss of] access to one’s self” has negative effects and can even result in students dropping out.

The concept of three-dimensional space is easy for architects to conceive. Designers of learning places should however as part of the design process, be open to the input of other disciplines. Designers who understand those factors that turn ‘space’ into learning ‘place’ for its intended users, can connect architecture to context and ensure that buildings are responsive to the needs of its users (Clark & Maher, 2005:2). Jorstad (2009) advise designers to find out how teachers teach and what they need to do so effectively. While even the most inexperienced of teachers can easily tell whether a space supports their teaching needs, points out Miller (2004:6), architects seldom consider asking their fellow professionals’

opinions. Geo-phenomenologists Hung, Stables and Bonnet (2008:9) propose that learners “should be encouraged to sense, feel, perceive, conceive, speculate, imagine school and thereby act and create in and towards it through as many kinds of experience as possible”.

The design studio as “the heartbeat of the school”

Across the world, architectural pedagogy is remarkably consistent in its belief in the centrality of the design studio in teaching delivery (Beisi, 2006:20; Clark & Maher, 2005; Duggan, 2004:71; Habraken, 2006:18; Kvan, 2000; Salama, 2008:102). Ahrentzen and Anthony (1993:16) consider the studio the “pulse” of any school of architecture. Despite this, teachers of architecture often complain about an unsatisfactory school “studio culture”, and that students do not spend enough time working in the school studios (Duggan, 2004:72). “Studio” in architecture school parlance, refers to both the educational activity and the space in which it takes place and its use is so ubiquitous that the true meaning of the construct may sometimes be lost. The section on “Studios”, in the Vital Signs Project on the Aronoff Centre at the University of Ohio states that:

The studios are probably the most important spaces within the College of Design, Architecture, Art, and Planning [DAAP]. When building the Aronoff Center for Design and Art addition to the DAAP complex, not only were additional studios provided but also most of the existing studios were also partially renovated. This effort was intended to establish “homes” for the numerous students who spend the majority of their time at school in their studios. The studios should contain basic needs of a “home” along with the requirements of an art and/or design studio. *The*

studio needs to be spacious, providing an atmosphere that is conducive to interaction among students, while offering a personal work space. Territorially [sic] is an important issue in studios. One’s supplies and projects must be respected and protected [emphasis added].

The American Institute of Architecture Students defines ‘studio culture’ as “the experiences, behaviours, habits and patterns found within the campus-based architecture design studio” (AIAS, 2010). Expecting of students to change their habits and behaviour without first changing their experiences in the studio is unlikely to have the desired results. Duggan (2004:75) believes that “[d]ata, imagination and courage are often ‘all’ that is needed” (quotes added) to provide for the specific and changing needs of students.

Architectural education is particularly resource-hungry of both teaching hours and workspace (Duggan, 2004:71). To fully develop their learning skills, students need to move between “diverse learning spaces” (Kolb & Kolb (2005a:205). These ‘learning spaces’ can be framed as both methodological (ways of teaching and learning) and physical (the physical attributes of the learning place).

The design studio as “the sacred cow of architectural education”

There is a danger that teachers of architecture may consider themselves such experts in the design of spaces, that they do not open themselves to be influenced in their own use of teaching space. Traditional studio practice still conforms to the beliefs of Alexander *et al* (1977:414-5), that work spaces are best configured when they “organize work around

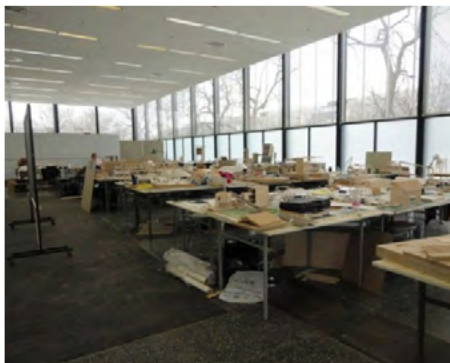


Figure 10: Studio, Crown Hall, 2011 (www.flickr.com)

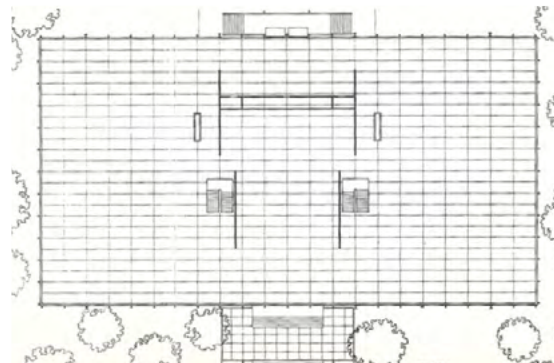


Figure 11: Floor plan, Crown Hall, IIT (<http://sdrdesign.com/crownHall2.jpg>)



Figure 12: Mies van der Rohe with model of Crown Hall, IIT (www.acsa100.org/bookcontent.html)



Figure 13: Second year studio, Crown Hall, 1956 (www.acsa100.org/bookcontent.html)

a tradition of masters and apprentices and support this form of social organization with a division of the workplace into spatial clusters – one for each master and his [sic] apprentices – where they can work and meet together”. Consider for example, the term ‘*studio master*’, typically used to describe academic staff who facilitate studio learning activities.

Despite this tradition, support for the traditional design studio as the only format for architectural education is not universal. Alexander *et al*’s (*ibid.*) approach, while acknowledging the importance of group learning, was contrary even to concurrently developing pedagogical theory (for example on communities of learning). In the early 1980s, organisational analyst Chris Argyris identified the “mastery-mystery” approach of some studio masters as the underlying reason for why learners struggle to understand the ideas and theories behind design decisions (Ahrentzen & Anthony, 1993:16). Habraken (2006:18) refers to the design studio as the “sacred cow of architectural education” and a growing group of theorists (e.g. Ahrentzen & Anthony, 1993; Beisi, 2006; Clark & Maher, 2005:2; Kvan, 2000) are lobbying for the development of alternative, more diverse, and inclusive teaching methodologies that take place in more supportive environments. Figures 10 and 13 illustrate the change in studio culture at the school of architecture at IIT.

2.3 BUILDING PERFORMANCE EVALUATION OF ARCHITECTURE SCHOOL BUILDINGS

It seems natural to assume that architecture schools, so often ‘landmark’ buildings on campuses, function as impressively as educational buildings as they do as architectural icons. The phenomenon of designing such schools with users’ specific needs in mind is unfortunately unusual (Nasar *et al*, 2007:184) and poor design is not only tolerated (Fisher, 2008:19), but also perpetuated (Nasar *et al*, 2007; Salama, 2009a; Fisher, 2008; Lau & Yang, 2009). Good architects understand the importance of school culture (Salama, 2009b:37) and consider the dynamics of a particular school as part of the design process. Unfortunately well-meant aims often become entangled with those of the profession at large, the institutional hierarchy or ultimately, with financial constraints. The result may even be a strong architectural statement that is lauded by professionals – and loathed by

students. A case in point, is the Yale School of Art and Architecture (Fig. 14a), designed by Paul Rudolph and opened in 1963:

This “Brutalist pile” is “[w]ithout question ... an icon of the Modern movement, a place, a site, that remains awash in sentiment for all those driven spirits who, at the outset of their careers, toiled within its concrete warren. To listen to some of them, you would think that it incarnated nothing less than the spirit of Architecture itself” Gardner, 2008:[sp]).

This somewhat backhanded compliment may leave some doubt about public and even professional opinion of the building, but Ouroussoff (2008:sp) unequivocally states that:

It is hard to think of a building that has suffered through more indignities than the Yale School of Art and Architecture. On the day of its dedication in 1963, the architectural historian Nikolaus Pevsner condemned the oppressive monumentality of its concrete forms. Two years later the school’s dean brutally cut up many of the interiors, which he claimed were dysfunctional. A few years after that a fire gutted what was left [resulting in] heartless renovations... Windows and skylights were boarded over; additional levels were stuffed between existing floors; large open studios were cut up into a warren of cramped, airless workspaces. The effect was suffocating.



Figure 14a (left): The Yale school of architecture building after the fire in 1969 (<http://fuckyeahbrutalism.tumblr.com/post/13973239270/aftermath-of-june-14-1969-fire-at-paul-rudolphs>)

Figure 14b (top): Paul Rudolph and the Yale School of Art and Architecture Building (www.architectmagazine.com/images/tmp3E36_tmp_tcm20-138380.jpg)

Amelar and Lewis (2009:54) refer to the original building as:

... insolent, [and] splendidly belligerent ... [f]ew were able to appreciate [it] when it opened in 1963; it seemed willfully [*sic*] provocative, as if its baffling spatial sequences and corrugated concrete walls were expressly devised to repulse understanding, let alone affection. As it happened, it existed in this shocking form for only a few years before it was mauled beyond recognition.

There are widespread rumours that the devastating fire which extensively damaged the building in 1969 (*Fig. 14*) was started by the architecture students themselves, as an expression of their dislike of the building (Amelar & Lewis, 2009:54; Nasar *et al*, 2007:31,184).

Poor design inevitably has negative results, and according to Nasar *et al* (2007:32) by the 1980s, the building was dirty, leaky, covered in pigeon droppings, thermally uncomfortable, and despite (or because of) poorly executed renovations, cramped for space. Whether these problems should be laid solely at the door of the original architect is debatable, for Charles Gwathmey (in Taylor, 2007:[sp]), architect of the recent extensions, renovations and alterations to the building, believes that the complexity of the building was Paul Rudolph's "architectural right". Despite Gwathmey's opinions, it seems that the negative responses to the original design had some positive results. In the November 2008 of the Yale Alumni Magazine, Robert Stern (2008), then head of the school, reported that "the [new] building is considered a masterpiece of modern architecture for its virtuosic use of the elements of mass, space, and light".

Performance evaluation categories

Lützkendorf *et al* (2005:3) propose that user requirements can be divided into six major performance categories (*Fig. 15*). Of these, three categories contain the majority of the criteria that directly relate to this study (Table 1): functional, technical, and social performance.

Unfortunately, despite a large and long-standing body of research on student perceptions of service quality, higher education policy makers do not take the importance of consumer needs seriously enough (Gallifa and Batallé, 2010:158). The literature review highlights three primary factors that influence the quality of the experience of architecture students on university campuses:

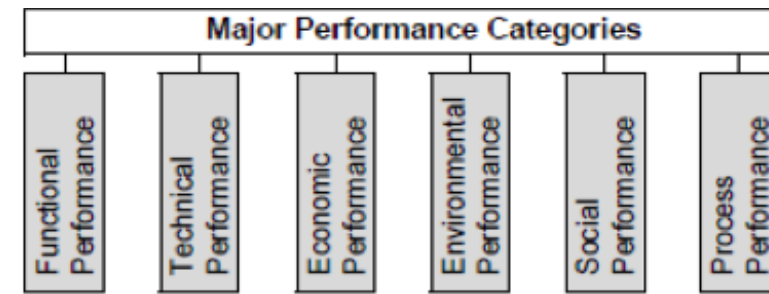


Figure 15: Categories of user performance requirements (Lützkendorf *et al*, 2005:3)

Table 1: Building Performance Evaluation categories

Functional performance: suitability of the surface and space program for planned use, accessibility and barrier-free design, adaptability to changing user requirements and uses, etc; closely related to the needs of the building users and others such as visitors, and the public community.
Technical performance: structural, physical and other technical features and characteristics, e.g. suitability for the planned service life, maintenance and revitalization capability, structural resistance to fire, control of noise transmission, heat insulation of building shell.
Social Performance: assessment of e.g. health, comfort and safety of users.

(Adapted from Lützkendorf *et al*, 2005:4)

1. The typical poor quality of spatial facilities available to schools of architecture (Bierut, 2006; Fisher, 2000; Lau & Yang, 2009; Nasar *et al*, 2007; Pearson, 2003; Rohan, 2000; Spooner, 2008);
2. Students' opinions are seldom considered when decisions are made about the campus environment (Abu Ghazze, 1999; Crissman Ishler & Upcraft, 2005; Cubukcu & Isistan, 2011; Flutter & Rudduck, 1995; Iacovidoua, Gibbs & Zopiatis, 2009; Kasim & Dzakiria, 2011; Price, Matzdorf, Smith & Agahi, 2003); and
3. Architects seldom assess users' opinions of existing buildings, so that lessons are not learned or shared within the profession (Clark, 2009; Nasar *et al*, 2007; Preiser, 2002; Preiser & Nasar, 2008; Riley, Kokkarinen, & Pitt, 2010; Salama, 2009a; Zimring, 1983).

These factors are explained in more detail the next section.

2.4 THE PREFERRED ATTRIBUTES OF THE ON-CAMPUS LEARNING ENVIRONMENT

In this section, those attributes that have been found to be important both in the literature review and through direct feedback, are discussed in detail.

2.4.1 Interior layout and spaces

Academic institutions and -schools place much focus on the conceptualisation and organisation of teaching methods, but pay relatively little attention to the design of the physical space that surrounds, and supports learning. At the overall institutional level of management, it is easy to lose sight of the fact that the physical structures (the size, shape and arrangement of rooms) has as much influence on interaction and behavioural patterns as do teaching activities and procedures (Hornecker, 2005: [sp]). Space as the 'context' or 'stage' for learning should be configured to support collaboration and rich interaction between all the 'actors' (Dickson, 2003:86; Fulton, 1992:5; Graetz & Goliber, 2002:13; Gruenewald, 2003:625; Hornecker, 2005, [sp]; Iacucci & Wagner, 2003:6; Sagan, 2008:175; Temple, 2008:229; Weaver, 2006:115). It is interesting to note though, how many schools of architecture tend to fall prey to the same lack of concern for spatial quality.

Communal studios: the Beaux-Arts tradition lives on

Traditionally, studios in schools of architecture are large open communal spaces (Fig. 16a) that are shared by a student population from a wide variety of demographic or psychosocial backgrounds (Strange, 2000:21). Often, following the Bauhaus / Beaux-Arts tradition, activities relating to different sub-disciplines such as architectural- and related design, building construction- and technology, and urban- and landscape design occur simultaneously in the same studio space. Such communal studios, open for the use of all members of the school, is a concept almost as old as schools of architecture themselves. The University of Pennsylvania, started in 1903 and one of the oldest colleges of architecture in the US (MIT is the oldest program, started in 1868), started out with one large "drafting room" for all its thirty students.



Figure 16a (left): An open, noisy and impersonal communal studio space at the Alfred Taubman College of Architecture and Urban Planning, University of Michigan (2006); compared to Fig 16b (right): dedicated group workspace at Queens University, Belfast (www.flickr.com/photos/gregorylee/255814495/ & www.flickr.com/photos/46719649@N02/)

The 'open' studio format has both positive and negative features (Table 2). The advantages of open spaces with few barriers include better communication and work flow. This approach also supports interaction and allows newer students to learn from more advanced ones (Gorgievski *et al*, 2010; Nasar *et al*, 2007:30-31).

Easier supervision of large open plan studios suits teachers well, but can cause student resentment. A lack of physical barriers also results in ambient noise, interruptions, and unpredictability in the environment, and Nasar *et al* (2007:82) suggest further research into this issue. To balance the apparent chaos that can result from seemingly uncontrolled and informal learning spaces, Duggan (2004:74) suggests that space usage be classified around learning activities, instead of around specific academic programmes or study groups.

Social groups commonly form within larger communities. Over time these groups may become increasingly differentiated as some member characteristics such as demographics (e.g. sex, age, race) or psychosocial characteristics (e.g. personality types or learning styles) become more dominant (Strange, 2000:21). In general, strong group norms are desirable and if well managed can have a positive influence on studio culture (Table 2). The influence of spatial attributes on group formation are discussed in the following section.

Table 2: Summary: the advantages and disadvantages of large studio spaces

Positive	Negative
More efficient communication and work flow	Limited visual and acoustic privacy.
Easier supervision of large groups	Communal space shared by students with different needs and backgrounds may cause friction.
Novices are exposed to expert knowledge	

Group spaces: creating communities of learning

The project-based assignments so extensively used in architectural education, encourage independent learning as well as group formation. The distinct advantages of communal open spaces have been illustrated, but studios should also allow groups the opportunity to form dedicated spaces where they can incubate and nurture complex projects (Fig. 16b). Place frames behaviour (Harrison & Dourish, 1996:3) so that people sharing a space often develop the trust and sense of belonging necessary to form a cohesive group and start behaving collectively (Gieryn, 2000:478; Wahlstedt *et al*, 2008:1024), when smaller spaces help people establish close social contact. (Gorgievsky *et al* (2007:208) refer to such spaces for 10 – 15 persons as “Club spaces”.) Furthermore, Maslow (1968, in Strange, 2000:23) believes that a sense of belonging is as important for self-actualisation as are physical safety and love. Group learning therefore optimises not only learning, but also the use of the physical learning environment (Fulton, 1992:4).

Based on the negative responses they found to open-plan staff workspaces at the Delft school of architecture, Gorgievsky *et al* (2010:220) point out that “subjective” safety and certainty increases when persons have control over their space on either individual, or group level. If properly understood, educators and spatial designers can positively manipulate student learning actions through this tendency towards group behaviour.

A positive way of using the tendency to form groups is promoting the formation of learning communities based not on the ‘expert and apprentices’ model propounded by Alexander *et al* (1977), but on configurations that tap the input of the whole group. Learning communities ensure that their members feel included and have a sense of belonging (Strange, 2000:24). Adult learners learn best when they belong to a peer group where they have access to common information and can reflect on, and discuss their learning actions so that informal learning can make up 70 – 80% of adult learning (Acker & Miller, 2005:5; Clark & Maher, 2005:2; Kuh *et al*, 2007:117; Utley, 2006:70). It is therefore not surprising that learning communities is one of the most effective support mechanisms for learners (Crissman Ishler & Upcraft, 2005:42). Novice learners can benefit from the experience of more experienced students in finding, analysing and converting information into knowledge.

Similar to communal spaces, group spaces can develop negative implications (Table 3). Spaces designed for group use should remain available for the use of all its members, without controlled or exclusive access. Gieryn (2000:478) and Gruenewald (2003:630) warn that when a powerful few gain power over a space, they often control movement and access, thereby further marginalising those without power. When “keep out signs” (real or imagined) are associated with a space, those with access are immediately empowered (Gruenewald, 2003:630).

As has been shown, spatial empowerment can be positive by creating solidarity, community and advantage (Gieryn, 2000:474). However, while exclusivity may make users feel more intimately linked to each other and a place, it can also restrict interaction. An understanding of group behaviour can be used to manage such situations: place attachment is a powerful factor of group cohesiveness and once a group no longer has access to the place where it formed, it will often disband (Gieryn, 2000:481).

Table 3: Summary: the advantages and disadvantages of group spaces

Positive	Negative
Opportunity to incubate and nurture complex projects	Groups can differentiate from the class community to the point of complete separation.
Support the forming of cohesive groups	Groups develop 'negative' power over spaces.
Optimise the use of the learning environment	Bullying of 'the other', by strongly differentiated groups.

Individuals in the cacophony of collaboration

Creativity, as Duggan (2004:75) remarks, requires solitude as well as collaboration. The busy, noisy atmosphere that goes with communal student spaces does not suit all working needs or personality types. Many problematic studio designs are based on the misconception that social- and informal learning requires constant exposure to social interaction. This is far from the truth, and constant exposure can cause psychological stress. Gorgievsky *et al* (2010:207) refer to a place of one's own, privacy, identity, status, and the ability to arrange one's workspace to suit one's personal needs, as "universal human needs". Many learners therefore prefer to work individually, either as a temporary phase in their creative process, or because it is their preferred learning style. The "cacophony of collaboration" (Acker & Miller, 2005:9) should not impede silent scholarship, and work that requires concentration should be accommodated in small peaceful spaces (Fig. 17), instead of rooms configured for larger groups of people (Rasila *et al*, 2010:150). Jankowska and Atlay (2008:273) describe the ideal creative learning space as one that stimulates new ways of thinking by being private and dedicated, and different from the 'usual' working space in layout, and decoration. Areas formally intended for group use can provide spacious areas for individuals to spread out large drawings, or work on complex projects (Applegate, 2009:345).

The extent to which individuals have a pleasant experience when sharing a space with a larger group, depends on their fit with the preferred attitudes, values, and preferences of the majority. When a space is used (temporarily or permanently) by a highly differentiated user group, persons who do not share its dominant features can be pushed out of the

environment (Strange, 2000:21). When groups treat someone who is "different" at the level of disability, group behaviour turns into bullying and if left unchecked can lead to people leaving the institution (Strange, 2000:20). Students who are very sensitive to noise, or require control over their learning environment may suffer psychological damage in large noisy studio spaces. Unless they are assisted to develop skills in working both collaboratively and individually (Yeo, 2008:281) their work may suffer or they may withdraw completely (Nasar *et al*, 2007:82). Network connectivity can be a valuable tool in accommodating a preference for solitude while still providing social interaction. The latter is important as extended solitude can lead to isolation or even depression (Duggan, 2004:75).



Figure 17: Individual study spaces allow for concentrated assessment preparation at stern University, Boston. The glass doors make a convenient message board. (www.flickr.com/photos/bryanallen/4446321350/)

Nixon's (2007) research into the types of spaces preferred for tasks that require focussed writing and analysis showed that the attributes of convenient location, comfortable furniture, low level of distraction and long-hour availability are much more desirable than social connectedness, good lighting, or low noise levels. Conversely, those students in Nixon's (*ibid.*) study who were working on image creation, exam preparation, and design presentations placed more emphasis on having help at hand and social contact.

Careful planning is required when devising workspace layouts that permit cognitive, visual, and acoustic privacy, as the following situation at the Global Energy Center at Stanford

University illustrates: open plan spaces are required as part of natural ventilation and day lighting strategies, but a post-occupancy evaluation has indicated that the nature of the occupants' work requires both focussed individual attention and noisy group meetings. These "fundamentally conflict[ing]" (project architect, quoted in Gonchar, 2008:[sp]) acoustic- and spatial requirements were not considered in the design. The architect was subsequently required to work with the client in looking for ways to combine acoustical isolation with natural ventilation strategies.

There are many strategies to cope with problems of space allocation and layout, such as carefully assessing the spatial needs of students at different levels of seniority. Duggan (2004:75) observes that while first year students need the sense of belonging and identity that can be found in the studio; senior students on the other hand, prefer greater mobility. Senior students, Duggan adds, can find identity through regular connectivity and studio-based events. Gieryn (2000: 482) makes the poignant comment that "[t]o be without a place of one's own – *persona non locata* – is to be almost non-existent". Provision is usually made for senior (masters / "thesis") students to have permanently assigned individual ("breakaway") spaces but because of limited space such cubicles are seldom available for junior students, even on a temporary basis.

Personal identity: individualisation of spaces

Nasar *et al* (2007:55) observe that Crown Hall, the home of the school of architecture at IIT (Fig. 11) expresses flexibility and openness, but does not permit individual personalisation. "Mies may not have valued the latter", they (*ibid.*) comment, "however many students do". (Fig. 13, and Ch 2 cover page:11).

To suit the needs of developing projects and presenting work in the best possible way, architecture students need to continually adapt their work environment (Iacucci & Wagner, 2003:9). Where it is not possible or even desirable to provide students with individual spaces, an effective method of empowering the users of a particular space is to permit them to control their learning environment, its configuration, and the objects it contains. In an environment of increasing "genericness" (Hornecker, 2005:1), individual studio users therefore should – within boundaries acceptable to the bigger group – be allowed

to express their identity and presence by adapting spaces to suit their own social and academic requirements (Clark & Maher, 2005:3; Duggan, 2004:74; Gruenewald, 2003:627, Misencik, 2005:[sp]).

Individualisation may lead to problems between groups or persons with different social norms (Harrison & Dourish, 1996:6) in the same studio space. Ahrentzen and Anthony (1993) for example point out that in class groups dominated by males, schools should take care to prevent the personalisation of spaces from becoming offensive to female students and staff. Montana State University's Cheever Hall studio rules (MSU, [sa]: IIIB) address this problem: "As this is a public building dedicated to the study of design of the physical environment, it is appropriate to project a professional image. Any graphic material that may be perceived as offensive, rude, or inappropriate is not permitted in the studio."

As a result of the above, the formation of distinct groups within a larger community may lead to clashes on issues of 'image'. While freedom of expression is to be encouraged as an outflow of creativity, the overall organisational culture should not be lost amongst those of smaller, possibly temporary groups. To maintain a balance, universities should provide what Gieryn (2000:480) terms a "territorialised normative order". "Front of house" (*ibid.*, 2000:479) areas where the wider institutional culture is exhibited, should be augmented with "backstage" spaces, where student groups can express their own culture with minimal control by campus maintenance authorities.

Elbow room: accommodation for large projects

As university student numbers are increasing year-on-year, all resources including space allocation are decreasing. This phenomenon bodes no good for resource-hungry, space-intensive academic disciplines such as architecture. The particular needs of design students include place "to present and perform, to have time and space for free play and day-dreaming, and to generate a 'different view' " (Iacucci and Wagner, 2003:7). Architecture students need large spaces, where they can continuously keep large-scale representations of their work at hand to explore qualities such as the scale, dimensionality, and ambience of their designs (*ibid.*, 2003:3) (Fig. 18 & 19). Even within academic domains, each group has specific spatial needs. Architectural design studios typically house activities around

projects that are of enormous scale, requiring dedicated space for model building, design development, and both individual- and group activities over a long period of time (Oblinger, 2005:16) (Fig. 18). Physical space is thus a critical resource in architectural education.

What is not immediately obvious to outsiders, is the ‘pulse and release’ use of space or that the collective artefacts of the design process – drawings, models, electronic presentations – are often produced in different locations concurrently. Architecture students now seldom produce drawings at “full scale” on drawing boards, but rather work to ‘no’ scale computer-based drawings. Even during intermediate desk crits or pin-ups, only selected parts of the process are produced. For this reason, facilities managers who investigate the complaints of architecture schools about spatial needs often find themselves walking around empty studios and cannot be blamed for not paying serious attention to constant requests for more space.

It is only at formal assessments that a varied collection of drawings, photos, posters, models, projections and other presentation tools are assembled in one space. The space-related problems perceived by staff and students are caused by the “bottlenecks” (Duggan, 2004:73) on such days, when candidates vie for insufficient floor- and wall space. The result of this feast-and-famine situation is wasted space on non-assessment or -studio days, and overcrowding when all the physical outcomes of the design process are assembled. There are creative alternatives to resolve the space issues – as Duggan (2004:75) remarks, “[p]roblems are rarely caused or solved by space alone” – but finding those solutions do not form part of this study.



Figure 18: Unstructured space for students to spread out and collaborate, Queens University, Belfast (www.flickr.com/photos/46719649@N02/4466133494/)

Open spaces for adaptable use

Institutions commonly focus on controlling and maintaining formal teaching spaces, but seldom pay enough attention to spaces that are informally used for learning. One of five critical requirements for successful schools of architecture identified by Nasar *et al* (2007:6), is a common gathering space for informal interaction and learning. An example of such use of space is found in an unexpected place: central London.

Students of the Architectural Association (AA) school in central London regularly incorporate Bedford Square, a public space on the north east side of the school (and adjoining the British Museum) into their ‘studio’ space (Fig. 21 - 22). It can even be said that the AA students use London as their informal studio. This is an excellent example of how schools short of space, can expand their areas. The AA school premises also include an internal courtyard that acts as a private multifunctional space (Fig. 19). A third type of open space, more protected from the weather, is located inside the building (Fig. 20).

Informal spaces are a form of adaptable space that are often ‘highjacked’ for use. Van Note Chism (2006:2.10) classifies informal spaces as those which are not clearly under the authority of any formal institutional entity, and which most people do not think of as learning spaces anyway. Care should be taken not to formalise the freedom of such space: MacPhee (2007:1) for example, describes informal spaces as “study areas for a group of 5 – 10 students with comfortable furniture ... [near] high traffic areas or just outside classroom doors”. It is highly debatable whether such specifically defined spaces can allow for completely independent learning activity. Not only non-timetabled open spaces for spontaneous use, but also technically, and functionally flexible spaces are important (Rasila, 2010:149). Changing technology and services can rapidly make certain types of spaces obsolete or inadequate, necessitating reconfiguration to suit new spatial and teaching needs. Despite the problems with generic teaching space, Elfland *et al* (2006:[sp]) believe that they should be designed as generically as possible since flexibility of use allows the focus of interaction between teacher and learners to change easily in response to the requirements of the situation (Miller, 2009:4). Ideally, such spaces must also be suitable for adaptation to non-formal uses (Oblinger, 2005) such as social clubs.



Figure 19: Outdoor courtyard installation, Architectural Association Summer School 2011
(www.lawrencelek.com/1471661/3013-Installation)



Figure 20: AA School, "Beyond Entrophy" exhibition in interior open space
(www.aaschool.ac.uk/public/whatson/exhibitions.php?item=209)



Figure 21: Students nearing completion of their AA Summer Pavilion, on the Southwest corner of Bedford Square, opposite the main entrance to the school (<http://aalog.00906/>)

The term "flexible space" is interpreted differently by learning space designers (e.g. Narum, 2004; Nasar *et al* (2007)). There are those who believe that 'adaptable' or 'versatile' are more appropriate descriptions, because the space is usually constructed of inflexible materials and contained within an inflexible physical environment. Versatile spaces can do many things well, and adaptable spaces can be easily changed to suit changing usage needs. Narum (2004:66) phrases the argument neatly: buildings must be "agile and open to new opportunities".

At the outer limits of flexible design, is what Nasar *et al* (2007:56) call a "kind of non-architecture" – large studio spaces that create the impression that the architect had simply given up on creating the complex and diverse teaching spaces required. An example of such as space, seems to be Knowlton Hall, at the Ohio State University (Fig. 23).

Figure 22: Location of the AA School, across Bedford Square from the British Museum in central London
(www.aaschool.ac.uk/)



Figure 23: Studio at Knowlton Hall, Ohio State University
(<http://farm4.static.flickr.com/3360/>)

Safety: a place of free of threat, fear, or anxiety

Students have the right to feel safe on campus, in all the senses of the word. Two types of safety immediately come to mind: personal safety when using the campus and studios, and the safety of personal equipment and possessions. A third interpretation, often forgotten or discounted, is psychological safety. Yet social, psychological, and instructional variables also influence the impact of the physical environment on human wellbeing (Graetz & Goliber, 2002:15). Strange (2000:23-24) puts this well: “[f]reedom from physical harm is one thing; feeling safe is another”. Hung *et al* (2008:9-10) propose that for many, ‘home’ is associated with privacy and intimacy, but that schools are linked in students’ minds with opposite feelings. Ideally though, institutional facilities should also be seen as a place where “people feel safe and warm”, and where learners can experience an “ambience of ease, freedom and safety” (*ibid.*).

Ultimately, students who do not feel free from threat, fear, or anxiety cannot be expected to perform well academically (Strange, 2000:23). Psychological safety is a construct that is obviously largely beyond the scope of this study, except to emphasise that how ‘safe’ students feel, will influence their perception of the quality of a space. One such occurrence has been discussed, which is the ‘fit’ of individuals in spaces used by larger groups (... individual workspaces).

A space where psychological safety is often under threat, is the ubiquitous ‘crit space’. Very public critiques of their work can be a traumatic experience for architecture students, and many schools are designed around such ‘public’ spaces (*Fig. 24 & 25*). The feelings of students are reflected in the name of a crit room at University D (*Fig. 26*).

Psychological safety also includes freedom from sexual harassment, even if unintended. Ubiquitous internet access is desirable, but while access to potentially offensive material on institutional equipment can easily be controlled, access to for example pornography or hate sites on uncontrolled connections can lead to inadvertent or even planned exposure to uninvited content (Oblinger, 2005:17).



Figure 24: The ‘critique bridge’ at the school of architecture, Albuquerque, New Mexico (www.architectmagazine.com/educational-projects/old-school-new-school-university-of-new-mexico.aspx#)



Figure 25: The public ramp in the Aronoff Center is used as critique space (http://mimoa.eu/images/11640_1.jpg)

Every effort should be made to provide personal safety in all its forms, but universities also need to be especially sensitive about how the security services and installations are perceived. Factors such as surveillance (both overt and covert), enclosure, segregation, display and classification (Gieryn, 2000:475) can have both positive and negative influence the comfort of campus users. Montana State University (MSU, [sa]) enforces the following studio regulations:

- Twenty-four hour access to the studios is provided through a combination lock door, and new combinations are used at the beginning of each semester. This combination is only available to majors.
- The exterior doors may not be not propped open.
- Any strangers noticed in the building after normal hours, must be addressed, or reported to campus security.
- All valuables, including all drafting equipment, are to be locked in desks or lockers.

The School of Architecture at the University of Hawaii (University of Hawaii, [sa]) requires:

- At least two people must be in studio during off peak hours.
- Sleeping is only permitted if there is at least one other person awake and working in the studio at the time.
- Studios and classrooms are to remain unlocked during normal business hours, and are to be locked during other hours.

Personal safety is becoming an increasingly important consideration for campus users. In a survey of educational places (a university and two schools) and office spaces, Rasila *et al* (2007) found that an average of seven percent of feedback referred to a feeling of security. The semi-public nature of educational buildings (Gorgievsky *et al* (2010:221) can negatively influence feelings of safety. The Noel-Levitz Student Satisfaction Inventory (Noel-Levitz, 2011: Appendix 2:2) indicates that in 2011, 'Safety and Security' had an importance of 6.32 on a 7-point rating scale, and a performance rating of 4.69 / 7. This indicates that on US campuses, students are feeling relatively safe, but one incident of injury or theft can negatively affect the satisfaction of entire groups of users.



Figure 26: The crit space at UD, labelled "Execution Hall" by students (Author, 29.11.2011).

2.4.2 External appearance and positioning

Much comment has been made about the conditions within the buildings that house schools of architecture, and it is relatively easy to measure such conditions against set criteria, as will be proven in later chapters. Measuring the quality of the exterior appearance of school of architecture buildings is an entirely different matter. Architecture school buildings arguably have to comply with higher design-related expectations than other educational buildings. Langdon (in Nasar *et al*, 2007:xiv) for example laments that while the University of Michigan building (designed by Robert S. Swanson, the nephew of Eero Saarinen) complies with most requirements expected of architecture schools, it has a critical shortcoming: "[t]he Art and Architecture Building was just there ... I've never heard people express delight about it or declare that it influenced their outlook". As Langdon (*ibid*:xvi) says, "there is a need for more attention to the architecture of schools of architecture".

Universities can avoid many design-related problems by implementing a rigorous appointment process that focuses primarily on a successful record of accomplishment in the design of academic buildings and of campus planning, rather than choosing an architect merely by reputation (Burns, 2001:3; Nasar *et al*, 2007:5).

Studies have shown that most learners are firstly concerned with the quality of teaching that they receive, and that only if this is completely satisfactory will they start showing an awareness of the physical environment (Temple, 2008:237). Far from seeing this as a reason not to consider the importance of the physical environment, architects and institutions of higher education should aspire to satisfy both the educational and environmental needs of campus users (Greenberg, 2007:2; Temple, 2008:234). This approach is unfortunately unusual, as criticism of facility design shows: Greenberg (2007:2) pronounces that a one-size-fits-all campus design by an international “starchitect” has the fitness for purpose of a “collection of trailers”. MacPhee (2007:15) agrees, adding that “it seems that you can only get variations on ... a current architectural trend” and that “[an architect] who arrives with a design in hand should be treated with caution” (*ibid.*:14). Unfortunately, ‘after-sales service’ seems to be a weakness in the architectural profession, for Gonchar (2008:160) is pushed to observe that “[o]nce the construction trailer is taken away, and the owner settles in, architects seldom systematically review a completed project to understand if it met its design objectives, [and] if the occupants are comfortable and productive”.

Steven Holl is a ‘starchitect’ who does not take designing a school of architecture lightly. Reflecting on the design of his multiple-award winning building at the University of Minnesota (*Fig. 36*), Holl is reported to have said that designing an architecture school is one of the most difficult of architectural commissions, because “[a]spiring to design a building which can add to the educational experience of architecture, is comparable to the problem of a brain surgeon operating on his own brain” (Holl, quoted in Logan, 2003:D1.2).

In opposition to Holl’s approach, is that of William W. Wurster, chairman of the College of Environmental Design at UC Berkeley and architect of its school building, Wurster Hall (completed in 1959) (*Fig. 27a*). This school building does not comply with requirements: students claim that “there’s good, bad, worse, and Wurster” (Nasar *et al*, 2007:33). Wurster

would probably appreciate this opinion though, as he wanted the building “to look like a ruin that no [university manager] would like. It’s absolutely unfinished, rough, uncouth and brilliantly strong. This is the way architecture is best done... [w]hat I wanted was a rough building, not a sweet building...” (Nasar *et al*, 2007:32; Peters, 1979:41).

Figure 27a (right): Schools that have been branded “ugly” in the press: top; Wurster Hall, home of the UC Berkeley (www.styleforum.net/t/150958/10-ugliest-buildings-in-the-world/360) and

Figure 27b (below): Wilkinson building, Sydney University School of Architecture (www.sydneyarchitecture.com/UNI/UNI-069.htm)



Nasar *et al* (2007:6) contend that good design can make an architectural statement and still fit into its environment. Thomas Fisher (2008:[sp]) concurs, commenting that:

The differences in the exterior aesthetics of architecture-school buildings reflect the differences among the faculty members and students within them, with evolutionary and revolutionary sensibilities coexisting in the curriculum. However, the often-negative response of casual observers to these buildings does raise the question of how much the discipline of architecture should inflict its internal debates on others. Where should we draw the line, architecturally, between academic freedom of expression and what borders on uncivil behaviour?

Fortunately, there are those who can challenge the ‘rules’ and yet create everything a school of architecture should be. Antoine Predock’s building for the School of Architecture and Planning in Albuquerque, New Mexico (Fig. 28 & 29) is designed around an inner atrium, and like the Walter L Smith building that houses Florida A&M University’s school of architecture, embraces the principle of “the building as teacher”. The atrium provides a private focus point for its users but the school also has a very public face: a two-story media screen for exhibiting student work is attached to the outside, and large glazed areas on the façade face the famous Route 66. While exposing the structure by having “[t]he guts of the building [hang] out, in an instructional sense” (Predock, in Gerfen, 2008: [sp]), the architect depends on unusually thick concrete walls (Fig. 29) for insulation rather than the more elaborate (and unsuccessful) systems at FAMU SoA (Fig. 43-7) and Qatar University (Fig. 35).

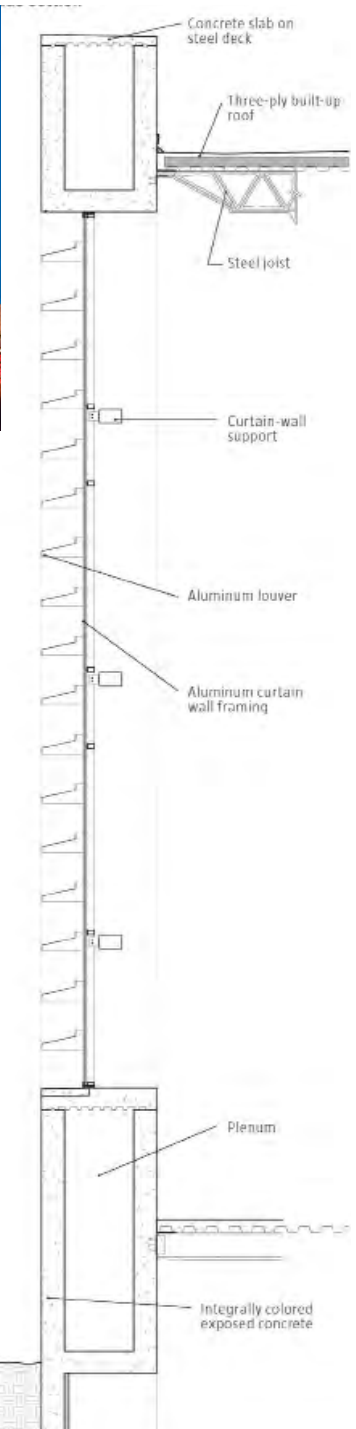
Attention to the surroundings: interdisciplinary interaction

On a campus-scale, some schools of architecture show a “remarkable lack of attention to their surroundings” (Fisher 2008:[sa]), a situation that reflects a disciplinary insularity and often stronger ties to other design disciplines than to the wider campus community. Schools of architecture are therefore often housed with other design- or art related disciplines. There is however little evidence that this is a successful approach. Yale has interpenetrating floor plates housing different disciplines, to encourage the intermingling of students. Unfortunately, the elevators in the ‘old’ Yale building were “notoriously inadequate” (Amelar & Lewis, 2009:54) so that no significant interaction between the ten floors and 37 different levels of the building was ever achieved.



Figure 28 (top): Media screen (far left) and expanses of glazing on Antoine Predock's (2009) School of Architecture.

Figure 29 (right): South facade section (www.architectmagazine.com/articles/educational-projects/old-school-new-school-university-of-new-mexico.aspx?)



Other school buildings resist interaction by being built around inward-facing courtyards e.g. at the universities of Minnesota, Arizona State, Manitoba, and Tennessee). No wonder that Nasar *et al* (2007:49) comment that the architectural profession tends to see itself “as apart from a part of [its] context”, and that this tendency towards inward-looking buildings is probably as much a result of architectural culture as of architectural design.

Beyond the building: outdoor spaces

Meeting students’ academic needs requires an array of on-campus facilities. Some, such as the library, faculty offices, and class- and seminar rooms, are obvious and usually receive much attention. To achieve a balanced learning environment, institutions should consciously provide places outside of the traditional classrooms and studios. Institutions can enhance their reputation and attract top students and teachers if they provide a pleasant outdoor learning and studying environment (Griffith, 1994; Myrick, sa:[sp]; Spooner, 2008:44). Ideally therefore, a campus environment is supportive of interactive, task-focused learning (Weaver, 2006:120; Wilson, 1995:3-4).

The value of “special, transformational, and even sacred” (Broussard, 2009:1) places must never be underestimated. Spiritual spaces or even simply landscaped gardens, are equally as important to student welfare but are often neglected. It is easy to lose sight of the importance of well designed and maintained landscaping and the places it creates in the campus milieu. The word ‘religious’ comes from the Latin verb *religare*, meaning to bind or reconnect. Depending on climate and season, favourable outside areas become congregation spots where the campus is experienced as place, and not a collection of buildings, thereby allowing building users to reconnect and to bind. Environments that offer access to, or even simply views of green spaces contribute to “fatigue attenuation” (Lau & Yang, 2009:67) by relieving mental stress, improving attention span, and encouraging physical exercise.

Because of the demands of “pop cultural imagery and appearance” (Gilson & DePoy, 2011:38), outdoor spaces often feature prominently in institutional branding campaigns and the social aspect of campus life is a common theme for promotional material. Broussard (2009:2) accurately observes that images selected for campus branding campaigns show not dormitories, classrooms, libraries, or students working late into the night, but the campus landscape with students walking and lounging in social situations. Despite its apparent importance to institutions, Salama (2009a:83) has found that very few studies addressing educational facilities even marginally consider the quality of outdoor spaces – ‘outside’ is simply not perceived as a place for learning, or studying. Fisher (2008:[sp]) observes a

recurring condition of under financed and poorly designed campus landscapes, which he considers particularly ironic around schools with courses in landscape architecture.

Neglecting the importance of maintaining campaign promises can cause severe dissatisfaction. The 2011 Student Satisfaction Inventory (Noel-Levitz, 2011: Appendix 2:5) indicates that when making their choice of university, students in the US rate ‘Campus appearance’ sixth out of the top nine criteria (Table 4). Should marketing promises turn out to be false, this can result in disappointment and resentment.

Table 4: US enrolment factors: ranked importance

Factor	Rank	Mean
Cost	1	6.23
Academic reputation	3	5.98
Geographic setting	4	5.56
Campus appearance	6	5.31
Recommendations from family friends	8	4.90
Opportunity to play sports	9	3.58

(Source: Noel-Levitz, 2011: Appendix 2:5)

Research has shown that a significant proportion of learners use outdoor spaces to study, even if these are not ideal (Abu-Ghazze, 1999; Lau & Yang, 2009; Spooner, 2008:44). Yet, designers often consider outdoor spaces in terms of architecture: as form-giving elements with historic symbolism or aesthetic properties (Salama, 2009a:83); and their primary function – to be visually pleasing gathering spaces – remains forgotten.

To address this important need of campus users, campus managers should note favoured outdoor places and carefully maintain them. In Salama’s (2009a:89) study of the use of outdoor spaces at Qatar University for example, students report that because of the unsuitable design and poor maintenance of seating in courtyards they no longer use them. Students now habitually go to the student center, which even though less conveniently placed, is

more comfortable. Care should however be taken not to extend institutional control to the extent that such places become overly formalised.

The degree to which architecture schools connect their interior environment to the exterior landscape varies dramatically (Fisher, 2008). There are excellent examples of campuses that support outdoor learning, such as the University of British Columbia (Vancouver, Canada) which provides outside learning spaces across campus (Fig 30). Temple Hoyne Buell Hall, home of the school of architecture at the University of Illinois, provides an indoor winter garden (Fig. 31), as well as outdoor seating for use in summer.

The 'other' as human beings: places where students and teachers can relax together

Because of the long hours spent together in design studios, the relationship between architecture students and teachers is often less formal and in many cases much closer than in other disciplines. A safe, comfortable, and supportive physical environment that positively influences interaction amongst teachers and learners is much more important, Roberts et al (2008) (perhaps controversially) argue, than becoming overly concerned with



Figure 30: Atrium, Temple Hoyne Buell Hall, home of the School of Architecture at the University of Illinois at Urbana-Champaign (www.inrs.illinois.edu/expo/)

general maintenance and service provision. On-campus social facilities should be considered as places where learning opportunities outside of the classroom can be supported and accommodated (Fig. 33).

The extent to which social interaction takes place, is a matter of personal preference. "Socially blended spaces" (Misencik et al, 2005:12) on campus "help to break down hierarchical barriers between professors and students [... and promote] conversation or at least the perception of one another as actual human beings". While Strange (2000:26) calls for the formation of socially based campus sub groups with common interests, others (e.g. Misencik et al, 2005) also see a need in some campus users to maintain a social distance between different groups. Even for those who do not wish to move beyond the boundaries of academic involvement, simply sharing a "comfortable coffee shop" (Acker & Miller, 2005:8) can be more supportive of effective interaction than extended office hours.

To encourage the use of social gathering spaces, Nasar et al (2007:81) suggest that they be designed around food service facilities, have access to greenery (even moving water if possible), and be placed along major circulation routes and near main entrances.



Figure 31: Informal learning spaces on the campus of the University of British Columbia (Informal learning space [sa] [sp])



Figure 32 (left) and 33 (right): A neglected courtyard behind the Wurster building has through a student design project, been converted into an outside space for social and flexible use (www.archiabile.com/201105/110512_wurstershire-sauce.html)

2.4.3 Indoor environmental conditions

Not only the outdoor environment, but also the indoor environmental quality (IEQ) of many schools of architecture leaves much to be desired. Especially where early experimentation with natural lighting and ventilation systems were implemented (for example the light- and ventilation duct system at FAMU SoA [see Zimring, 1983 for a full report], and the light scoops installed over the classrooms at the University of Qatar [see Salama, 2009a]) (Fig. 35), these are often unsuccessful. The principle of “the building as teaching aid” may sound laudable, but when services are excessively experimental or exposed their appropriateness should be questioned. An unusually successful example is Antoine Predock’s architecture school building in Albuquerque that simply and successfully depends on orientation and thermal massing (Fig. 29).

The “sensual experiences” of smelling, hearing, feeling, and seeing (Rasila *et al*, 2010:147) greatly influence the overall atmosphere of an environment and ambient factors such as temperature, lighting levels, and acoustics therefore have an unquestionable influence

on learners’ experience, and use of specific spaces (Graetz & Goliber, 2002:16; Jorstad, 2009; Musa *et al*, 2011:288; Nasar *et al*, 2007:201; Roberts *et al*, 2008:50-51). Despite their importance, potential problematic environmental conditions such as humidity causing drawings to curl (Zimring, 1983:46), and stale air in large studio spaces rarely receive the necessary design consideration, becoming what Nasar *et al* (2007:85) call the “Achilles heel” of most such buildings.

Lighting

Lighting quality affects improves students’ moods, behaviour, concentration, and therefore their learning. Fluorescent lighting causes a heightened state of physiological arousal and reduces sociability; dim lighting has a negative effect on self-awareness (Musa *et al*, 2011:288) (in other words, it causes users to fall asleep). Musa *et al* (*ibid.*) implemented an Importance-Performance Analysis of the daylighting, brightness, and glare levels in the

architecture studios of the University of Malaysia (Fig. 34). The overall results indicate that general lighting levels in the studio do not even comply with the relevant Malaysian Code of Practice on Indoor Air Quality. The researchers explain that the 100 percent difference between importance (blue bar) and performance (green bar) is because there is no natural day lighting in the studio (which also explains the low values of the attribute “glare”). The result of the student survey delivered both surprising and disturbing results: the third year students using the studios perceive the insufficient lighting levels as “normal” and acceptable and it does not influence the time they spend in the studio. As Musa *et al* (*ibid.*) point out, “[t]his situation will affect the student ability to perceive visual stimuli in a short term and health in terms of students’ vision in a [sic] long run.”

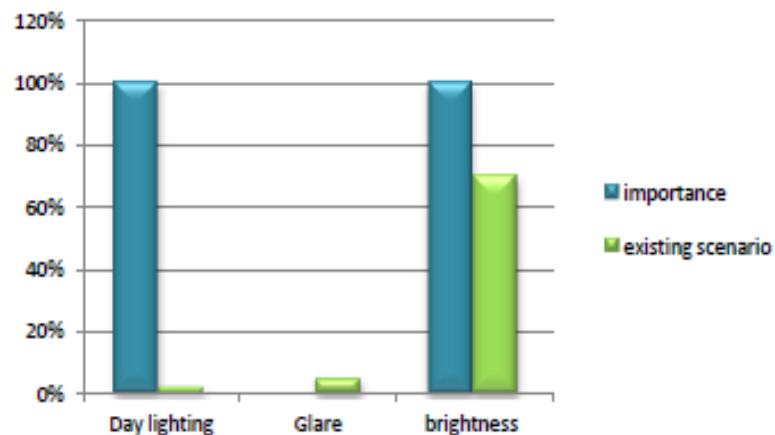


Figure 34: IPA responses for daylight, glare and brightness in UKM architecture studios (Musa *et al*, 2011:292)

Thermal comfort

Comfortable thermal conditions are considered a “basic” design requirement by Nasar *et al* (2007:6). Designers of service installations should consider anticipated activities when designing service installations or IEQ systems. In potentially crowded spaces or where groups will work together, ventilation levels should be increased, and the ambient temperature reduced (Graetz & Goliber, 2002:16). POEs at the School of Architecture, Florida A&M University (Zimring, 1983) and the University of Qatar (Salama, 2009a) report serious problems with “natural” ventilation systems. At FAMU, poorly operating thermal chimneys cause discomfort (Zimring, *ibid*:47); at the University of Qatar, the light

scoops (Fig. 35) are permanently closed because of excessive dust ingress. Even that icon of architecture schools, the Dessau Bauhaus (Walter Gropius, 1926), may have forged technological breakthroughs with its glazed facades but a common complaint by its users was that, despite the advantages of excellent natural lighting, the interior became overheated (Nasar *et al*, 2007:30).



Figure 35: Dysfunctional light scoops adorn classroom roofs, University of Qatar (www.best-masters.com/)

Acoustics and noise

Noise is inextricably linked with dense student populations. The main problem with this is that stress levels are increased when building users cannot control noise in their environment, or suffer from a loss of auditory privacy (Nasar *et al*, 2007:82). As Applegate (2009:345) remarks, just because students like to make a noise themselves, does not mean that they want to be subjected to it. When group activities are taking place, noise is more acceptable but during lectures or crits, ambient noise can be troublesome (Graetz & Goliber, 2002:16). In studios, movable pinup boards acting as partitions allow those who prefer to visually and / or acoustically isolate themselves from the larger group, to do so.

The majority of schools that have large open spaces suffer from problems with poor acoustics (e.g. Crown Hall, IIT; Knowles Hall, Ohio State; Taubman College, University of Michigan) and the ‘clash’ between the requirements for open flexible space and noise control should be carefully considered at the design stage. At the University of Minnesota (Steven Holl, completed 2002) (Fig. 36) large open spaces are popular as communal crit areas, but ambient noise is a big problem (Nasar, 2007:1). The Vital Signs Report of the Aronoff Center (Vital Signs Report, 1998:[sp]) returned feedback results for ‘background noise’ in the atrium- and open stair crit areas as Excellent 6.45%, Very Good 16.13%, Good 19.35%, Fair 32.26%, Poor 32.26%.

Some universities include rules about noise in their studio regulations, for example Montana State University (MSU, [sa]) and the University of Hawaii [sa] which both enforce the use of earphones in studios.

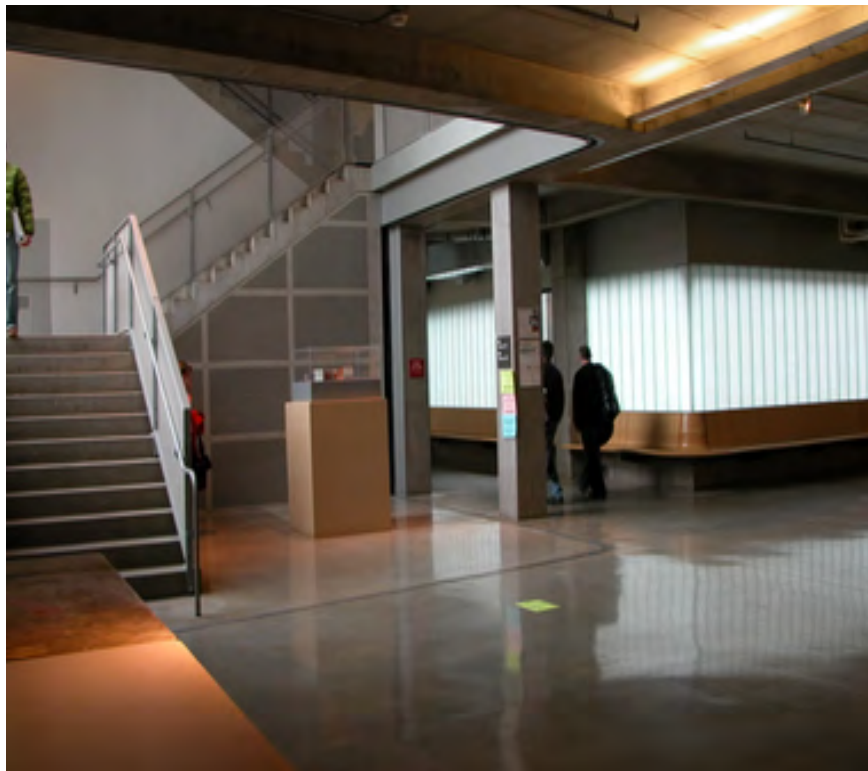


Figure 36: Hard surfaces in double volume crit spaces cause noise problems at University of Minnesota (www.architecture.uwaterloo.ca/faculty_projects/terri/holl_arch.html)

2.4.4 Infrastructure and finishes

Infrastructure seems to be a consistently under-performing university service. The “servicescape” (Rasila *et al*, 2010:150) of the learning environment should optimise the physical learning environment (Miller, 2009:4), and yet as the previous section showed, many schools suffer from serious problems with basic infrastructural factors such as thermal control, lighting, and acoustics. A lack of basic services, according to Nasar *et al* (2007:6) actively hinders activities in studios and crit spaces. The “abundant, high quality resources” demanded by MacPhee (2007:16) is unlikely to be found in most architecture studios.

Not only institutions underestimate the importance of infrastructure. Surveys of UK (1998) and US (1985) university applicants found that when applicants decide which university to attend, the quality of facilities lagged far behind course availability, overall image and social life. Conversely, a 1992 survey of second year students by Price *et al* (2003:214) found that the most criticised aspects of their university included poor facilities, overcrowding, security, and lighting. These findings indicate that while facilities are low on applicants’ priority lists, they are important to experienced students; further proof of the importance of the quality of facilities. The previous section provided an overview of intangible service attributes, while this section investigates tangible service attributes.

Seating and furniture

The fixed seating found in many seminar rooms, while being less expensive to install and maintain, does not answer the needs of contemporary teaching or learning approaches. It is well known that a comfortable learning space improves learners’ ability to pay attention and maintain an interest in their learning process (Bentham, 2008:73). Anyone who has seen a group of young adults relaxing, know that they prefer to lounge rather than to sit upright. Despite this common knowledge, cold, hard, and bare surfaces and seating are provided in the average university classroom and even on the greater campus (see Figs. 2,13,16a & 18). Such places can neither enrich students’ learning experience nor provide the breaks necessary to relieve tension (Lau & Yang, 2009).

The provision of wireless services for ubiquitous internet access is becoming widespread but the need for the correct, ergonomically designed furniture and seating to go with these is often not considered. Just as in formal computer laboratories, furniture in informal spaces should also be ergonomically suitable to allow for changing of posture, moving around, and adjustment to suit changing light conditions. Furniture that considers health and posture issues, and allows for a variety of physical conditions and body types including “atypical bodies”, and left-handed users should be provided as a matter of course (Acker & Miller, 2005:7; De Noriega & Gonzales, 2004:38; Gilson & DePoy, 2011:31).

To encourage the formation of communities of learning, group spaces should be provided with furniture that can be moved around easily, plenty of writing surfaces, good acoustics, and no central seminar table (i.e. no ‘master’) (Graetz & Goliber, 2002:13). The furniture should also be robust yet lightweight, and able to be moved noiselessly (De Noriega & Gonzales, 2004: 38) into what Spooner (2008:50) refers to as “sociofugal” configurations.

A masters student at Harvard’s Graduate School of Design (GSD) reports that the 2010 update of student workstation furniture was the first since 1972 (Chang, 2010:[sp]) (Fig. 37). Architecture schools often expect students to provide their own furniture needs beyond the very basic, and it is traditional to fill the space with old easy chairs, mattresses and other furniture (Fig. 38) to the extent that the studio rules of many schools specifically address this issue.

The Montana State University studio policy (MSU, [sa]: II F) stipulates under “Extraneous Furniture, Rugs, etc” that:

Due to severe space limits in the studio area, no extra furniture or personal belongings are permitted in the studio. Any personal property not removed at the end of the semester will be subject to disposal by the School with a minimum charge of \$10.00 assessed to the student for disposal. Because of the difficulty in keeping area rugs, no rugs will be permitted in the studios.

Conversely, the University of Hawaii School of Architecture (UH, [sa]:2.9.2) openly encourages students to bring furniture into the studio, and regulations include that:

- Depending on the availability of furniture and student enrolment, the SoA will provide



Figure 37a: Old student workstations, John Gund Hall, Harvard GSD.

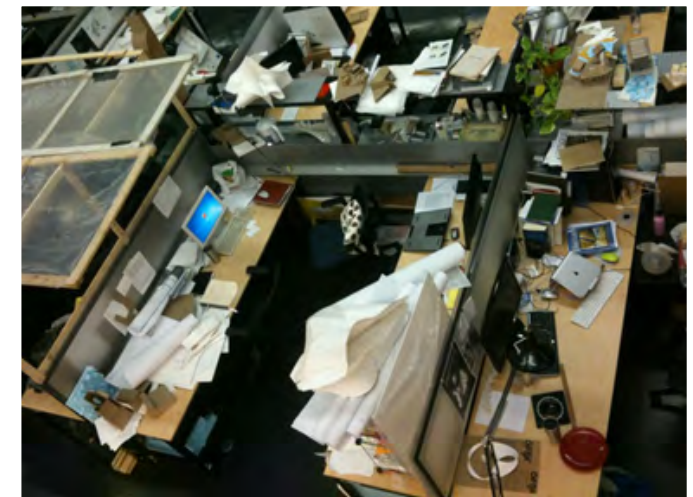


Figure 37b: New student workstations – note the enclosure of the workstation at the left of the photo (<http://archinect.com/blog/article/21453750/>)

each student enrolled in an upper level studio with a minimum of *one chair and one desk* (emphasis added).

- Students may supplement what is provided by the SoA with their own furniture provided there is space available and ... consent has been obtained. *Personal furnishings are subject to the SoA cleanup policy at the end of each semester* [italics added].

Architecture students are notoriously demanding of furniture, to the extent that schools have to include in their policies rules such as: “Do not cut directly on desks, tables, or floors. Always use a cutting mat. Drilling and cutting tools cannot be used in the studios” (CED, [sa]:[sp]).

Considering the tradition of ‘studio living’ in schools of architecture, greater than average levels of consumption of food and drink in school spaces are common. Resilience, cleanability, and durability of surfaces are subsequently important design considerations to reduce furniture maintenance needs (Spooner, 2008:46). Schools react to this in different ways, and some (e.g. University of Hawaii and Liverpool University) simply do not permit eating in classrooms or even studios.

Connectivity and power supply

‘Net-savvy’ learners are used to being able to access electronic services at the click of a button and become easily frustrated when (non-) available technology prevents this. Provision for internet connectivity has therefore become one of the most important infrastructural requirements in architecture schools. Today’s learners are used to finding the information they need fast, in a socially interactive environment, and expect to receive immediate feedback (Skiba, 2006:3; Watts, 2005:340). Furthermore, students are constantly devising new ways in which to use new technologies (Johnson & Lomas, 2005:22).

With the “Googlization” (Acker & Miller, 2005:4) of information, information that was traditionally only available in libraries is now at the fingertips of learners wherever they need it, but only if they can access it. Net-savvy institutions make the most of this expended access to information by providing campus-wide Wi-fi services. The renovated studios in the School of Architecture at MIT, are not only networked for internet but also with ISDN lines for video conferencing.

The use of computer-generated work is all but ubiquitous and laptop computers need a constant power supply. The increasing number of computers (and other electronic equipment) tethered to the service network in buildings requires careful design consideration of not only electrical- and data reticulation, but also spatial organisation and furniture provision. Providing wireless (Wi-fi) computer access may very well prove more efficient despite relatively higher installation cost.

Maintenance

A comparison of Figure 38a, the individual space of a computer graphics masters student, to Figure 38b, that of an architecture student, shows the very different spatial habits inculcated by extended periods of time spent in architecture studios. As discussed, the ideal studio furniture can be moved and reconfigured easily, but as a result requires regular maintenance (Duggan, 2004:72). Even with regular care, the maximum life cycle of furniture is approximately eight to ten years (Johnson & Lomas, 2005:22). As architecture students make ‘heavy’ use of their desks, some schools have to draw official attention to the results of abuse – Montana State University (MSU, [sa]: II Equipment care) includes in its studio regulations that: “Every dollar the School spends on maintenance and repair is one less dollar available for educational resources. Students will be held financially responsible for any damage done to the building or equipment” and “[n]o cutting is permitted on any table, counter, or desk top surface. A cutting board ... is required of every student in a studio course”.

Students are required to respect their equipment, and so are schools of architecture. Regular maintenance, and keeping up with furniture needs not only reflects a respect for the learning environment and its users, it also makes economic sense, for as Acker and Miller (2005:8) remark, it is much easier to change furniture than to break down walls.

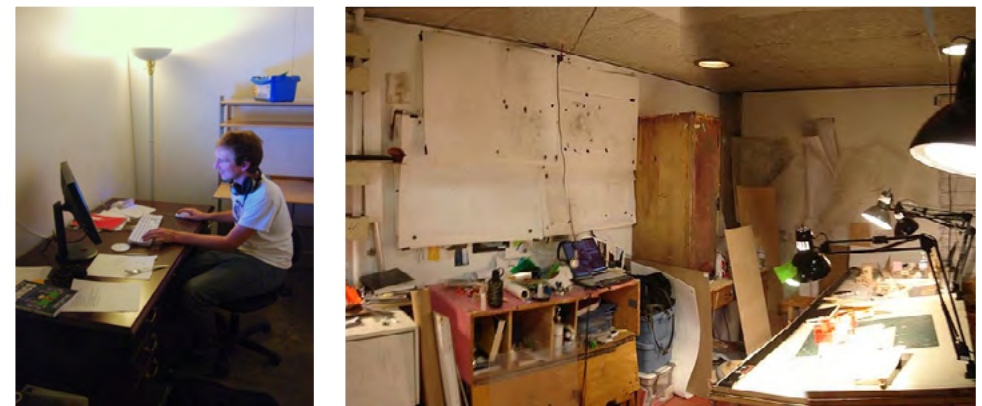


Figure 38a (left): The ordered, sparse, and tidy study cubicle of a computer graphics masters student, compared to Figure 38b (right): The messy, lived-in study cubicle of an architecture masters student (www.flickr.com/photos/ms_cwang/74053152/)

2.4.5 Access, signage and way finding

One of Nasar *et al*'s (2007:6) five critical concepts for good school design is “[m]ake it easy for people to find their way around” and they believe that schools of architecture should have exemplary accessibility features. This is unfortunately seldom the case. Ramps are the primary non-mechanical facility to enable wheelchair movement, yet they are often treated as architectural design elements so that their real function – access, connections, wayfinding – become lost. Once again, Peter Eisenman’s Aronoff Center at the University of Ohio, Cincinnati (*Fig. 39*) provides an excellent case in point. Nasar *et al* (2007:2) believe that the difficulties experienced by visitors and particularly disabled persons in getting around, is the result of intrinsic design problems.

Eisenman’s design “[was] driven by a powerful social vision. The relationship between the various floors is meant to foster a sense of solidarity among the students, to engender a big, embracing community of vibrant souls” (Ouroussoff, 2008:[sp]). Unfortunately, the ramps in the building are so complex that they “disorient and impede[d] access, even as [they try] to connect people and activities” (Nasar *et al*, 2007:53). As the original building has 37 separate levels, navigation demands constant awareness, and “the inattentive do so at their peril” (Scanlan, 2009:[sp]). To add ‘injury to insult’, the central atrium was initially rimmed by seven wide, deceptive steps, which “unfortunately” (*ibid.*), after years of unwitting people tumbling into this ‘pit’, had to be levelled off. The Vital Signs Project (1998:[sp]) reports that “the new atrium is evidently one of the most versatile and aesthetically interesting spaces the new addition has to offer”.

Often overlooked, are simple strategies such as providing views to the outside to help people orientate themselves within the building (Nasar *et al*, 2007:85). To relieve the stress, anxiety, and frustration caused by poor signage, improvised hand-made signs litter circulation routes. To avoid this eye sore, designers can easily augment signage by simple cues such as differentiation in colour schemes and the positioning of landmarks can make it easier to make a mental map of complex interiors (Nasar *et al*, 2007:83). A positive aspect of the new addition to the Aronoff Center for Design and Art is the use of contrasting textures at crossroads, as a visual cue (*Fig. 39*).

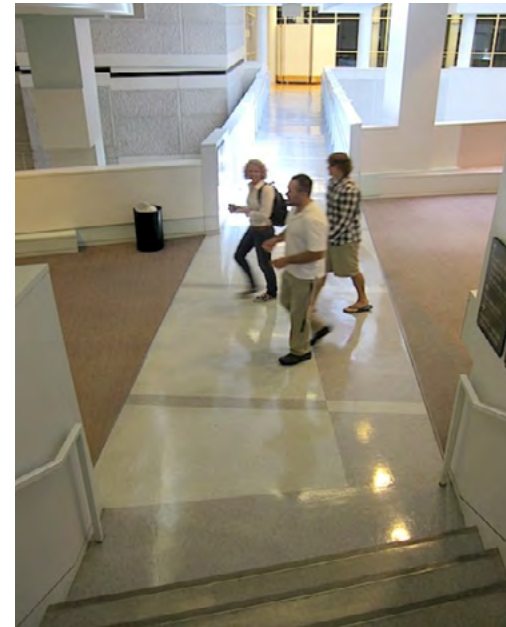


Figure 39: Contrasting floor finishes act as wayfinding tool at a ‘crossroads’ in the Aronoff Center (<http://chronicle.com/blogs/buildings/files/2010/10/>)

Access for disabled persons should include not only ease of moving around inside the building but also ease of getting to the building (Rasila *et al*, 2010:146), but campus way finding is to the benefit of everyone. At the University of Qatar, Salama (2009a:86) found that even senior students and staff find it difficult to reach their destinations. An anecdote by Jack Nasar (in Nasar *et al*, 2007:7) illustrates how design approaches can play havoc with usability: an (unnamed) campus architect refused to include signage on a university campus because he wanted to “force” lost visitors to interact with campus users by asking for directions.

2.4.6 Space- and time management: legend or myth?

There seems to be a common belief that architecture students are simply incapable of managing their time- and space needs. Students and even qualified architects enjoy swapping anecdotes of spending round-the-clock hours in their studios so that their student life experience sometimes seems to resemble a “boot camp experience, with relatively little time to spend outside its walls” (Nasar *et al*, 2007:45; see also Zimring, 1983:47). There are indications that this trend may be changing, as some students are now showing

a preference to use the studio as a social space. The studio is seen as a place to make quick contact with other students and with teaching staff (Duggan, 2004:72; Gorgievsky *et al*, 2010:208), but they can find better facilities and more comfortable workspace elsewhere.

Yeo (2008:279) makes an important observation here – it is not only necessary that facilities are provided, but also that they are available when needed. Many students report that they would work in the studios beyond school hours for the convenience of the additional space, privacy, and reduced distraction that those times offer; but find that the support facilities they need such as printing and food, are not available then. If they have to pack up their work and leave campus to find food or take a break from working, they usually prefer to return to their living places rather than to the studio.

Duggan (2004:74) reports on an (unnamed) school of architecture that solved its space-use problems by “decoupling” studio space from unit groups. Accepting that senior students seldom make full use of their studio space, the school retains ‘live-in’ space via a large first year studio and a small number of small lockable studios for seniors. Short-term use ‘drop-in’ space for use by students from all years is provided in large, infrastructure- and technology-intensive studios. The balance of the space is shared as classrooms with the larger university, a solution that supports Nasar *et al*’s (2007:46) point of view that architecture schools need relative few specialised spaces and many large, open, and relatively generic studios.

2.5 DEBATES IN THE FIELD

Theories that question the traditional teacher-learner relationships inevitably meet with some resistance. The studio master despite his/her typical close relationship with students, is still the ‘master’. In this section, some of the debates around the changing relationships between universities and students, and its impact on the teacher-learner relationship are unpacked, and both sides of these arguments considered. No particular “side” is taken, although the sympathies of the researcher leans towards the view of the architecture student as a equal member of the community of learning, and the as client of the university.

2.5.1 Boot camp or school of architecture?



Figure 40: Architecture student sleeping under his desk, University of Tokyo (<http://texasteatime-rachel.blogspot.com/2010/08/arrival.html>)

Nasar *et al* (*ibid*:56) observe that “[i]t’s a paradox of architectural education that students may thrive in the most casual and even slightly decrepit quarters, perhaps because such facilities may allow a certain freedom and accommodate the intense use – designing, eating, and sleeping – of the studio.” Not everyone is equally concerned over the fact that

many, including some iconic, schools are poor examples of architectural design. It even appears that for some, poor environmental conditions are just one part of the “boot camp experience” (Nasar *et al*, 2007:45) that architecture students traditionally ‘survive’. Iacucci and Wagner (2003:12) believe that teachers and spatial designers should resist the urge to provide students with their personal concept of the ‘perfect’ space with the ‘ideal’ furniture and configuration. Learners, they (*ibid.*) propose, should have to struggle with the constraints of a space to interpret, and configure it into their own ‘place’.

One journalist (Gardner, 2008:[sp]) comments that “[m]ore than any other American building, the home of the Yale School of Architecture holds a special, numinous place in the hearts of architects throughout the world”, yet goes on to refer to the “suspicious fire” in 1969 as “what may have been the single most incendiary act in the history of architectural criticism” (Fig. 14). Gardner (*ibid.*) expresses the hope that the extensively remodelled building will be “far more amenable to human habitation than it has ever been before”. From the above statements, it appears as though the profession feels an almost perverse

pride in the negative criticism that is heaped upon the schools that serve it. On the other side of the argument is the irrefutable proof of students’ dissatisfaction with the conditions in their schools, as identified in POEs of schools of architecture (Fisher, 2008: [sp]; Nasar *et al*, 2007; Chapter 4 of this study).

If the studio is to be more than a place to make quick contact with other students and with teaching staff (Duggan, 2004:72), with better facilities and more comfort to be found off campus, schools must make more effort to compete with those alternatives. In response to office layouts at the Delft school of architecture, one respondent said that “[t]he main objective is beauty, how [people want] to work plays a minor part”; a comment repeated by a student from UC (see Chapter 3 and 4 in this document) who believes that extensive alterations to the school were “designed to look nice on photographs - not with students’ needs in mind” (See Annexure G2).

Yeo (2008:271) explains the anomaly of architecture schools with poor facilities and yet good reputations: the shortcomings of one service can be offset by the strengths of



Figure 41a (left) A high-ceilinged studio at the Architectural Association School, London is flooded with light (www.aaschool.ac.za), while in Figure 41b (right): a studio is dark, low-ceilinged and, inexplicably, painted dark green (Author, 29.11 2011)

another. Customers, propose Yeo (*ibid.*) are willing to modify their expectations of service delivery if they are assured that the total product is of high quality and standing. Note for example, the comments of senior students at the University College London's Bartlett School of Architecture that "each architecture school has a different ethos. Some schools, such as the one at the University of Bath, are big on engineering and practical skills. Others, such as the one at the University of Cambridge, are sticklers for architectural history. And the Bartlett? 'They do the crazy stuff...'" (Dyckhoff, 2009, [sp]).

Not only students, but also many professionals disagree with the 'bad is better' approach to school facilities provision. Fisher (2008:[sp]) believes that as many schools of architecture do receive relatively good responses about their interior environments, the problem must be solvable. Simple solutions, well known to office planners (providing smaller breakaway spaces in open plan areas, managing daylight and task lighting, comfortable furniture and acoustic control), "apply just as much to open architecture studios" (*ibid.*). Studios need not be decrepit if they are carefully designed, managed, and maintained.

2.5.2 The 'tyranny of the masses'?

A continuing debate within both the fields of service provision evaluation and the higher education (HE) sector centres on the delineation of the 'client' body (in other words, whether students should be acknowledged and treated as the primary clients of the university) (Angell *et al*, 2007; Lewis, 2004:7; Law, 2010:260; Yeo, 2008:269). Those who on principle object to a teaching delivery approach of 'the customer is always right', explain Angell *et al* (2007:239), believe that it (negatively) interferes with the traditional relationship between teacher and learner. Angell *et al* (*ibid.*) point out that this point of view takes greatly narrows the entire student experience, which stretches far beyond academic confines.

Students pay universities for their education, which makes them clients of the university with the right to have reasonable requirements met. Students are also aware of the value attached to studying at certain universities. Even 18-year-olds at the Bartlett School, London, talk about the "edge" a Bartlett degree will give them in the jobs market, and a fellow student makes a poignant statement: "The art market is flooded. Here you get to

see a tutor every week. Some places you see them once a term. *After all, we're paying for the education*" (emphasis added) (Dyckhoff, 2009:[sp]). Yeo (2009:269) discusses the issue of "students as customers" and presents these alternative views: Rhinehart (1993, *ibid.*) contrasts the importance of the views of students as part of the input and output of the learning process, with that of the eventual employer as the customer of the learning process outcome. Joseph and Joseph (1998, *ibid.*) place students in the position of primary beneficiaries of education and therefore as the primary customers. Law (2010:258) identifies the crux of the argument: education reform and the expansion of access to higher education has led to an increasing tendency to treat students as the primary consumers "and as a result extending the traditional view of educational quality".

In an extensive review of student feedback mechanisms for use in quality assurance, Law (2010) found evidence of "fundamental doubts" (*ibid.*:252) about students' capacity for assessing teaching effectiveness. This point of view may have some value, as students seldom have a sufficient understanding of 'the bigger picture' to assess complex systems of which they form a part. O'Neill and Palmer (2004:40) nonetheless believe that pedagogically sound teaching can be combined with student-friendly, high quality student support. "Unfortunately", they (*ibid.*) comment, "a coalition of interests, including academics, politicians and the media, has had an observed tendency to hold out examples of student friendliness as being evidence of the 'dumbing down' " of their education. According to Law (2010:261), using valid and reliable instruments to survey an entire student population, and systematically documenting their opinions of their learning experience year-on-year, will allow comparisons and therefore permit assessment of the true value of such surveys.

By no means does this argument propose that the campus should become "an alternative to Club Med" or even enter an "amenities arms race" (Weinberg, 2005:[sp]) in an attempt to attract students to campus. The top-ranked US B Arch program in 2011, Cornell, demanded a tuition fee of \$41 541 (Cramer, 2011:58). Very few schools can hope to justify such fees and schools need to devise methods to achieve better outcomes with fewer resources.

That students are customers of the university is not in question. How much power this gives them over decisions and policies, will be debated for a long time. That their opinion

is a valuable tool in improving the service provided by the university has been proven. Ultimately, Nasar *et al* (2007:62) comment, it all comes down to values. Whose values, they ask, and what criteria do architects (and by extension, universities) subscribe to? This complex issue will not be debated here, however Nasar *et al*'s (*ibid.*) conclusion is supported – that a design based on democratic values representing “bottom-up, inclusive, human-oriented, and user and client involvement concerned with meaning and context”, must ultimately work for and please the majority of campus users.

2.5.3 The value of rating systems

In the 2011 *DesignIntelligence* rating of America's top architecture schools, the University of Michigan was in top position. In 2012, they share eighth place with the University of Pennsylvania. From this anomaly it can be deduced that the application of generic rating systems to schools of architecture is at best questionable, and at worst misleading. Cramer (2007:[sp]), when discussing the results of an annual large-scale survey of architecture schools, reports that “[t]he survey staff recognizes the subjectivity and fallibility of the survey process and has continually (over the course of the last nine consecutive surveys) made careful analysis and quality reviews to improve upon the consistency and value of the survey”. It is argued that if, after nine years, the survey is still considered subjective and fallible, externally administered surveys are neither an appropriate method of discovering strengths and weaknesses within schools, nor of devising a strategic improvement process. However, as rating systems are increasing in popularity, the advantages and disadvantages of such surveys are briefly discussed here.

Rating systems, while not yet as widely used in South Africa as in for example the US or UK, are increasingly used by potential students in deciding which HE institution to attend. Most university ranking systems are based primarily on research output. As research is a weak area in architectural practice, architecture schools cannot hope to compete with those in science- or law faculties for institutional attention on that basis. Forsyth (2008:12) refers to this as a “key dilemma” faced by architecture schools and poses the question of how schools can position themselves in the value system of their universities.

For as long as established schools in top rated universities continue to attract the top candidates, smaller or newer schools cannot compete on a level playing field. Schools within elite universities can at least benefit from the halo effect of the overall institution. Less popular schools from less illustrious institutions, should consider alternative “paths to prominence” (Forsyth, 2008:16), for as Forsyth (*ibid.*:19) remarks, “[t]here is surely more to architecture than [employing elite design teachers or preparing students for employment in large firms]”. With the bias of ranking systems towards research, important influences on the learning experience such as active learning programs, enriching experiences, and excellent campus environments do not receive the attention that they are due (*ibid.*).

Despite the apparent inappropriateness of applying existing ranking systems to schools of architecture, there is a similarly apparent need for quality measures and benchmarking in the field. Langdon, in Nasar *et al*'s (2007:xiii) meta-analysis of schools of architecture in the US and Europe, points out the radical differences to be found in the physical facilities offered by schools of architecture. In its November 2011 edition, *Architectural Record* published its annual list of “America's best architecture schools” (Cramer, 2011:55). In this article, Cramer (2007, 2011), four years after first acknowledging that the system is flawed, again comments that “[although] any ranking is bound to be controversial, we can't escape the fact that there are better and worse schools”; that “[r]esearch reveals clearly that the profession cares deeply about education” and finally, that “[o]f course, there are significant differences among schools”. Forsyth (2008) identified five typologies of ranking systems that apply to schools of architecture: reputational, assessments by employers of graduates, quantity of cited publications, combinations of the above, and selected subsets of the above (Table 5).

By identifying niche markets and specialisations smaller schools can build up word-of-mouth reputations and attract students by offering a learning experience not available at other schools.

Table 5: Ranking system typologies

	Type	Based on
1	Reputational	Prestige, name-brand visibility, historical visibility, institutional identity, the halo effect of real accomplishments. Benefit schools with specialisations and niches.
2	Employer assessments	Employer experience with graduates, how well schools prepare students for professional practice. Data collection is complicated, usually only large commercial practices are surveyed.
3	Publication and citation counts	Publication data are collected through computerised databases. Publications are not a key output for design / architecture academics.
4	Complex / multiple / multi-faceted	A single overall score calculated based on for example teacher seniority and qualifications, entry requirements, spending per student, student/teacher ratio, student destination post-completion, post graduate numbers, and student diversity (British Research Assessment Exercise for planning). Data collection is complicated and results are open to debate.
5	Uncombined	Multiple performance indicators can be collated that allow for schools to be assessed on selected subsets based on the needs or interests of the user. Not an overall ranking system and allows valuing of schools that have alternative missions and specialisations.

(Adapted from Forsyth, 2008:13 -16)

2.6 DATA COLLECTION: BUILDING PERFORMANCE EVALUATION

Building Performance Evaluation is an umbrella term for a range of methods of evaluating the success of buildings in use. Instruments used in the field include Building Evaluation, Building-in-Use Assessments, Environmental Audits, Environmental Design Evaluations, Facilities Performance Evaluation, Facility Assessment, Post Occupancy Evaluation, and Universal Design Evaluation. With so many related methods, theories and instruments, it is not surprising that Lützkendorf *et al* (2005:1) comment that “little consensus [exists], as to which building performance evaluation criteria and methodologies might best apply in which situations” and go on to conclude that

there is a growing need to build on these different approaches to create a more comprehensive standardized and universal methodology to state requirements, describe and choose performance indicators, and compare the two in order to verify that the building product or service performs as required.

Similar to the literature review for this study, not Zimring *et al* (2010:[sp]), Gonchar (2008:163), or Lützkendorf *et al* (2005) have found industry-wide accepted definitions, or standardised methods for conducting such evaluations. As concise a description as any is Preiser’s (2002), that the overall aim of Building Performance Evaluation is a holistic, process-oriented approach to the evaluation of buildings in use. Zimring *et al* (*ibid.*) try to bring some clarity to the field by proposing these generic aims for BPE processes:

- To better understand the impact of early design decisions on long-term efficiency and effectiveness of buildings; and
- To better understand the impact of building delivery processes and decisions on user satisfaction.

Preiser (2002:9) explains that Universal Design Evaluation is currently the most in-depth BPE method, taking not only facilities, but also the forces that shape them (e.g. political, economic, social), into account. POE in the other hand, is a “softer” (*ibid.*:10) approach, implemented to obtain an insight into the experiences and perceptions of the users of a building in their everyday use of it. Post Occupancy Evaluation is arguably the best known

and most published method of BPE, and is the method selected for use in this study. The following uses of POE as proposed by Zimring *et al* (2010:[sp]) are relevant to both the immediate and long term aims of this study:

Quick-response surveys are implemented to support settling into, and fine-tuning of buildings two to three months after occupancy. Surveys typically include a questionnaire, structured interviews, and feedback to managers and users. The aim of this abbreviated evaluation is to support organised feedback and prioritise ways to increase client comfort.

Decision-focused evaluations can help designers to make specific important programming or design decisions; be used to diagnose problems in troubled projects; and assess new programs, technologies and design approaches.

Evaluations for design guides establish key decisions and components for repeated building types, and identify best research and practices;

Evaluations for creating a knowledge base link facilities decisions to key decision drivers; make evaluation information easily accessible; and allow stakeholders to identify lessons learned in the field.

This study falls primarily into the last category, as stated in the research goal: an attempt to answer questions about what architecture school buildings should be, and how that knowledge can be created. In conclusion to the evaluation process undertaken at Florida A&M University School of Architecture, Zimring (1983) suggests that once an initial POE has been completed, a broad based and on-going evaluation program need not be expensive as long as existing methodologies are carefully coordinated and includes a multi-disciplinary team.

2.6.1 Implementing Post Occupancy Evaluation

For this study, Post Occupancy Evaluation (POE) has been selected as the method to gather data on student satisfaction, with attribute performance at schools of architecture. Figure 42 illustrates POE and Importance-Performance Analysis (IPA) as complementary instruments, as both include a component of the assessment of building attribute performance from

the point of view of the user. An I-P matrix (Fig. 7) is an effective method of presenting the results of a Post Occupancy Evaluation. (IPA is discussed in detail in 2.6.2 Importance-Performance Analysis.) POE in turn, is an effective method of generating attribute criteria for the purpose of IPA.

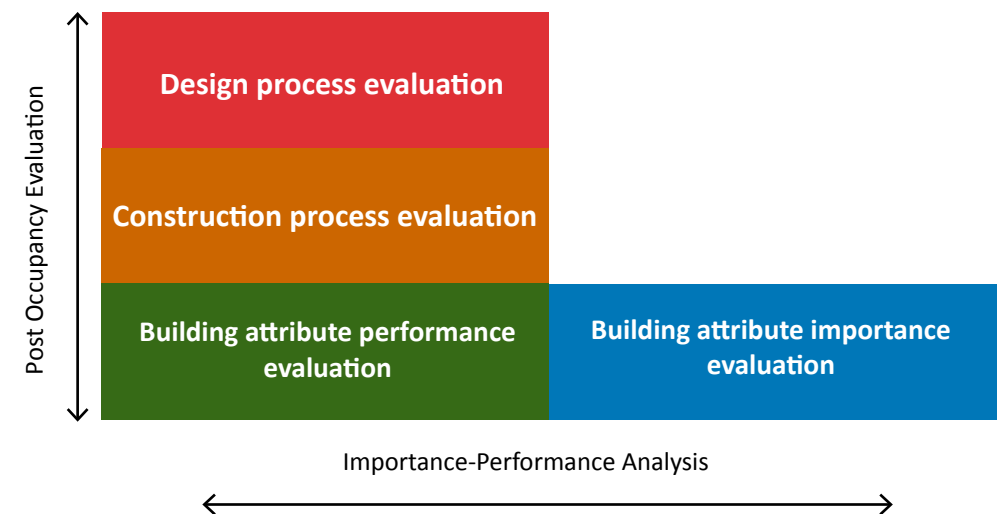


Figure 42: The relationship between Post Occupancy Evaluation & Importance-Performance Analysis

Definitions of POE vary from the concise: “[e]valuating the performance of buildings after they have been occupied” (Tanyer and Pembegül, 2010:241), to the more extensive: “the process of evaluating buildings in a systematic and vigorous manner after they have been built and occupied for some time” (Preiser *et al*, 1988) to the discipline specific: “a systematic study of buildings in use to provide architects with information about the performance of their designs and building owners and users with guidelines to achieve the best out of what they already have” (RIBA, Research Steering Group, 1991, cited in Tanyer and Pembegül, 2010:241-2).

The specific term ‘Post Occupancy Evaluation’ has been in general use for approximately 30 years. The first building performance evaluations were done in response to the problems found in post-WWII institutional buildings, and public housing projects (Meir *et al*, 2009;

Riley *et al*, 2010; Tanyer & Pembegül, 2010). Problems were so prevalent in ‘care’ buildings such as hospitals and mental institutions that they were felt to be hindering, rather than helping patients’ convalescence.

A particular weakness of the early evaluations, was that they were based on once-off case studies of individual buildings (Preiser, 2002:[sp]). This situation improved in the 1970s and 1980s, when an increase in cross-building studies made benchmarking and comparison between buildings and typologies possible. Cross-disciplinary studies also became more common, and the link between occupant behaviour and the built environment is now better understood, and more readily accepted (Cooper, Ahrentzen & Hasselkus, 1991). By the 1980s POE was still done as case studies but also as part of primary research and as a method of providing feedback across a range of disciplines to organisations and institutions (Cooper *et al*, 1991; Vischer, 2002). Vischer’s (2002) research has shown that in the UK and the US, POE is now widely used as both a method to provide performance feedback to stakeholders and for empirical research. In Europe and Japan though, it is more specifically applied as an academic research methodology to broaden the scientific knowledge base of building performance.

Despite the acknowledged value of POE and its apparent acceptance by other professions, the architectural profession has not embraced the concept. Feedback / evaluation has been in and out of the RIBA Plan of Works document since 1965. What started as a mere suggestion in “The Architect and His [sic] Office” (RIBA, 1962) that information about the experiences of building users should be gathered and considered in the design process, was formalised as Stage M – the feedback stage, in 1965. RIBA now acknowledged that there was a lack of scientific study of buildings in use, and architects were encouraged to inspect completed buildings together with their clients within two to five years of completion. This was seen as a way to improve service to future clients and through dissemination of the findings, to increase the scientific knowledge base of the discipline (Tanyer & Pembegül, 2010). The inclusion of this formal (though not compulsory) feedback stage by architects did not last long though, and by 1978, the stage was again omitted from the Plan of Works. In 2006, Stage M (now known as ‘Stage L Post Practical Completion’) was once again

included, but it is still only recommended. Stage L2 includes assisting building users during initial occupation, and Stage L3 entails reviewing the building performance in use.

The Building Research Establishment (BRE Trust, 2012:[sp]) considers POE a necessary part of the architect’s service as it completes the feedback loop of the building procurement life cycle. The BRE also considers the requirements set out in Part L to still be rather vague. Regular assessments, they believe, should ensure more efficient building operation over a potential whole life of sixty years or more. In the RIBA online journal, Gary Clark (2009) comments that:

It is 44 years since the RIBA led the way in post occupancy evaluation (POE) with the inclusion of Stage M: Feedback within the RIBA plan of work in 1965. Nevertheless, its implementation has been patchy. Most studies have been by academics, service engineers and facility managers ... increasing requirement for POE by government funding agencies will ensure feedback is firmly back on the agenda. The question is: *Will the architectural profession be interested, or able to lead the debate?* [emphasis added].

A positive indication of future support, is that in ‘*The RIBA outlines its priorities for the new government*’, Ruth Reed, president of RIBA, states that “[w]e need stringent new-build performance standards and improved post-occupancy evaluation” (Reed 2010).

Theorists have attempted to analyse reasons for the disinterest towards POE within the architectural profession, and it is generally believed that questions around payment is the primary issue. The problem lies within the ownership of the process – both from the point of view of payment, and of taking responsibility for any flaws or mistakes that may be uncovered in the process (Gonchar 2008; Riley *et al*, 2010; Tanyer and Pembegül, 2010).

Zimring *et al* (2005:[sp]) acknowledge that there are reasons for doubting the effectiveness of POE:

- The cost- and time implications of conducting an in-depth evaluation;
- The necessary skills for conducting a complex POE may not be available;
- Professionals often do not like to have their work judged by other professionals;
- It is sometimes difficult to establish a clear link between user assessments (which are necessarily qualitative) and the attributes of the physical environment;
- The relationship between facility design and BPE is complex and fuzzy.

These possible objections are addressed in the following section.

Professional practitioners should be willing (if not legally required) to expose their work to scrutiny. It is necessary, argues Lippman (2010:1), that existing ‘best practice’ in the design of learning facilities be challenged. The possible objections listed by Zimring *et al* (*ibid.*) are reasonable, but careful planning and appropriate decisions can counteract many of these:

1. When evaluation is implemented within a school of architecture the typical cost of the process is reduced, as the target population is easily accessible. Schools and teachers can also implement the evaluation as a student project (see the precedent studies that follow). The use of an instrument that has been developed along theoretical principles, and tested in the field, makes the need for great expertise redundant (and at the same time fosters such expertise). Should quantitative measurements be required (e.g. temperature, light, noise) it can be assumed that within a university context access to the necessary equipment and expertise will be relatively easy to obtain.
2. It is true that professionals do not like to have their work critically assessed, but a well-designed POE, based on valid criteria is a fair basis for evaluation. Furthermore, IPA as a reporting instrument takes some of the sting out of the tail of evaluation feedback, as successful attributes are as clearly identified as those that may be performing poorly.
3. It can be argued that while the complex link between users’ perception of performance and actual performance cannot be scientifically determined, the proposed method is at worst, no less subjective than critiques based on writers’ perceptions.

The precedent studies that follow are of the application of POE at schools of architecture or at institutions of higher education in general. They show that POE is a valuable tool in identifying specific attributes of a learning environment that do not satisfy user needs. It is also shown to be an effective method of making students of architecture more aware of the long-term effects of design decisions – both good and bad. These examples were selected for close investigation, as they reflect real insights into the state of architecture school buildings, and provided much guidance in the process of developing, designing and interpreting the results of the current study. The first, by a task team under the directorship of Craig Zimring, at the Florida A&M University (FAMU) School of Architecture is the earliest

example of such a study that could be found. Following in chronological order are three POE projects that were conducted partly, or in whole as student projects: The Vital Signs Project at the Aronoff Center (1998); ‘*Lessons learned from schools of architecture*’ (2007); and ‘*The secret life of buildings*’ at Wurster Hall, UC Berkley (2010).

POE precedent 1: Florida A&M University School of Architecture (Zimring *et al*, 1983)

In December 1984, the FAMU SoA (Florida Agricultural and Mechanical University School of Architecture) relocated from the inadequate Bannaker Building, to the new Walter L Smith Building (*Fig. 43-4; 46-7*). The new 5 946m² building was designed to accommodate 400 students and 85 teaching- and administrative staff members (Greer, 1985:16).

Published in book form (Zimring, 1983), the 70-page official report follows the process from its inception at the pre-move stage in 1981 to the final follow-up evaluation one year after moving in, in 1985. The evaluation was done by a team of experienced evaluators made up of academics at Georgia Tech and an independent architecture practice, Min Kantrowitz Associates.

Articles and reports about the process of creating the Walter L Smith Building brings to light a litany of errors – almost a guide of how not to go about the process of commissioning, designing and constructing a building. Despite every effort on the part of the client, the funding body, and the evaluation team to ensure the best possible end product, the final building has attracted “numerous complaints from architecture students who often inhabit the building around the clock” (Zimring, 1983:47).

The building during pre-design phase and while in use was the subject of close scrutiny because the demanding brief required for example, innovative natural lighting- and ventilation systems and visible service systems to act as a teaching tool. With the twin goals of assessing both the building delivery process and the quality of the completed building, the evaluation process followed two phases: the first extended beyond the school building itself, and described the overall Florida State building procurement process. Phase Two focussed expressly on the SoA building and comprised four stages:



Figure 43: Main entrance, FAMU School of Architecture (www.rattlernation.blogspot.com)

Stage 1: Pre-move. This stage included evaluating the existing facilities in the Bannaker Building to determine goals for and expectations of the new building (Zimring, 1983:15); monitoring the selection of the architect; and documenting the design architect's intentions and decisions for purposes of later comparison (White, 1985:13).

Stage 1 also required quantitative research on the physical conditions such as temperature, light, and noise levels in the Bannaker Building. Use patterns were also monitored – when, how and by whom the building was used (Fig. 45).

Spatial studies in the Bannaker building included classrooms, offices, staff work spaces, circulation elements, and exterior use areas (White, 1985:15). A broad range of data gathering methods was used: walkthroughs, interviews, on-site observations, and discussion meetings with faculty.

Stage 2: Construction monitoring. The main purpose of Stage 2, according to White (*ibid.*:13), was to evaluate how deviations from the original design may have affected the long-term performance of the new building. The team analysed programming

documentation, monitored the construction process, attended site meetings, interviewed the construction team and recorded field notes.

During Stage 2 the team interviewed the architect several times to assess whether the requirements as set out in the competition brief were being met. The POE report highlights serious shortcomings in the design process. Client concerns about the complexity of the design, poor durability and water tightness of the building (based on incomplete and incorrect technical drawings), and the overall clarity of the working drawings, were raised early on (Zimring, 1985:45).

Stage 3: Settling in. Ten weeks after occupation of the new building, the research team visited the school to assess whether the reality of the new school building compared favourably with expectations and the stated design intent.

Stage 3 performance indicators reports White (*ibid.*), included building-related issues such as image, function, space size, shape and proportion, adjacencies (relationships between spaces), furniture, materials and finishes, durability, and maintenance. Occupant-related indicators encompassed access, safety and security, efficiency, comfort, productivity, privacy and overall satisfaction. Quantitative research included comparisons between the process documentation and the final product on a space-by-space basis (Zimring, 1983:28). Physical measurements of environmental conditions were also made, but the team found that these are so changeable that unless almost continuous monitoring can be done over a long time, such measurements were not worth the cost, effort, and time required to make them.

Stage 4: One year after occupancy. During this in-depth stage of the evaluation process, the team conducted another walk-through with building users.

Based on the initial survey, the task team had identified the following evaluation issues to be addressed in Stage 4 (adapted from Zimring, 1983:16):

1. Does the building provide a high impact, forward-looking image that can be a positive symbol for the school? The desire was that the new building should “communicate to students the School’s approach toward architecture (Zimring, 1983:32).
2. Does the building function well for all users, regarding:

- a. Day-to-day activities of the school
 - b. Serving as a teaching tool
 - c. Security of persons and possessions
 - d. Encouragement of formal and informal social interaction.
3. Does the building perform well technically, regarding:
 - a. HVAC (heating, ventilation and air conditioning)
 - b. Flexibility for all required purposes
 - c. Maintenance, upkeep and long-term operation.
 4. Building delivery:
 - a. Impacts of special design requirements on design, programming and architect selection
 - b. Changes during the construction process
 - c. Consequences of problems with the building delivery process on occupancy.

To obtain this information, published articles, and the school's promotional material were also scrutinised (Zimring, 1983:25).

Discussion

In light of the outcomes of the project as reflected in the official report, the architect selection process is briefly outlined first. FAMU held a design competition that was won by Clements/Rumpel Associates (*Fig. 44*), despite jury reservations that the passive energy system in their design seemed overly ambitious (a concern that would prove all too true). The client did not initially consider this a big problem, because the competition brief specified that the winning architect was expected to put aside the original design, and begin afresh with a new design in close consultation with the evaluation team. This did not happen because of early misunderstandings about the requirements for changes to the competition design, fees for redesign, and a generally poor client-architect relationship (Zimring, 1985:44). The independent evaluation team found that the completed building was conceptually identical to the competition entry; that the architect resisted attempts by the client to have the building significantly redesigned; that the ventilation system was dysfunctional; and that according to the client “the overriding concern of the architect in the design of the construction details was the appearance of the building” (*ibid*:44).

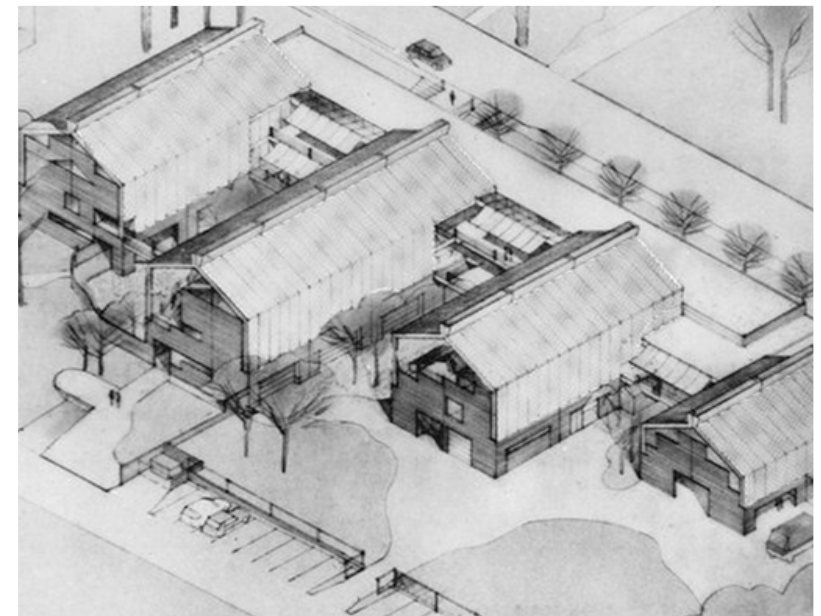
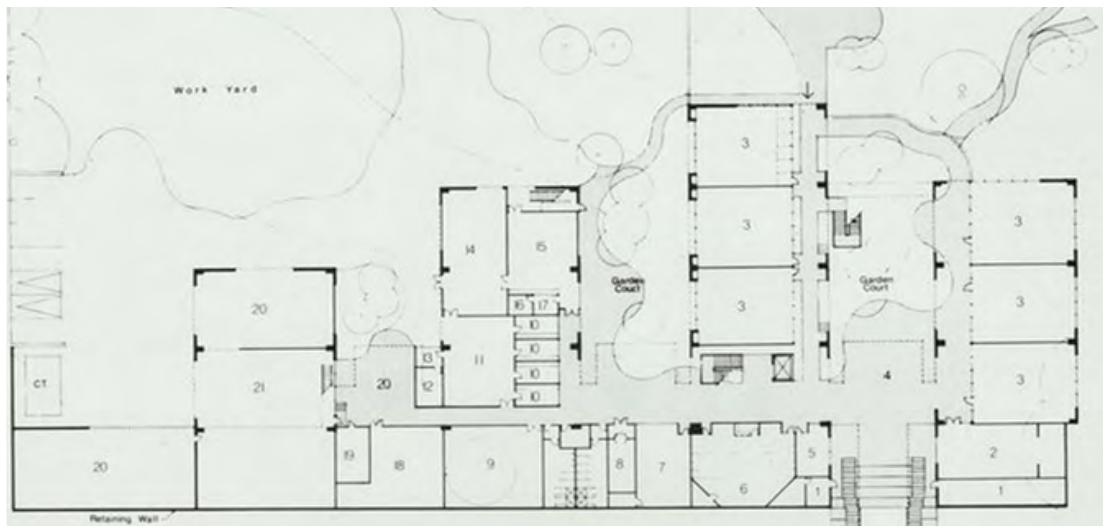


Figure 44a: Birds-eye view and Figure 44b: Floor plan, of the FAMU School of Architecture winning competition entry by Clements/Rumpel Associates, 1981 (Greer, 1985:16)

Findings by the evaluation team included that: The POE process had definite benefits, such as that evaluation findings helped the school to fine tune the new building to suit users' needs; the process and the publications that followed drew positive attention to the school; and there was greatly increased awareness of POE within the school. The last factor was largely because both staff and students had been involved in the overall research process, including data gathering and -analysis (Zimring, 1983:15). Another benefit was the timeous attention that was drawn to the extensive long-term maintenance requirements of the materials and finishes used in the building. The exposure of services (e.g. HVAC and energy systems) was deemed a potentially valuable teaching tool even though it interfered with one of the main design requirements: large open spaces for flexible and adaptable use.

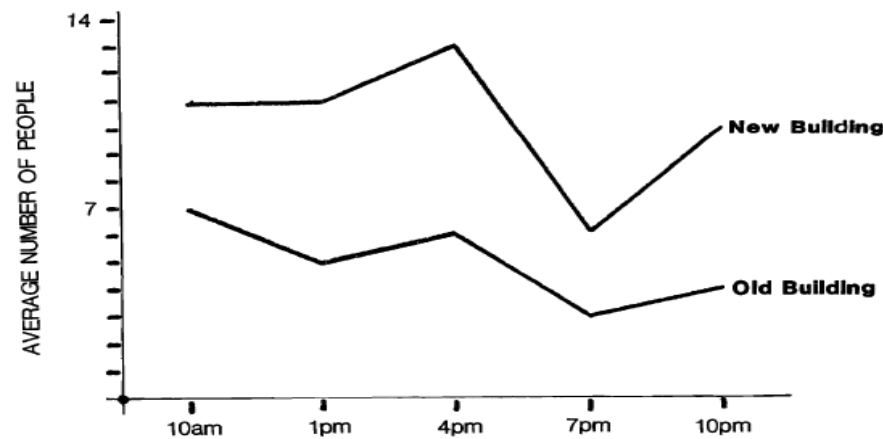


Figure 45: Number of people using the studios, Bannaker Building (lower line) and the Walker Building (upper line) (Zimring, 1983: 39)

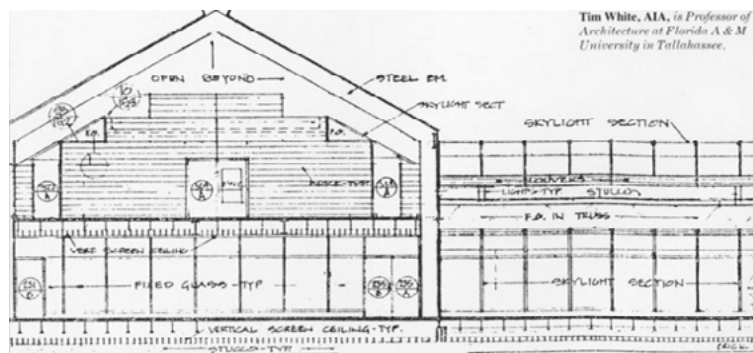


Figure 46: Technical drawing, FAMU School of Architecture, by Clements/Rumpel Associates ca. 1981 (White, 1985:13)

As in the Bannaker Building, lighting and ventilation in the new building were still problematic: the metal halide lights in the new studios were noisy and inefficient, and this combined with insufficient natural lighting caused the studios to be “dark and stuffy” (Zimring, 1983:33).

A particularly significant finding was that the architect considered “symbolic appearance” as more important than “the goal of increasing space for each student thereby making it appropriate for the activities that go on in a school of architecture” (Greer, 1985:14). Despite the many shortcomings of the design and construction process, the study indicates that the award-winning building (the building has won a Florida American Institute of Architects Award for Design, as awarded by a jury of internationally known architects) is generally liked by its users.

The team suggested that subsequent demonstration programs are implemented both at FAMU SoA and other buildings to further demonstrate the value of Post Occupancy Evaluation. Following are examples of studies conducted by architecture students, as well as a meta-study published in book form.



Figure 47: FAMU SoA in 2011 (www.flickr.com/famu_arch/)

POE precedent 2: The Vital Signs Project, Aronoff Center, 1998

The Aronoff Center for Design and Art, designed by Peter Eisenman, is a “landmark” building located at the north west corner of the main campus of the University of Cincinnati, Ohio (Fig. 48). The Center, completed in 1996, is an extension and consolidation of the complex of three previously existing buildings that had collectively housed the College of Design, Architecture, Art, and Planning (DAAP).

The Vital Signs Project, an extensive POE of the extension, was result of a 1998 student project initiated by Professors David Lee Smith and Wolfgang Preiser. Six students coordinated the POE, with the assistance of the student body and staff. The project included measurements of physical building performance, user surveys, and a lively online discussion group. The final report was published online (Vital Signs Project, 1998) and the overview that follows is based on that report.

The purpose of the POE was to determine if the new addition met the needs of the users (students, teachers, and staff). The study examined architectural-, lighting-, and mechanical systems with specific attention to energy use, occupant well-being, and the art and science of creating space. Even though already aging, the POE report serves as a particularly appropriate precedent for the current study.



Figure 48: The main entrance to the Aronoff Center. The new extension is to the right and the existing building is to the left of the photo. (<http://chronicle.com/blogs/buildings/files/2010/10/>)



Figure 49: Fifth and Sixth floor plans, Aronoff Center, clearly indicating the complex circulation routes and warren-like layout (www.daapspace.daap.uc.edu/rooms/)

The project exposed students to a wide range of research activities: they planned, conducted, and interpreted the results of the evaluation. They collected data by conducting surveys, and doing walk-through evaluations; and obtained qualitative information by interviewing the on-site Project Architect, senior academics, the head of DAAP facilities department, and the head librarian. The input of these knowledgeable project stakeholders revealed significant concerns that often remain concealed in such complex projects.

In the report, each space was described in terms of its physical and psychological attributes (Table 6), and illustrated. Space reports referred to:

- Design intent (the aesthetic and experiential intentions as outlined by Eisenman);
- Programmatic intent (the requirements of the particular space identified during the design development phase);
- Technical elements (basic health, safety, and welfare parameters);
- Functional elements (access for personnel and equipment, security, parking, and adequate spatial capacity for the activities to be accommodated);
- Behavioural elements (link between occupants' activities and satisfaction with the physical environment); and
- Internal/External influences (phenomena that the user would expect in the space, but which were not present).

The evaluations did not indicate much satisfaction with studio conditions (Table 6). The research team made the importance of satisfactory studio conditions clear:

The studios are probably the most important spaces within the College of Design, Architecture, Art, and Planning. When building the Aronoff Center for Design and Art addition to the DAAP complex, not only were additional studios provided but most of the existing studios were also partially renovated. This effort was intended to establish “homes” for the numerous students who spend the majority of their time at school in their studios. The studios should contain basic needs of a “home” along with the requirements of an art and/or design studio. The studio needs to be spacious, providing an atmosphere that is conducive to interaction among students, while offering a personal work space. Territorially [sic] is an important issue in studios. One’s supplies and projects must be respected and protected.

When surveyed about the various aspects of the studios, most students rated them only between fair and good.

Table 6: Typical studio space reporting, Aronoff Center

“Human” criteria	Evaluation
<u>Design Intent:</u> Desk space/personal space, natural light, pin-up space, storage space, security, cleaning receptacles, and walking space are all necessary.	Technical Report: Desk space per student needs to be larger, clean-up space is adequate, storage space is small, and not enough pin-up space. Natural light is provided through large windows.
	Survey and Interview Data: Survey results were: Excellent 8%, Good 36%, Fair 40%, Poor 16%
“Facilities” criteria	Evaluation
<u>Illumination:</u> Program Intent: Natural light important for art work Artificial light necessary to supplement during day & night	Technical Report: Natural light from windows, artificial placed well throughout room giving necessary lighting.
	Survey and Interview Data: Survey results were: Excellent 11%, Good 47%, Fair 31%, Poor 11%

<u>Environmental Control Systems:</u> Program Intent: Adequate air flow (cfm) for long hours of drawing and construction of projects Comfortable temperature (20 – 22.2°C) for activities	Technical Report: Studio 6245: The duct work is exposed and suspended from the ceiling. It is not very sturdy and obstructs students plugging cords into outlets. Having the duct work exposed creates additional noise. The cold air returns are located on the wall adjoining the hallway. Due to no natural ventilation, the ECS provides the primary source of air circulation for the rooms.
	Survey and Interview Data: Less than adequate air flow for activities and odours from construction materials Temperature not appropriate for activities Temperature: Excellent 7%, Good 47%, Fair 33%, Poor 14% Air Quality: Excellent 0%, Good 20%, Fair 13%, Poor 67% Odour: Excellent 7%, Good 36%, Fair 39%, Poor 18%
<u>Acoustics:</u> Program Intent: Covered walls to reduce the echo effect and are needed to give clear resonance.	Technical report: Studio 6245: Considered bad acoustics, partitions in middle do no good. Harsh materials, and ECS noise. General levels between 55-57 dB. Background levels between 45-52 dB. Hallway levels at 60 dB.
	Survey and Interview Data: Survey results were: Excellent 6%, Good 46%, Fair 32%, Poor 16%
<u>Interior Finishes:</u> Program Intent: Walls have to be made of a resilient material, durable and easily cleaned Windows need to be large and of thick-paned glass to allow natural light	Technical Report: Walls are made of drywall. Floors are linoleum tile making them easy to clean, and ceilings have artificial lighting. Natural light is sometimes let in through large windows.
<u>Specialization within Building/Space Types</u> Program Intent: Needs to be close to all resources necessary for studio and long hour usage (restrooms, vending, and exits) Desks, partitions, storage space, trash receptacles and cleaning space Socialization areas	Technical Report: Close to emergency exits and stairways. Close walking distance to other important parts of building; bathrooms, elevator, water fountain. Desks, partitions, and storage are provided, but small proportions. Critique space is small and cramped.

Survey and Interview Data: Lighting is supplemented by large windows, but still needs to be brighter. Trash cans and sinks are provided, but socialization space is needed. Survey results were: Excellent 5%, Good 50%, Fair 36%, Poor 9%

(Adapted from www.daap.space.daap.uc.edu/~smithdl/VitalSignsWeb/)

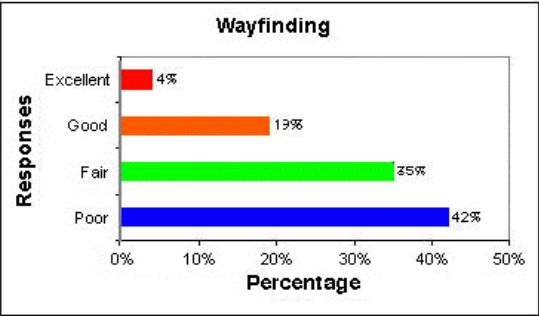
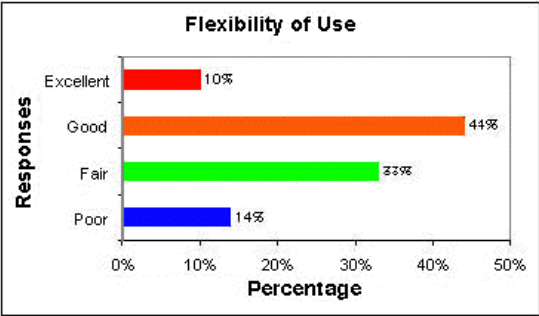
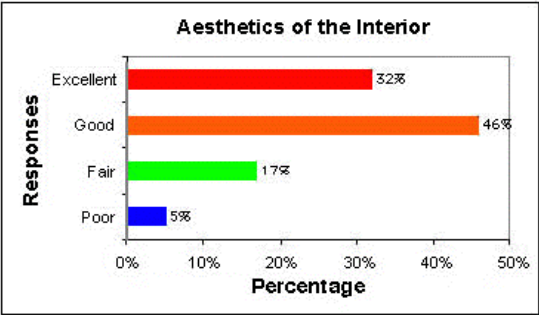


Figure 50a: The Vital signs project interior;

50b: Flexibility of use;

50c: Wayfinding

(www.daap.space.daap.uc.edu/~smithdl/VitalSignsWeb/)

The graphs of responses to attributes of the overall building such as “aesthetics of the interior” (Fig. 50a), “flexibility of use” (Fig. 50b), and “wayfinding” (Fig. 50c) seem to support Yeo’s (2008:271) proposal that attributes with high satisfaction responses can balance those with low satisfaction. These findings are also similar to findings of a study of the same building by Nasar *et al* (2007), in whose study the attributes wayfinding (score 3.36 / 7) and circulation (score 3.79 / 7) were issues of much discontent, despite interior aesthetics (score 5.32 / 7), and relationships (score 4.65 / 7) receiving relatively high ratings. Users are apparently still appreciative of the aesthetics created by the complex interior, despite the subsequent problems experienced with circulation.

Methodology

The coordinating student group met bi-weekly to plan their strategy, complete individual research, discuss various relevant aspects of the building and report together as a group, and to compose assigned sections within the report. In completing the POE process, the student research group followed the following steps:

- Research of previous post-occupancy evaluations (POE’s) of the Aronoff Center conducted by Professor Preiser and other students;
- Review and augmentation of projects completed for the subject ‘Environmental Technology’, which investigated lighting and acoustics levels, thermal comfort and other scientific data that was collected on the building systems;
- Conducting additional tests to determine lighting levels, ambient noise levels and airflow, and comparing results to code requirements and/or industry standards;
- Researching the theoretical development of the design by Peter Eisenman through books, magazines and interviews;
- Acquiring and examining the technical drawings;
- An “intuitive” walk-through conducted by each team member, taking into consideration past experience while using the building, exploration of the facility and speaking with both students and staff members;
- Distributing survey forms to students, teachers, and staff; inputting frequency of response into a spreadsheet and calculating percentages and drawing conclusions from data;

- Interviewing influential stakeholders;
- Photographing the various evaluated spaces to provide a sample perspective, and highlight particular issues;
- Gathering of findings and creating a paper report in addition to the required web site project.

From the extensive amount of data presented in the report, the technical assessments and the conclusions, it is clear that students in the school (or at least those directly involved) were very well prepared for user-sensitive design practice. This study is a valuable example (both of intent and of methodology) to any school of architecture that wishes to implement a POE and / or include POE in its curriculum.

POE precedent 3: Lessons learned from schools of architecture: Nasar *et al*, 2007

Jack Nasar, Wolfgang Preiser and Thomas Fisher (Nasar *et al*, 2007) conducted a meta-POE of seventeen schools of architecture and design across the US, UK and Europe. The results are published in a book titled *Designing for designers: lessons learned from schools of architecture*. In their study the authors asked, and answered, in-depth questions about the facilities provided by schools of architecture. The study was done because the authors could find among all the systematic reviews of architectural education, none that critiqued the buildings which house schools of architecture (*ibid.*:3). They explain that they

“... saw the need for a knowledge base to guide designs for schools of design, a knowledge base that would serve practice and education in schools of design, provide guidance for other university and non-university facilities, and stand as a broader model for an evidence-based and forward-looking design process” (*ibid.*:4).

The authors (*ibid.*:1) point out that many universities seek to enhance their reputation by commissioning “signature architects” to design landmark buildings. These iconic structures are often praised and awarded with prizes, even before construction, only to result in buildings that poorly serve their users (refer to FAMU SoA, above).

Schools included in the study are the Bauhaus in Dessau (Walter Gropius 1925-1926), the winter school of The Frank Lloyd Wright School of Architecture at Taliesin West in Scottsdale (Frank Lloyd Wright 1937), Crown Hall at the Illinois Institute of Technology in Chicago (Mies van der Rohe 1956), and the University of Houston (Philip Johnson 1956). More recent

buildings include the Aronoff Center at the University of Cincinnati (Peter Eisenman 1996), the College of Architecture and Landscape Architecture at the University of Minnesota (Steven Holl 2002), and Knowlton Hall at Ohio State University (Scogin/Elam 2004). Some designs, they (*ibid.*:3) report, worked well (e.g. that of the University of Texas), while other did not (e.g. the University of Sydney). Particularly useful, is the summary of “Lessons Learned” included in each evaluation. Here, the authors concisely summarise their findings, and make suggestions for improvements. The summaries are collated and further explained with the help of statistical data in Appendix B of the book. At the end of the book, not only the survey instrument (Appendix A), but also an in depth ‘user guide’ is provided, thereby sharing the methodology with those researchers or even interested architectural educators who wish to replicate the study. As reference is made elsewhere to several of the school buildings evaluated in the book, individual cases are not discussed here.

POE precedent 4: The Secret Life of Buildings, University of California Berkeley, 2010

For this POE, second year architecture students examined architectural, lighting, and mechanical systems in existing buildings across the UC Berkeley campus. Particular attention was paid to energy use, occupant well-being, and architectural space making. Wurster Hall, the controversial building housing the school of architecture was evaluated under the categories public lighting, ventilation, and water usage.

Students were required to devote two hours to finding information on the actual performance of the building as opposed to its designer’s intent or various forms of speculation. The data was to include:

1. Basic identification of the selected building
2. A succinct statement of the student’s research intent
3. Findings and their source
4. An accounting of where they looked for information (including dead ends).

A reading of the lively communication on the online project blog indicates that students became intensely involved (see Petuskey, 2010). The final report collated from all the student research is no longer available online.

2.6.2 Importance-Performance Analysis

In this section Importance-Performance Assessment (IPA) is presented as an effective, and in the context of this study appropriate, method for conducting a performance gap analysis. How the I-P matrix forms part of the process of developing strategic responses to given problematic situations is explained with the use of precedents. A brief history is included to provide background and context. Applications of I-P matrix analysis can be found in Chapter 4: Results, Reports, and Discussions.

IPA is operationalised with a two-axis model (Fig. 7, 51) that combines both performance- and importance indicators. The latter are included to gain additional insight into how efficiently and appropriately resources are being spent, and to improve change strategies. To obtain both importance- and performance data, the standard POE method is adapted, as explained in Chapter 3.

The aims of the analysis are to:

- **evaluate** user expectations: the importance of selected attributes from the user's perspective;
- **assess** user satisfaction: how those attributes perform from the user's perspective;
- **develop** strategies to satisfy user demands.

With reference to the terminology used in this section:- IPA has been developed for use in the marketing industries and its terminology (such as 'client', 'consumer', and 'service provider') reflects that context. To retain consistency with the literature, some of these terms are used in this document. 'Students' are sometimes referred to as 'clients' (or 'users' or 'learners') depending on the context, and the university or school of architecture is sometimes termed the 'service provider'. The debate around whether it is appropriate to consider students as clients of the university has been discussed previously (2.5.2 The tyranny of the masses?).

Importance is widely accepted to be "a reflection by consumers of the relative value of different quality attributes" (O'Neill & Palmer, 2004:43). Kwok and Warren (2005:5) however admit that in the field of facilities management there is no generally accepted definition of 'performance'. They prefer Atkin *et al's* (2000, in *ibid.*) definition; "the level of

service delivered to clients against agreed standards and targets set out in the service specifications and service level agreements".

The designers, owners, and managers of buildings can achieve a competitive edge when they understand which performance attributes are most important to users, and how users assess that performance (Tanyer & Pembegül, 2010:246). To achieve this understanding, evaluators need proper quality assessment methods that can be used in various contexts without the need for extensive adaptation (Yeo, 2008:283). IPA is an instrument that, as Tanyer and Pembegül (2010:248) point out, has been applied over a long time and in a number of settings with relatively little modification.

Anyone who has implemented student response instruments understands that recent assessment experiences can positively or negatively influence the responses. Yeo (2008:272) believes that the IPA method of "[a]sking students to consider their expectations as well as their experiences provides an opportunity for reflection based on personal desires and contextual considerations", is a built-in defence mechanism against student response bias. Using IPA, Yeo (*ibid.*) believes, makes it less likely that recent assessment experiences will cloud responses and ensures that ratings and feedback by students are more objective and less erratic.

The development of the Importance-Performance Analysis model

IPA is a model for reporting customer satisfaction and identifying those primary service attributes a service provider should focus on. The results allow universities or schools to identify areas of strength (where students report high satisfaction in areas of high importance) and challenges (where students indicate low satisfaction in areas of high importance).

The first article that refers to "Importance-Performance Analysis" is a brief research report by Martilla and James, in 1977. Despite three and a half decades of heated debates, regular criticism and several interpretations to suit the needs of particular disciplines, industries, and statisticians, their traditional model is still extensively used. In their seminal article,

Martilla and James explain IPA as “an easily-applied technique for measuring attribute performance and performance [to] further the development of effective marketing programs” (*ibid.*, 1977:77).

Their research indicated that firms often research client satisfaction with specific features of their products or service. It also showed that when using poorly designed research instruments, managers often find that 1) it is difficult to understand the practical significance of the research findings, and 2) only one side of the equation is determined – either how satisfied clients are with a service, or how important certain attributes are to them. Martilla and James realised that a structured reporting model was needed - one that makes intuitive sense rather than providing feedback in terms of complex constructs such as “coefficients of determination”. For their research project, Martilla and James collected data with a questionnaire on the importance and performance of services delivered by car dealerships. A short 4-point rating scale was used, anchored at 1 = Fair performance and 4 = Excellent performance, and 1 = Slightly important to 4 = Extremely important. The performance data were assigned to x-values and the importance data to y-values and these data pairs plotted on a scattergram referred to as an “Importance-Performance matrix” (Fig. 51). They labelled the X-(horizontal) axis ‘Performance’ (Fair – Excellent) and the Y- (vertical) axis ‘Importance’ (Slightly – Extremely).

The developers of this model claim that its graphic nature that allows for an easily interpreted feedback mechanism, is one of its strongest features. They labelled the four quadrants of the matrix from A to D, as per Table 8.

For a practical illustration of the interpretation this model, consider Table 7, that lists importance and performance data for four typical attributes of a studio in a school of architecture (natural light, noise control, ceiling finish, and pinning boards). The results of (Table 7) are plotted on a scattergram, as seen in Figure 51. In the current study, the I-P matrix is generated using a Microsoft Excel scattergram with the axes crossing at (3.5,3.5) which is the midpoint score on the seven-point rating scale.

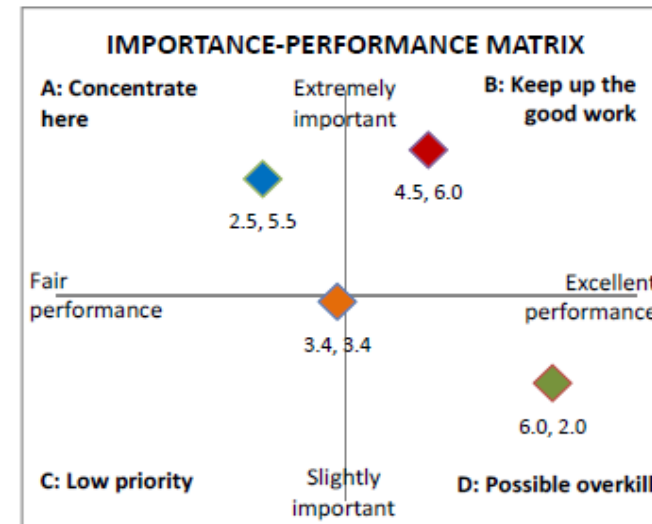


Figure 51: Illustrative I-P matrix for studio performance attributes

Table 7: Performance and importance data table

Attribute	Performance (X values)	Importance (Y values)
Natural light	4.5	6.0
Noise control	3.4	3.45
Ceiling finish	6.0	2.0
Pinning boards (number)	2.5	5.5

(1 = Low importance/performance, 7 = High importance/performance)

By comparing the labelled quadrants of the I-P matrix, to Table 8, it is straightforward to identify which attribute should be attended to most urgently: the number of pinning boards, as it falls in Quadrant A (‘Concentrate here’). Further expenditure on ceiling finishes, falling in Quadrant D and therefore already performing beyond its level of importance, should be carefully considered. Spending resources on ceilings and not on more pinning boards will not only make no difference to studio conditions, it will be a waste. Furthermore, it may even cause resentment on the side of the users of the studio.

Tanyer and Pembegül (2010:247) explain this phenomenon: attributes considered less important (quadrants C and D) have a lesser influence on overall satisfaction, while attributes that are more important (quadrants A and B) play a more critical role in general perception of service quality. Decision makers should therefore consider the knock-on effects of their actions: making changes to one attribute will influence the importance of others (Deng, 2008:256). Still referring to Figure 51, this means that spending money on noise control would probably be much more effective than on spending it on improving natural lighting (although less beneficial than on providing better pin-up facilities). Continuous maintenance of ceilings and particularly of windows is required to ensure continued satisfaction.

In summary, attributes that fall within Quadrant B are strategic strengths, and provide an opportunity for celebration and positive reinforcement within the school (Noel-Levitz, 2011:5). Attributes falling in Quadrant A should be seen as opportunities to redirect resources and refocus dialogue around students' primary concerns.

Table 8 Interpretation of the quadrants of the I-P matrix

Quadrant		Suggested actions
A. Concentrate here	B	These attributes are critical for improvement – they are very important but performance is rated low by the clients. These attributes are major weaknesses in the service provision and should significantly increase satisfaction if improved.
C	D	They should be targeted for immediate intervention (Deng, 2008:254; Tontini & Picolo, 2010:573). Lewis (2004:4) suggests shifting resources from D to A, to achieve this.
A	B. Keep up the good work	Customers much value these and are satisfied with the service . These attributes bestow a competitive advantage (Tontini & Picolo, 2010:566) and appropriate effort is being expended (Lewis, 2004:1). Deng (2008:254) warns that far from being bypassed for attention, they should be maintained, leveraged, and heavily promoted . Tontini and Picolo (2010:573) warn that if performance is reduced here, major customer dissatisfaction can result.
C	D	

A	B	Feedback scores indicate that service provision is rated low on the quality of the service provided, but that this is also not an important service attribute for most clients. As for B, resource allocation is appropriate ; however this quadrant represents attributes that, if judiciously improved, can greatly improve satisfaction (Tontini & Picolo, 2010:573).
C. Low priority	D	
A	B	Clients are satisfied with the service , but as for C, it is not important for their overall satisfaction. The service provider is spending too much effort (Lewis, 2004:1) and may be wasting resources which could be better applied elsewhere (Tontini & Picolo, 2010:566). Shift resources to A (Lewis 2004:4).
C	D. Possible overkill	

Positioning of matrix axes

Martilla and James (1977:79) realised that the positioning of the axes can have an important influence on the interpretation of the matrix. This is because the graph axes indicate “frontiers” (Tontini & Picolo, 2010:573) between improvement categories. Different studies show different attitudes to placement: Tontini and Picolo (2010:579) place their dividing lines at (0,0) which is the neutral / midpoint of their nine-point scale (-4 to +4) (Fig. 52). Tanyer and Pembegül (2010:254) (Fig. 53) use an ordinary Cartesian graph (not a scattergram), and place the axes at (3.0,3.0) as a starting point, thereby cutting off areas which are not populated by data pairs. (This strategy was also applied by Tontini and Picolo.)

IPA is of course not without its detractors, notably Law (2010). Law bases his assessment on a literature review, using arguably outdated material. From this, he deduces that “the P – I [Performance - Importance] difference-score model should be on equally shaky theoretical foundation [as the P – E model] and it is quite surprising to find an almost uncritical acceptance of this model in the IPA literature” (2010:259 – 260).² Law (*ibid.*) also criticises the dynamic nature of axis positioning and considers it an indication that the I-P grid is still “somewhat underdeveloped”.

² For a detailed explanation of P – E models such as SERVQUAL, refer to Kitcharoen, 2004; and Kasim & Dzakiria, 2001 below; and to ‘Disconfirmation theory’ (2.7: Data analysis.)



Figure 52: I-P matrix for supermarket customer satisfaction (Tontini & Picolo, 2010:579)

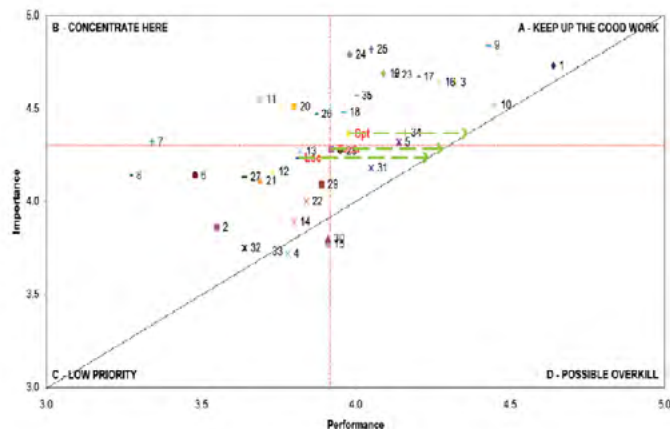


Figure 53: I-P matrix for the users of a convention center (Tanyer & Pembegül, 2010:254)

Tontini and Picolo (2010:574) take a more positive approach to IPA, proposing that a “soft approach” to axis positions, permits the analyst to consider final positioning relative to borderline cases. A somewhat more sympathetic overview of IPA methodology can also be found in Bacon (2003).

Kasim and Dzakiria (2011:23), O’Neill and Palmer (2004) and Lewis (2004) all point out that few IPA studies include sufficient qualitative data to make survey results better understood. This shortcoming is addressed in the data collection process for the current study, by including several open ended questions to further expand on scale-based responses.

There are many examples of the use of IPA as a research instrument in the higher education field and the method is used as the basis for nation-wide student satisfaction surveys both in the UK and in the US. The following examples of Importance-Performance Analysis studies were selected, as they are all in some way similar to the current study: 1) The Noel-Levitz Student Satisfaction Survey is used for surveys across different colleges; 2) O’Neill and Palmer (2004) did ground-breaking work in testing the use of IPA in the Higher Education sector; 3) Kitcharoen (2004) combined IPA with another research method (SERVQUAL); 4) Lewis (2004) did a small-scale evaluation of resource expenditure on a university course; 5) Silva and Fernandes (2010) studied quality attribute performance from students’ perspective; and 6) Kasim and Dzakiria (2011) used IPA to study external campus facilities.

IPA Precedent 1: The Noel-Levitz Student Satisfaction Inventory

The Noel-Levitz Student Satisfaction Inventory (SSI) is a commercially available instrument, developed for use by colleges in the US. The 2011 SSI report contains the satisfaction- and importance ratings of 81 094 students gathered from 2008 – 2011 (Noel-Levitz, 2011: Appendix 2:2). Twelve categories containing 79 items are included, of which two are common to this study: Safety and Security, and Campus life. A focussed survey on university selection reveals that geographic setting and campus appearance rank higher in importance than recommendation of the institution by others.

Noel-Levitz (2011:11) have found that institutions which respond to the ‘strength’ and ‘challenge’ indicators benefit from their actions. Successful participation in a national benchmark initiative requires regular surveys, reviewing and sharing the results, responding to challenges with new initiatives, and closing the feedback loop by communicating what has been accomplished.

The Noel-Levitz SSI is a suitable precedent study for large scale and longitudinal studies of student satisfaction. Its focus however is the complete student experience and as such, it is not sufficiently finely differentiated on aspects of the physical learning environment to be used as a framework for this study.

IPA Precedent 2: O'Neill and Palmer, 2004

O'Neill and Palmer (2004) published one of the first studies on the use of IPA in a higher education environment. They deducted from existing client satisfaction studies that not only academic strength but also the quality of support services affect whether students recommend a university to others. To understand this phenomenon they researched students' attitudes towards the quality of service provided by administrative support mechanisms at a large state university in Western Australia.

When selecting and implementing a method to measure student perceptions of service quality, O'Neill and Palmer found that many of these techniques were too costly, too complicated, or inappropriate for what they wanted to measure. They also found that many methods had become so strongly geared toward psychometric performance, that there remained little regard for their practical value. The challenge for evaluators, explain Kwok and Warren (2005:2) is measuring importance, and measuring what is important, rather than becoming overly concerned with the process of measurement. An important part of O'Neil and Palmer's (*ibid.*) study, in addition to the importance of service quality, was their investigation of whether IPA as a measurement instrument is both psychometrically and practically sound. O'Neill and Palmer's goal was similar to the goal of the present study, and is therefore discussed in more detail.

As for the studies by Kitcharoen (2004), and Kasim and Dzakiria (2011), attribute variables were based on the 22 items of the original SERVQUAL (see 'Disconfirmation theories'). In keeping with similar survey adaptations, a series of three focus groups was conducted to adapt the SERVQUAL scales to suit their research goals. In the interest of instrument validity, O'Neill and Palmer asked the focus groups to consider each survey item and suggest alternatives. (It is interesting to note, that even though the groups were specifically required to consider 'soft' service quality factors, one of the items which strongly emerged was "aesthetically pleasing environment".) The refined scale items, combining performance and importance, were compiled in a self-completion questionnaire. Attributes were listed on a five-point Likert scale anchored between 1 = Strongly disagree and 5 = Strongly agree for performance; and 1 = Low importance to 5 = High importance for importance.

O'Neill and Palmer administered the questionnaires within the normal classroom setting with the co-operation of academic staff, and also surveyed students at a number of central points on the campus. The process took one week. Of the 500 questionnaires handed out, 368 usable returns were returned, representing a valid response rate of 76.5 per cent. Using students in an almost 'captive' environment facilitated this high response.

The researchers report that the instrument performed well in terms of both reliability and validity. This indicates that when done with care and concern for the questionnaire design process, adaptations of existing and proven methodologies can be successful. Analysis of response results indicated varying levels of importance attached to different administrative support functions. The researchers could therefore conclude which attributes would benefit most from improvement efforts. The positioning of the axes in the I-P matrix (*Fig. 54*) should be noted: both were moved beyond the halfway mark. Moving the axes to 3.0, 3.5 would place 'Process' in Quadrant B and requiring no further action while 'Empathy' would fall into quadrant A with 'Process', both requiring urgent attention. This underscores the importance of the positioning of the axes is for strategic decisions. 'Tangibles' is however firmly and safely positioned within quadrant D and will require only occasional review to ensure that it remains there.

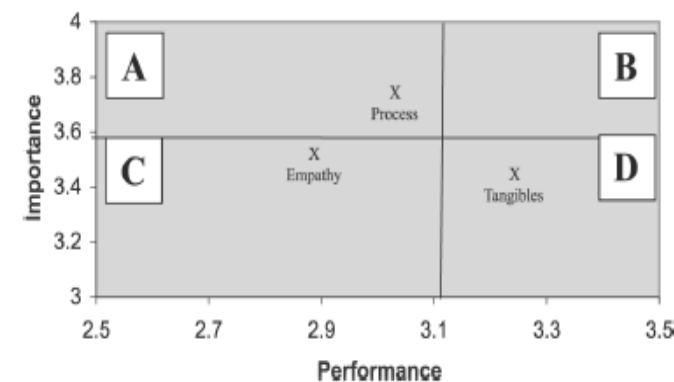


Figure 54: IP matrix of service quality attributes at a large Western Australian university (O'Neill & Palmer, 2004:48)

A critical observation by O'Neill and Palmer of their own study, is the lack of a qualitative component in their final questionnaire (a finding echoed by Kasim & Dzakiria, 2011). Purely quantitative analysis, they observe, did not explain *why* the observed ratings had occurred.

The timing of questionnaires is also in their opinion significant: while a first year student may still be smarting from problems with application and registration (and therefore rate relevant attributes within the 'process' and 'empathy' categories very low), a more senior student may be much more concerned with tangibles such as library services and assess these more critically. This indicates an advantage in the current study: all the students surveyed are senior students and are likely to have broadly similar concerns. They can also be expected to be more concerned with the tangible attributes being tested.

A particularly important outcome of O'Neill and Palmer's (2004) study is that it supports the hypothesis that IPA is a potentially valid method with great practical value for both assessing, and directing quality improvement efforts in schools of architecture. Healthy debates may continue around the definitive characteristics of constructs such as 'performance' and 'quality' and the 'one best way' to evaluate the data, but in practice, IPA can be seen to "identify how educational services are performing, pin-point specific problem areas and help target corresponding improvement efforts" (O'Neill & Palmer, 2004:49).

IPA Precedent 3: Kitcharoen, 2004

Kitcharoen's (2004) cross-institutional investigation took a similar methodological stance to the current study. Kitcharoen used a combination of SERVQUAL and IPA to compare staff and students' perceptions about service quality (for a more detailed discussion of SERVQUAL, see 2.7 Disconfirmation theory). Data was gathered from both target groups at 26 Thai universities. 384 students ($n=207$ 136) and 357 university staff members ($n=5$ 600) were surveyed to find out if there is a difference between student and staff perceptions, and whether perception of service quality correlates with satisfaction. A modified SERVQUAL questionnaire with a 5-point rating scale was used.

A self-administered questionnaire was mailed to staff members but students were asked to complete a questionnaire in person. The outcomes of Kitcharoen's study correlated with those of Silva and Fernandes's (2010) research: that there are differences in perceptions of service performance by staff and students. Designers of surveys, and decision makers using IPA should take this difference into careful consideration when making decisions about their target population, the data they intend to gather, and therefore questionnaire design.

Incidentally, study results also indicated that students' satisfaction with service quality positively affected pride in their universities.

IPA Precedent 4: Lewis, 2004

Lewis (2004) conducted an IPA to identify how resources could best be allocated to address possible shortcomings in a university course. The study was conducted on first- and second year classes in mechanics at the University of Wollongong, Australia.

The reason for selecting IPA as the research method was to combine "ubiquitous, but often one-dimensional" (Lewis, 2004:2) performance ratings with importance ratings so that greater insight could be applied when developing change strategies. Lewis added a series of "importance" related questions to a standard teaching evaluation questionnaire. These were rated on a five-point Likert scale.

All the results were clustered in quadrant B (Fig. 55a and b), raising the concern that the students had not been discerning enough in their assessments. To address this problem, Lewis (*ibid.*:5) relocated the X and Y axes from (0,0) to (2.5,4.0) (Fig. 55b) which resulted in a much more differentiated data scatter. This adjustment to the positioning of the axes made a significant difference to many of the attributes, changing their status from quadrant B to quadrant D and in two cases even to quadrant A.

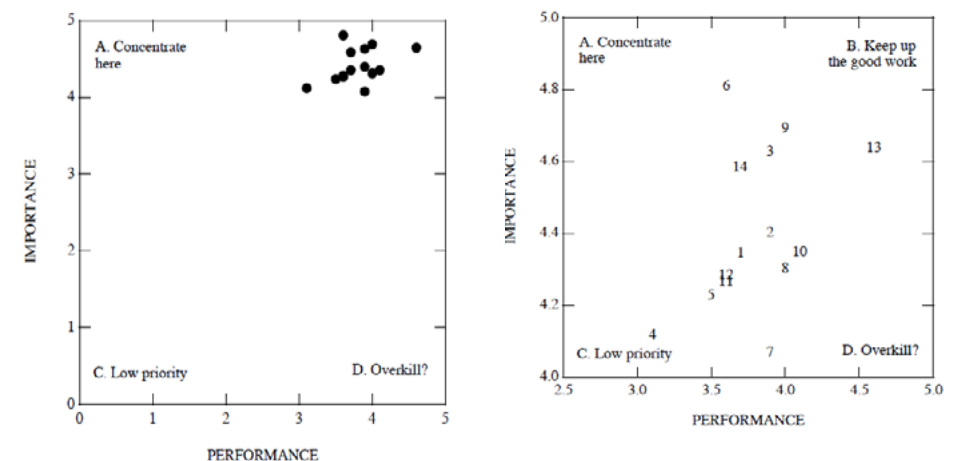


Figure 55a and 55b: University of Wollongong: undifferentiated and differentiated student feedback data (Lewis, 2004:7-8)

A criticism of the presentation of the data, is that without graphically delineated boundaries clear interpretation of the positioning of data points is not easy.

Lewis (*ibid.*:7), like Kitcharoen (2004) and Silva and Fernandes (2010), acknowledges that additional research is necessary to differentiate the attitudes of different user groups. These differences were not formally examined in Lewis's study but he (*ibid.*:8) concludes that IPA, even with its acknowledged weaknesses, provides a broader base for evaluation in higher education than performance evaluation alone.

IPA Precedent 5: Silva and Fernandes, 2010

Silva and Fernandes (2010) collected data from 695 undergraduate students at the Polytechnic Institute of Bragança (Portugal). The questionnaire on general aspects, the library, computer laboratory facilities, academic services, teaching aspects, undergraduate programs, and external relations was administered in their classrooms. Results show that the students are generally satisfied with their institution (Fig. 56). The results however, as for Lewis (2004), are clustered in quadrant B, and an even higher performance than importance score was registered for each of the items (performance mean of 4.34 / 5).

Silva and Fernandes conclude that policy and quality improvement plans can be based on IPA results, but warn that results should not be generalised and that differences in priorities between target groups should be taken into consideration when decisions are made. A

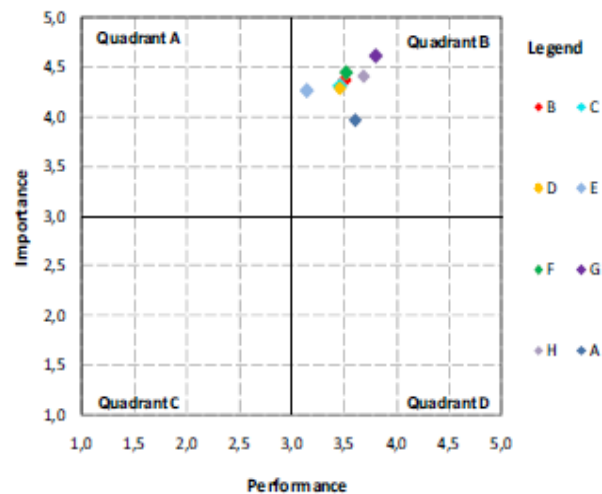


Figure 56: I-P matrix for Silva and Fernandes study (Silva & Fernandes, 2010:122).

valuable exercise for Silva and Fernandes may be to apply Lewis's (2004) method of re-dividing the results into four quadrants to achieve more significant result differentiation.

IPA Precedent 6: Kasim and Dzakiria, 2011

Kasim and Dzakiria (2011) used IPA to assess the quality of recreation provision at the Northern University of Malaysia (NUM). Data were collected from 1 214 first- to fourth year students across various disciplines. Similar to the studies by Kitcharoen (2004) and O'Neill and Palmer (2004), categories for the questionnaire were based on the SERVQUAL instrument (see 2.7 Disconfirmation theory).

The study evaluated the accessibility, adequacy, suitability, availability, and benefit of recreation services on a five-point Likert scale. To improve qualitative insight, two open-ended questions were included. Similar to most IPA studies, the purpose was to: 1) evaluate the importance of selected attributes from the users' perspectives (i.e. user expectations); 2) assess the performance of how those attributes perform from the user' perspectives (i.e. user satisfaction); 3) develop an Importance-Performance Matrix; and 4) recommend which attributes to maintain, improve, give less priority to or even ignore.

Together with the I-P matrix (Fig. 57), paired sample t-tests showed a significant difference between the level of importance and satisfaction. (Paired sample t-tests are performed by subtracting the importance values from the performance values for the same question.)

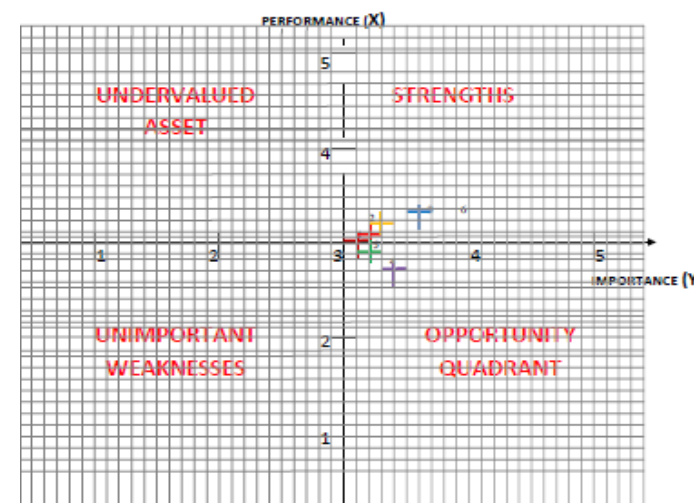


Figure 57: Importance-Performance matrix for campus recreational facilities at NUM (Kasim & Dzakiria, 2011:19)

Kasim and Dzakiria claim that their study provides further proof of the usefulness of I-P analysis by providing both a snapshot image, and an overall picture of the tested conditions. Such information they claim, can help managers to identify problem areas, and formulate suggestions to improve the situation. They also emphasise that sole dependence on I-P analysis is not enough and that quantitative findings must be supported with qualitative data from open-ended questions.

Summary and discussion

The foregoing case studies indicate many of the positive, as well as the negative aspects of Importance-Performance Analysis. SERVQUAL (see 2.7 Disconfirmation theory) was successfully adapted for use in three of the studies (Kasim & Dzakiria, 2011; Kitcharoen, 2004; O'Neill & Palmer, 2004), while one study was an adaptation of a tried and tested student satisfaction survey (Lewis 2004).

Two of the studies highlight the importance of qualitative data to provide a context for the quantitative data (Kasim & Dzakiria, 2011; Lewis, 2004).

Two of the studies resulted in a consistent attribute grouping in quadrant B (Lewis, 2004; Silva & Fernandes, 2010). Rather than taking this outcome at face value, researchers should follow Lewis' (2004) method of re-analysing that quadrant under a stronger lens. Including qualitative data in the questionnaire should also provide deeper insight into respondents' attitudes.

Kitcharoen's (2004) findings that different stakeholders have different points of view about the quality of the same spaces, is definitive proof that different questionnaires have to be developed for testing each target group.

Despite identifying some inevitable shortcomings in the method, the researchers of all six studies concluded that IPA is a suitable method to identify areas of strength and weakness in the service provided by HE institutions. As no significant indicators were found in any of the six case studies that IPA is not valid and reliable, its suitability for achieving the research aims of this study has been confirmed.

2.7 DISCONFIRMATION THEORY

'Disconfirmation' theories aim to measure quality of service by comparing client expectations of products or services, to the perceived quality of delivery. Whether it is even possible to measure a subjective construct such as quality, is still a topic of much research and debate. Quality evaluation is a relatively new concept in higher education, and as O'Neill and Palmer (2004:40) observe, "[t]he term 'quality' did not exist in the lexicons of most universities until a couple of decades ago". Gallifa and Batallé (2010:157) believe that "discovering student perceptions of quality may be a quest", to which Cramer (2011:55) laconically adds "there are better and worse schools [but] quality is hard to measure". Yeo (2008:268) explains that the lack of standardisation of measurement of quality is because each customer's expectation of service quality is different, and varies from situation to situation.

Disconfirmation theory is a complex construct, but the following section aims to provide a simplified explanation. By implementing the equation $P - E$ (perception-minus-expectation) to performance and satisfaction data, researchers seek to confirm or disconfirm the presence of customer satisfaction. (Statisticians call this type of comparison a 'paired sample t-test'). SERVQUAL was the first major instrument developed to measure disconfirmation.

Originally developed in 1985 by Parasuraman, Berry and Zeithaml (Parasuraman *et al*, 1991), SERVQUAL has been customised to form the basis of many subsequent instruments to measure service quality (e.g. Angell *et al*, 2008; Kasim & Dzakiria, 2011; Wright & O'Neill, 2002). As implied in the name, the SERVQUAL model measures five categories of 'service quality' attributes. Yeo (2008:270-271) attempts to relate the general SERVQUAL service qualities to those particular to HE institutions (Table 9).

Yeo (2008) find the 'tangibles' category problematic, as "service performance should go beyond tangible forms". It is argued however, in terms of the parameters of this study, that tangible service provision can incorporate the quality of the physical environment that supports teaching and learning.

Table 9: Service quality attribute categories

Service quality attribute	Traditional SERVQUAL interpretation	HE environment
Reliability	Consistently delivering the promised service	Reliable service provision that complies with promises made in branding campaigns and course brochures
Responsiveness	The ability to update, adjust or customize the contents and delivery of a service	Responsiveness to the shifting needs of students
Assurance	The capability of the service provider to deliver the promised service	Assurance that the more important the service standard, the less tolerance for mistakes
Empathy	A caring and customer centred 'soft' environment	An empathetic approach to contextual requirements such as limited class sizes and the need for individual attention
Tangibles	The 'hardware', or infrastructure	The physical on-campus learning environment

(Adapted from: Angell *et al*, 2008; Kasim & Dzakiria, 2011; Wright & O'Neill, 2002; Yeo, 2008).

To address the perceived shortcomings of SERVQUAL, Cronin and Taylor (1992 & 1994, cited in Law, 2010:259) developed an alternative instrument called SERVPERF ("service performance"). SERVPERF circumvents the issues surrounding the measurement of expectation by simply omitting it from the model and is therefore conceptually linked to Post-Occupancy Evaluation, but not to Importance-Performance Analysis or the aim of this study.

Not all researchers in the field of service quality measurement agree with disconfirmation theory. Some (Angell *et al*, 2008:238; Wright & O'Neill, 2002) strongly support the concept. Others believe that the theory is inherently flawed because it is impossible to objectively assess expectation after experience (Cronin & Taylor, 1992, in Angell *et al*, 2008:238); or that I-P theorists are simply not critical enough of their theoretical underpinnings (Law, 2010). To address Cronin and Taylor's (*ibid.*) objection, Tanyer and Pembegül (2010) asked respondents in their research project to complete two questionnaires: one on the importance of selected attributes *before* "the consumption experience" (*ibid.*:248) and

another, on the performance of the service *after* the experience. This method is possible where the experience is relatively brief – in their study, attending a convention. Students at a school of architecture, who are likely to attend one school only, cannot knowledgeably frame expectations beforehand; and after up to seven years of study they are unlikely to be able to accurately revisit their initial expectations. This approach is therefore not considered a practical option for implementation in the current study.

Law's (2010) misgivings about the validity of IPA theory is not shared here. Based on the foregoing reviews of literature and case studies, it is proposed that there is by now a wide enough body of published work on its theoretical constructs and empirical research to indicate that IPA is a valid methodology for measuring and reporting gaps in service provision.

KANO'S MODEL AND DERIVATIVES

One of the most widely supported criticisms of the original IPA model of Martilla and James (1977) is that it assumes a linear relationship between the importance and performance of an attribute's performance. As the outcomes of this study lends weight to this criticism, it is discussed in some detail here.

Some researchers (e.g. Arbore & Busacca, 2010; Deng, 2008; Tontini & Picolo, 2010) believe that in most situations the relationship between importance- and performance ratings for an attribute is non-linear and asymmetrical. Three models based on this theory were reviewed, and preliminary conclusions drawn about the suitability of their application in the current study. One of the first indications of a major move toward changes to the original Martilla and James IPA model was an article published in 1984 by Dr Noriaki Kano and a team of fellow researchers, called "Attractive quality and must-be quality"³. Kano and his colleagues believe that certain "must-be" service qualities (also termed excitement factors / satisfiers) will affect customer satisfaction negatively if they are not provided, but will not improve satisfaction if more than the minimum resources are spent on them.

³ Kano N, Seraku, N, Takahashi, F & Tsuji S. 1984. Attractive quality and must-be quality. *Quality, the Journal of the Japanese Society for Quality Control* 14 14(2), 147-156. The article was published in Japanese and could not be sourced in English translation. Abstract available in English at <http://ci.nii.ac.jp/naid/110003158895/en/>

“Attractive” qualities on the other hand, will “delight” customers if they are provided but will not disappoint if they are not provided. An example of an ‘excitement factor’ is the digital fabrication lab at the Taubmann College of Architecture and Planning, University of Michigan (Fig. 59) – just the name, FAB lab, is an indication of its impact on student satisfaction. The attribute categories in the Kano model and its derivatives are summarised in Table 10.

Similar to the previously discussed SERVQUAL model, the original Kano model divides service quality into five categories: attractive, one-dimensional, must-be, indifference, and reverse (Deng, 2008:255). In subsequent models, this framework was simplified into a three-part structure of basic, performance, and excitement factors (Table 10). When studying the Kano Model (Fig. 58) it is clear that Kano *et al* acknowledge that there are attributes that have a straight forward linear performance. Following are three case studies of research based on the Kano model: the Student Satisfaction Approach that is directly based on Kano *et al*, Deng’s Fuzzy set theory that claims to statistically derive accurate importance values; and Tontini and Picolo’s Improvement Gap Analysis that questions the accuracy of implicitly stated importance and performance ratings.

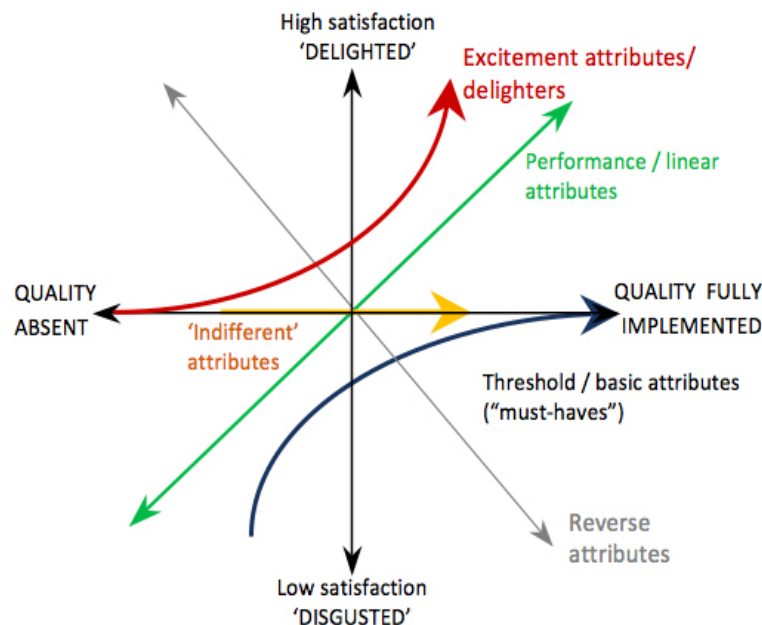


Figure 58: The Kano Model (after www.ifm.eng.cam.ac.uk/dmg/tools/definition/kano.html)

Table 10: Kano model - attribute categories

Kano model category	Alternative categories	Interpretation
Attractive	Excitement factors, satisfiers	Increase satisfaction if provided, but do not cause dissatisfaction if not provided; excellent performance has a greater impact than poor performance; critical when performance is high, irrelevant when performance is low; often rated lower in importance than basic and performance attributes.
One-dimensional	Performance	Linear relationship. Better performance results in greater satisfaction; poor performance results in dissatisfaction.
Must-be	Basic factors, dissatisfiers	The basic functions of a service; minimum requirements that produce dissatisfaction when not provided but do not result in satisfaction if provided or even exceeded; non-performance has a negative impact on satisfaction but excellent performance does not improve satisfaction; often rated with inflated importance; crucial when performance is low, unimportant when performance is high. Deal breakers, clients won't consider service without this attribute.
Indifference		Not of interest or concern to customers, customers simply don't care.
Reverse		Customers would prefer not to have this, may even pay not to have it. Presence is dissatisfying, absence is satisfying.

(Adapted from Deng, 2005; Tontini and Picolo, 2010)

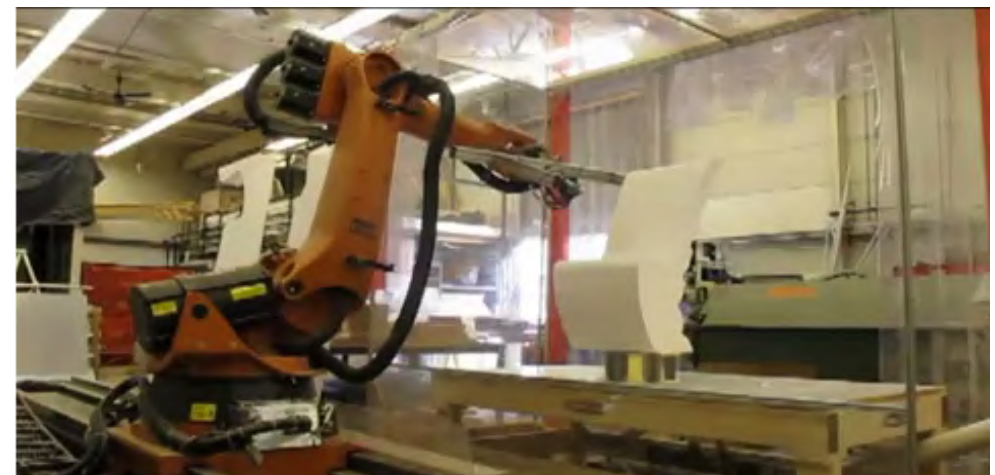


Figure 59: The digital fabrication lab (FAB lab) at the Taubmann College of Architecture and Planning (www.annarbor.com/business-review/u-of-m-opens-state-of-the-art-digital-fabrication-lab/)

The Student Satisfaction Approach

The Student Satisfaction Approach (SSA), developed by the University of Central England (UCE) in Birmingham, is directly based on the Kano Model. It is particularly interesting to note that the SSA questionnaire content is not fixed, but annually re-populated with the results of focus-group discussions and analysis of comments made in the previous year's questionnaires (Kane *et al*, 2008: 136; Law, 2010:257; Westney, 2007:2). The SSA is therefore strong in the category of "responsiveness" (see Table 9) by acknowledging the importance of student input into survey design, and the dynamic nature of student needs and priorities. Results are analysed and used to design targeted improvement strategies at both institutional and departmental levels.

Kane *et al* (2008:136) consider the major attributes of the SSA to be: 1) the research focuses on the total learning experience as defined by students; 2) satisfaction and importance ratings are examined to identify which areas are important for students, and 3) areas that are important to students but where they are dissatisfied, are priority areas for management intervention.

A criticism that can be levelled at the SSA, is that despite a very intricate feedback mechanism, it is based on scales that only differentiate three levels of importance, and five levels of performance. The SSA seems to be an ideal instrument for its particular application, which is to routinely collect a great deal of data from a large number of respondents. Its classification- and interpretation methods are however more complex than that of the classic I-P matrix and for that reason, while the SSE is acknowledged as an excellent example of collecting student satisfaction data and implementing the results in an effective and transparent manner, it is not appropriate for the current smaller scale study.

Kano's model has motivated a number of studies to prove his hypothesis that the relationship between performance and importance is not linear or symmetrical. The common theory underlying these studies is that statistically derived importance ratings are more accurate than explicitly stated ratings (i.e. those that are gathered directly through questionnaires). As Tontini and Pico (2010:567) observe, in most cases attributes are rated more important than what they rationally are. The next two case studies address this concern.

Fuzzy set theory

Deng's (2008) model of Fuzzy Importance-Performance Analysis (FIPA) is based on the premise that human perception is 'fuzzy', rendering the method of assessing attribute importance in traditional IPA psychometrically invalid. Fuzzy theory was first introduced by Zadeh in 1965 and is applied to problems where uncertainty exists, explains Deng (*ibid.*:256). In the case of IPA the uncertainty exists around the fact that human judgements of the same situation vary significantly. Temple (2008:238) astutely observes that students are more likely to complain if they are dissatisfied, than to compliment if they are satisfied. Linguistic assessment methods (e.g. 1 = Unimportant), Deng (*ibid.*) believes, are problematic as the same word can have very different meanings for different respondents. Subsequently, "the use of binary logic and crisp numbers to describe human perceptions or attitudes fails to address fuzziness" (Deng, 2008:254). He then proceeds to propose a three factor, partial correlation, natural logarithmic transformation model to interpret human perceptions.

FIPA relies on a complex process of "fuzzifying" importance rating scores for individual respondents. These scores are then "defuzzified" (*ibid.*:258) using "some necessary arithmetic" (*ibid.*:260) to arrive at "crisp" performance and importance values for each respondent, for each attribute. These data pairs – directly measured performance values and statistically derived importance values – are then plotted on a standard I-P matrix.

Deng (2008:259) claims that the advantages of his method are that 1) statistically derived importance data reduces the inaccuracy of 'fuzzy' importance values, and 2) the data collection questionnaire is much shortened. This is because only performance data are gathered directly from respondents, and multivariate normal correlation is used to implicitly derive the importance values. While Deng has empirically tested his model, there has not been a comparative traditional IPA study to prove his claims that FIPA is superior to traditional IPA. There is thus no conclusive proof that some additional qualitative data cannot make the statistical and mathematical complexities of fuzzy theory redundant. Tontini and Pico (2010:570) also express doubt that the method is unfailingly accurate. For these reasons, Deng's model was not selected as a data interpretation tool for this study.

Improvement gap analysis

Tontini and Picolo (2010) developed their Improvement Gap Analysis (IGA) model to overcome the limitations of traditional IPA. Similar to Deng (2008) they believe that if left unmanipulated, explicitly stated performance and importance opinions may lead to poor or even wrong improvement decisions. They (*ibid.*:567) claim that attributes with low variation in importance among customers are typically rated as less important than those with significant variation. In other words, respondents with a particular grievance or requirement will rate that attribute with greater importance than they would if they were satisfied or unconcerned. Tontini and Picolo (*ibid.*) propose that by assessing the performance of one service provider relative to that of its competitors, it is possible to direct resources most effectively to improve competitiveness. The crux of the IGA model is that when the performance of a basic attribute (Fig. 60) is equal to that of a competitor (or the industry in general) and already performing adequately, increasing its performance will not result in a strategic advantage (*ibid.*:568).

The IGA model requires respondents to compare experiences in a general context (for example, with all supermarket chains) with their experiences in a specific context (e.g. with a new supermarket). As architecture students very often attend only one school, this type of assessment is not feasible. The IGA model is therefore not considered suitable for application in the current study.

The IGA model is an adaptation of an earlier model, the Competitive Analysis of the Improvement Gap (CAIG), developed by Tontini and Silveira (Tontini & Picolo, 2010:570). CAIG compares the performance of organisations relative to each other with the purpose of assessing how one organisation can improve its competitive advantage over the other/s. In the case of the current study, such an analysis is possible as the required data is available, but it is not in line with the research goal of this study. It is of course, a possible basis for future studies based on the data gathered with the measurement tools being developed.

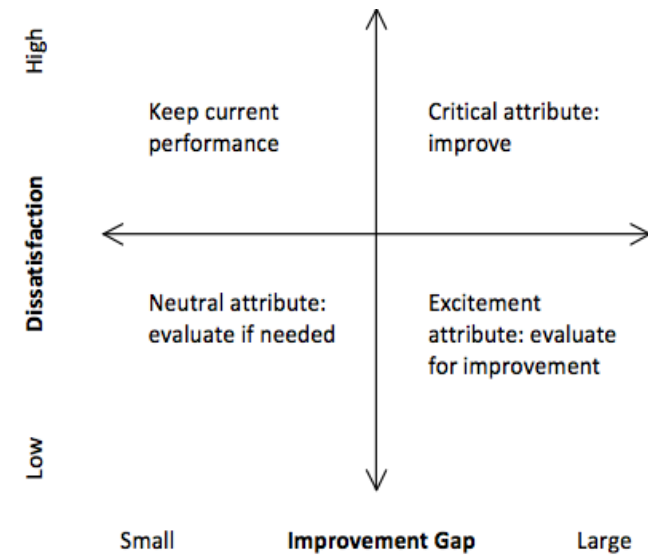


Figure 60: Application of I-P matrix to Improvement Gap Analysis (Note that as performance is plotted on the Y-axis and not on the X-axis as in the traditional I-P matrix, the arrangement of quadrants A – D is different).

2.8 CHAPTER SUMMARY

This chapter was structured around two main elements. In the first part, an overview of the literature on spaces and places in which learning takes place was followed by a review of the preferred attributes of an on-campus learning environment for students of architecture. The impact of physical design on the quality of places of learning was reinforced. It was proposed that a tendency to design architecture schools without users' specific needs in mind, is in part the cause of the typical poor quality of spatial facilities in such schools. Debates in the fields relating to the research were discussed.

The second part of the chapter focused on the principles of Post Occupancy Evaluation and Importance-Performance Analysis, which were illustrated with the use of precedent studies. Criticism of IPA, and alternative models was briefly reviewed.

Despite shortcomings (which are further discussed in Chapter 4: Results, Reports and Discussions) it is concluded that despite some shortcomings, POE and IPA are suitable research instruments for achieving the goals of this study.

3 Methodology

3.1 Chapter overview

3.2 Implementing POE and IPA as research methodology

3.2.1 Performance criteria and performance indicators

3.2.2 Data collection

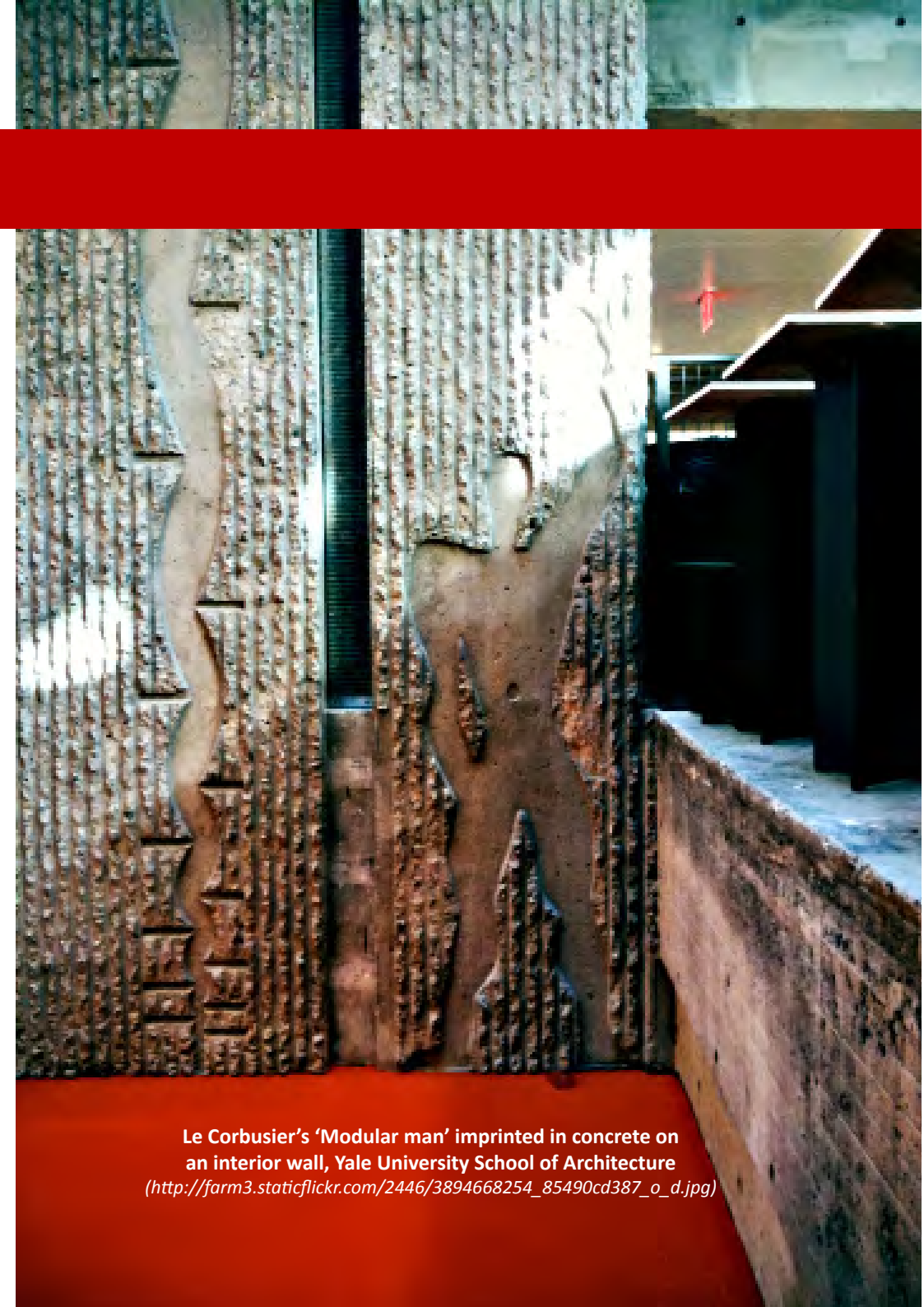
3.3 Development of a trial questionnaire

3.3.1 Populating the questionnaire

3.3.2 Pilot questionnaire design

3.3.3 Lessons learned: Discussion of IPA questionnaire and revisions

3.4 Chapter summary



Le Corbusier's 'Modular man' imprinted in concrete on an interior wall, Yale University School of Architecture
(http://farm3.staticflickr.com/2446/3894668254_85490cd387_o_d.jpg)

3. METHODOLOGY

3.1 CHAPTER OVERVIEW

The structure of this chapter reflects the two foci of the current study: 1) identifying the attributes (or variables, or criteria) that influence student satisfaction, and 2) designing and testing a questionnaire that operationalises those variables. While Chapter 2, the literature review, reviewed the theoretical underpinnings of POE and IPA, this chapter considers the application of the theory. The general principles of Post Occupancy Evaluation and Importance-Performance Analysis methodology are reviewed; and the theoretical underpinnings of questionnaire design are discussed. In this chapter the reasons for selecting a combined application of POE and IPA as the methodology for this study, will be reviewed. The process of compiling the attribute list and the data collection instrument will be explained, followed by the implementation of the pilot study and finalising the questionnaire that was used in the field.

3.2 POE AND IPA AS RESEARCH METHODOLOGY

It has been established that the 'learning environment' is the place where learners socialise and share both common and personal experiences. The learning environment can therefore be said to form a stage where the academic, social, built, and personal environments of individual learners interact to form a chapter, or an act, in the 'story' of their cognitive development.

Standards have been developed to assure quality control in building design, from pragmatic building regulations and health-and safety standards, to more specialised guidelines for designing and equipping specialised buildings. There is however, a lack of specific guidelines for professional teams tasked with the design of a school of architecture. This may seem a contentious statement, as it appears logical that qualified architects should be capable of designing schools of architecture. The school buildings discussed in the literature review,

present a strong counter argument. Without carefully analysing the particular requirements of their client school, architects cannot depend on their own past experience to design schools that will satisfy future users. Importance-Performance Analysis presents architects with the opportunity to identify the shortcomings of existing schools and the priorities of the current student cohort before designing new facilities.

Institutional managers, architectural designers, and educational practitioners wish to provide a good quality learning environment. The problem is that they seldom understand this "intrinsically fuzzy and ill-defined" (Gruenewald, 2003:622) concept well enough to use the coordinated approach required to achieve student satisfaction. Surveys are often implemented in an attempt to fathom student opinions (See Annexure C). Unfortunately, the best-intended surveys are often in-house attempts that do not comply with rigorous requirements for validity and reliability (Law, 2010:252). Just as many well-intending managers or educators implement poorly designed questionnaires because they do not comprehend the intricacies of good questionnaire design, many architects design poor schools of architecture because they do not understand the intricacies of good learning environments. The many debates and research projects around the requirements for learning underscores Wilson's (1995:3) comment that "an environment that is good for learning cannot be fully prepackaged and defined". The result is that many architecture students learn about the best practices in their chosen field in poor examples of its application.

Even if evaluation of user satisfaction is done, poorly designed measurement instruments almost inevitably reflect the biases of their designers, and the researchers that use them. It is only by using psychometrically valid techniques, Nasar et al (2007:63) believe, that researchers can attempt to quantify and evaluate the perceived qualities of buildings and hope to achieve agreement across a cross section of the user population. By systematically evaluating their product and sharing their findings, architects may come to an agreement on required performance standards (Nasar et al, 2007:63).

The use of student feedback questionnaires is a thoroughly researched field but Law (2010) has found many shortcomings in individual instruments. Even data collection instruments based on much-used instruments such as SERVQUAL and SEEQ (Students' Evaluations of Educational Quality) are not satisfactory in Law's (*ibid.*) opinion. O'Neill and Palmer (2004:39) found that many measurement instruments are psychometrically sound, but are difficult to use.

The debate around the psychometrics of quality assurance research methods should be of interest to researchers in all fields, and careful planning is necessary in the early design process of any survey initiative. Obtaining formative feedback from users is valuable for developing a dependable research instrument. Martilla and James (1977:79) do not go into much detail about data collection in their seminal article on IPA, but do make the following recommendations:

1. Determine which attributes to measure. Overlooking important factors will limit the usefulness of the data. Developing the attribute list should begin with identifying key features of the "marketing mix" (or in the case of this study, the desired learning environment). This step is followed by a review of previous research in the same or related areas, and obtaining context-specific insight by conducting focus groups and interviews. (They also list managerial judgement as a useful tool in developing the attribute list.) Screen the attribute list by repeating these steps, to ensure that over-long questionnaires do not negatively influence the response rate.
2. Separate the importance measures from the performance measures. Asking a respondent to assess the importance of an attribute directly after considering the performance or *vice versa*, might very well influence the response to the second part of the question.

Following, is an outline of how Martilla and James's advice was adapted and implemented in this study.

3.2.1 Performance criteria and performance indicators

The debate around quality criteria for questionnaire design has been discussed, but another important consideration should be the fairness to school designers and service providers of the selected performance indicators. Building performance evaluations can easily become mired in perceptions, intuition, and guesswork (Szigeti & Davis, 2005:2). Systematic evaluation should be based on clear-cut categories with appropriate performance attributes (criteria / variables) (Lützkendorf, 2005:64). To ensure a fair and objective outcome that benefit all stakeholders in the evaluation process, assessment criteria must refer back to the initial, explicitly stated design requirements. Ultimately, a learning space should conform to Alexander *et al*'s (1979) imagining of spaces "in which man [*sic*] feels at home".

Several frameworks for the development of assessment criteria have been developed; from Parker Palmer's (1993, in Narum, 2004:63) purely subjective requirements of openness, boundaries, and an air of hospitality; to Rasila *et al*'s (2010) comprehensive list of "usability dimensions" such as efficiency, flexibility, learnability, amount/tolerance/prevention of errors, accessibility, navigation, functionality, atmosphere, visual design, interaction and feedback, and satisfaction; to the entirely quantitative requirements set by MacPhee (2007:16): good acoustics, minimal background noise, good and adjustable lighting, clear lines of sight, flexible layout, and easy circulation.

Lützkendorf *et al* (2005:61) usefully pose their framework as a series of questions:

- How are user requirements to be defined?
- Which performance attributes are to be described?
- Which indicators of capability are to be included?
- Which measurements tools are most appropriate? and
- How can the requirements of the users and the performance of the facility be compared?

Once the performance attributes have been determined, they are in turn measured with the use of performance indicators. Indicators can take many forms, for example quantitative rating scales, yes/no options or open-ended qualitative questions.

In the following section two salient examples of data collection instruments, the AUDE “Guide to Post Occupancy Evaluation”, and “Lessons learned from schools of architecture”, are analysed.

3.2.2 Data collection

The primary goal of this study is to prove the hypothesis that there are common patterns in the learning place-related requirements of architecture students. Once this goal had been identified the need for a data gathering process that is easy to implement at schools of architecture, easy to adapt to the context, simple to administer and above all, makes it easy to record, interpret and use the data. The data collection phase therefore had a dual function: to test the psychometric quality of the proposed data collection instrument, and to provide the data with which to test the hypothesis.

The literature review has shown the importance of using a multi-layered data collection methodology for collecting useful quantitative and qualitative data. The school case studies (see 2.6.1 Post Occupancy Evaluation and 2.6.2: Importance-Performance Analysis) indicate that while the two primary methods are questionnaires and focus group discussions, there are many other methods for data collection.

For his assessment of the use of open spaces at the University of Qatar, Salama (2009a) used both direct impressionistic observation methods such as walkthroughs, photography and behavioural mapping, and a survey questionnaire. Salama (*ibid.*) did not use focus group discussions to develop an attribute list, but to test the reliability of his data he conducted a student walkthrough evaluation of the survey results. Spooner (2008) implemented a similar research process for a POE of the Memorial Garden at the University of Georgia. For ease of analysis and comparison of the results of their meta-analysis, Nasar *et al* (2007:4) chose to use a common questionnaire-based survey. Considering its proven success, the development of the questionnaire for this study was similarly based on group discussions and a shared questionnaire.

Particularly valuable precedents were the questionnaires used by the Association of University Directors or Estates (AUDE) (Blythe & Gilbey, 2006) and the template provided by Nasar *et al* (2007:245 – 252). Those two examples of data collection instruments are discussed and critiqued here, with reference to good practice standards in the fields of questionnaire design, quality assessment, and spatial design (see also 3.3.1 Questionnaire design). Conclusions are drawn about the relevance of methodology of each instrument, to the current study.

Survey precedent 1: AUDE Guide to post occupancy evaluation

Developed as a collaborative project between the Higher Education Funding Council for England (hefce) and the University of Westminster, the AUDE Guide is published as a ‘good practice toolkit’ for use in the Higher Education sector (Blythe & Gilbey, 2006:3). Similar to the FAMU SoA study (Zimring, 1983), and the ‘Lessons learned’ study by Nasar *et al* (2007), the AUDE toolkit covers a POE process from post construction / initiation, to occupation and strategic review. Only the most relevant component, ‘Template 6: Sample occupant survey questionnaire’ (*ibid.*:44-50) (see Annexure D) is discussed here.

AUDE Template 6 evaluates the response of the occupants to their environment. The questionnaire starts with a general demographics section and includes questions about the hours per day that occupants spend inside the building, and in particular those spent using computers. Next, a ‘location’ section covers the building or campus in general. Feedback is gathered on occupants’ use of particular locations and their opinion of the quality, security and accessibility of those. The aim is to gain insight into respondents’ wellbeing while on campus. The final section covers the indoor environmental quality of specific locations such as individual classrooms. Blythe and Gilbey (*ibid.*:44) suggest that to make data analysis and comparison easier, this section of the questionnaire is copied and used unchanged for each separate space.

Quantitative data are gathered using 7-point anchored rating scales (*Fig. 61*). Quantitative feedback is invited with the use of open ended questions.

Building Generally

6. Security

a. Personal safety: How safe do you feel in the building?
(Please tick)

Unsafe	1	2	3	4	5	6	7	Very safe
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b. What aspects of the environment contribute to feeling safe?

i). Visibility of security personnel
(Please tick)

Not significant	1	2	3	4	5	6	7	Very significant
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ii). Access control to the building

Figure 61: AUDE questionnaire, typical 7-point anchored rating scale (AUDE, 2006:46).

Relevant and positive aspects of the AUDE questionnaire:

- The toolkit is, unlike most other similar instruments, specifically aimed at educational institutions
- The spaces referred to, and the questions asked are applicable to the current study
- A concise introduction phrase is included (Blythe & Gilbey, 2006:44):

We are conducting an evaluation of your building to assess how well it performs for those who occupy it. This information will be used to assess areas that need improvement, provide feedback for similar buildings and projects and to help us better manage the environment. Responses are anonymous. Please answer all the relevant questions.

A good introduction includes a compact preface, information for consent, and motivation to participate. An introduction that does not make the effort spent in completing a questionnaire seem worthwhile, can lead to non-response bias and invalid data (Czaja & Blair, 2005:5-6). The AUDE introduction explains the purpose of the survey well.

- The seven-point scale is long enough to differentiate a wide range of opinions, but not so long that it needs excessive effort to record and analyse results.

When asked to divide a continuous scale into their preferred number of categories, respondents tend to prefer between five and nine (Grover & Vriens, 2006:12; Krosnick & Presser, 2009:18). Rating scales can vary from five to 101 points, but 5-, 7- or 9-point scales are most common. The more categories, point out Grover and Vriens (*ibid.*:12), the finer the discrimination, permitting increasingly fine differentiation of opinion. Excessively small intervals though, can lead to either respondent fatigue or inaccurate responses.

- The questionnaire largely collects data in a quantitative format, making it easy to code for analysis, to record responses, and to extract statistical information.
- The questionnaire includes a brief open-ended section, allowing for qualitative input.

Open-ended questions permit respondents to express themselves without being restricted to a limited list of options and can result in richer data. Open questions are particularly popular in self-administered written questionnaires – as Czaja and Blair (2009:20) observe, they “seem natural” to the format, but they are also more complex to answer and interpret. The number of such questions should be limited. Open-ended questions are ideal for exploratory studies, when the underlying motivations, beliefs and attitudes or a target population is assessed (Grover & Vriens, 2006:8).

Negative / non-relevant aspects of the AUDE questionnaire:

- The questionnaire starts with asking personal information that may be sensitive.

The amount of information a respondent is willing to give depends on the sensitivity of the information requested, and respondents should within reason, be able to ask questions of the researcher. While there is an introduction phrase (discussed above), the first section on potentially sensitive demographic information does not make the purpose of the survey clear, and does not draw the respondent into the topic. Such information should be asked for at the end of the questionnaire, especially if it is not critical. Should the respondent not complete the questionnaire, more of the critical information will have been provided. Designers of questionnaires should therefore pay careful attention to the format and wording of the introduction.

To comply with general ethics requirements, the introduction must include sufficient and accurate information to allow properly informed consent to participate (Czaja & Blair, 2005:6), which the AUDE introduction does not. It mentions anonymity, but does not indicate that completion is voluntary. To ensure full ethical compliance, Nasar *et al* (2007) recommend that clearance for the administration of the survey should first be obtained with each institution’s ethics clearance committee.

Conclusion

The AUDE Guide to Post Occupancy Evaluation includes several templates for use by universities and is a valuable resource in the development of this study. Schools wanting to either research the actual POE process in more depth, or want to develop a specialised POE instrument for their use, should study this instrument and its accompanying ‘toolkit’ with care.

Survey precedent 2: Lessons learned from schools of architecture

Nasar *et al* (2007) included a questionnaire in their meta study of schools of architecture (Annexure D). The questionnaire is divided into five parts: the first part collects background information about the building project; the second, about the exterior appearance of the building; the third part is a POE of the building and its spaces; and the fourth and fifth parts relate to survey administration aspects such as coding and data analysis. The second and third parts are specifically applicable to the current study and are discussed further here.

The authors recommend a standardised procedure for administering the POE. As leaving surveys in mailboxes, or asking members of staff to implement the questionnaire on behalf of the researcher seldom results in the required responses rates, the researcher should schedule to meet students in classes and studios. All students can then complete and return the survey together.

The introduction reads as follows:

We wish to conduct a post-occupancy evaluation (P.O.E.) [sic] of your facilities. Our purpose is to assess how well the facilities perform for your health, safety, security, functionality, and psychological comfort. We hope the POE will identify areas for improvement, areas that work well, and will provide information to improve facility utilization, and the design of future buildings. Your answers will be kept confidential and anonymous. There are no right or wrong answers. So feel free to give your honest opinions [Nasar, email communication, 27 December 2011] [see Annexure E].

In the original administration of the study, the second part (on the exterior of the building) was not completed by users of the building, but by passers-by. Campus users passing

by a selected point, were asked to answer 16 questions covering attributes of building appearance including overall appeal; how exciting, distressing or friendly the building looks; and how well it fits the campus image.

The third part, is a 14-question survey on interior conditions followed by a demographic section at the end, is completed by building users. Categories of questions in this part are: physical features; the overall quality of the design of the facilities; dedicated spaces (studios, classrooms, *etc.*); and hours spent per space per week. Respondents are then asked to rate their satisfaction with these spaces and give reasons for their opinion (*Fig. 62*). Finally, respondents are asked to make any other suggestions for physical improvements in their facility. The questions are answered on an 8 – point tick-box scale, which includes a neutral midpoint and a ‘not applicable’ option.

1) For each space listed below, please rate your overall satisfaction with its quality, where:

VD=Very Dissatisfied D=Dissatisfied SD=Somewhat Dissatisfied N=Neither Dissatisfied SS=Somewhat Satisfied S=Satisfied VS=Very Satisfied NA (n/a)

	VD	D	SD	N	SS	S	VS	NA (n/a)
a) Public areas (entrance, atrium, and connecting areas)	☐	☐	☐	☐	☐	☐	☐	☐
b) Seminar rooms (5-20 students)	☐	☐	☐	☐	☐	☐	☐	☐
c) Medium size classroom (21-40 students)	☐	☐	☐	☐	☐	☐	☐	☐
d) Large classroom (41-100 students)	☐	☐	☐	☐	☐	☐	☐	☐

Figure 62: Lessons learned from schools of architecture - typical question format (Nasar et al, 2007).

Useful aspects of the questionnaire:

The introduction is concise and, as that for the AUDE survey (see above), includes most of the required information. Furthermore:-

- It is designed specifically for use in schools of architecture;
- The questionnaire has been extensively administered and tested;
- A standardised coding format is provided for ease of transferability of data;
- Analysis methods are recommended for making sense of the data;
- The rating scale includes both a neutral midpoint and a “not applicable” option.
- The sections on coding and data analysis are well explained and useful.

With reference to the last point, the use of ‘forced’ or ‘nonforced’ rating scales (Grover & Vriens, 2006:13) is controversial among survey designers. The rating scale used by Nasar *et al* (*ibid.*) is a nonforced scale as it includes neutral / no opinion / not applicable options. Krosnick and Presser (2009:37) prefer the inclusion of a “don’t know” (DK) option, as it permits the respondent to indicate that a question is not answered because of a lack of knowledge, ambivalence, or question ambiguity. Other reasons for resorting to the DK option are satisficing, feeling intimidated, and self-protection.

To differentiate DK and neutral responses (which reflect actual knowledge or opinion) from those that result from satisficing (and reflect a lack of opinion) some questionnaires include open or follow-up questions to measure attitude strength. This however will increase questionnaire length which may further encourage satisficing.

Negative / non-relevant aspects of the questionnaire:

- The introduction omits to mention that completion is optional, and to ask for consent.
- The complex method of presenting the scale (*Fig. 62*), and repeating this for each question, makes the questionnaire appear complex, and longer than what it really is.

Questionnaire length has an influence on cognitive processing, such as motivation to participate, satisficing and optimising. Obtaining the best quality data is central to

questionnaire design, and therefore the phenomena of ‘optimising’ and ‘satisficing’ are briefly explained here.

Optimising is the extent to which the respondent is willing to make an effort to answer questions thoroughly and in an unbiased way, in other words to give answers of high quality.

When they are doing the survey because they have to or because they feel they have to, respondents will often not put in the required effort: this is known as ‘satisficing’. This tactic can be described as taking shortcuts with cognitive processing (Krosnick & Presser, 2009:5). The tendency to satisfice is influenced by task difficulty, respondent ability, and respondent motivation (*ibid.*:6).

Task difficulty is influenced by survey design (e.g. how difficult the questions are to interpret, or how much work is required to formulate the answer) and by the conditions under which the survey is completed (e.g. a distracting environment).

Respondent ability depends on whether the respondents are able to complete the complex mental tasks required to process the information, or even if they are used to thinking about the topic and have any opinions / judgements about it.

Motivation is a complex combination of need for recognition, personal importance to the respondent, belief in the usefulness of the exercise or respondent fatigue. It can also be influenced by the impression the respondent receives from the method the questionnaire is administered and presented –for example whether optimising encouraged, or not.

Conclusion

Several categories and questions in the ‘Lessons Learned’ questionnaire are applicable to the current study and were used in the questionnaire design process. The presentation format was however not adopted, and a simpler scale presentation format was developed.

3.3 DEVELOPMENT OF THE TRIAL QUESTIONNAIRE

Designing a questionnaire that accurately evaluates the appropriate attributes requires exact research and careful pre-testing. Meir *et al* (2009:205) succinctly observe that a “cleverly prepared questionnaire” can obtain 80 per cent of the indicators required to do an investigation. This may sound like a quick-fix solution to the researcher’s needs, but as Salama (2009b:38) points out, the researcher must understand the target group’s relationship with their environment: their expectations of it, how they comprehend it, adapt to it and react to it. The physical environment can facilitate, but also hinder action, and therefore the space in which teaching takes place will influence learning (Hornecker, 2005, [sp]).

The purpose of the questionnaire developed through this study is to gain insight into architecture students’ conception of how their campus- and studio environment influences their teaching and learning activities. A brief discussion of the main design considerations follows here, and Table 12 summarises the processes and design issues that were considered in the development of the trial questionnaire. Note, that the “trial questionnaire” referred to here, is the questionnaire from pilot study stage, up to the final test version implemented at University D (Annexures A1, and B1 - 4).

3.3.1 Populating the questionnaire

Literature search

The Literature Review comprises an overview of current best practice in the provision of satisfactory student learning environments. Also included are examples of both good and poor learning environments at schools of architecture. The evaluations studied, were conducted either by recognised authorities in the field of Building Performance Evaluation, or by students under the guidance of experts. Through analysing these examples, an exploratory ‘criteria grid’ (Annexure F) was developed and from that, using a process of “intra-study replication” (Rasila *et al* (2010:148), assessment categories were developed and populated with questions.

Discussion groups

Rasila *et al* (2010:148) found that conducting interviews with individual users to develop questionnaires is inefficient, as few individuals have enough overall understanding of the overall field. Representative discussion groups on the other hand are a valuable source of information and are often used in the preliminary phases of questionnaire development (Barbour, 2007:3). Group discussions incorporate a qualitative element in the overall research process, and ensure that all attributes of importance to the target population are included in the measurement instrument and are converted to appropriate assessment criteria. A debate exists among social scientists on exactly what a ‘focus group’ or a ‘focus group discussion’ is. To avoid methodological complications, this study implements Barbour’s (2007:2) approach that “[a]ny group discussion may be called a focus group as long as the researcher is actively encouraging of, and attentive to, the group interaction”. Therefore, rather than conducting formal focus groups or interviews with students, less structured discussions were used to develop a performance criteria list.

Two group discussions were conducted. The first, to develop a framework of issues that are of importance to architecture students, was held with the third year architecture class group in their studio at University A. The researcher briefly explained the purpose of the discussion and the role it would play in the overall research process. During a lively session, the class voiced their opinions about the physical conditions in their studio and on the campus as a whole. Key items were recorded (*Fig. 63*).

Some issues were hotly debated (e.g. the preferred levels and points of access control) and others unanimously agreed upon (e.g. the need to reduce the noise leaking into the studio from adjoining spaces and the busy road outside). Similar to the focus groups conducted by Rasila *et al* (2010:148), some guidance was needed to keep the discussion within the framework of the research question, but the students were permitted to freely speak of their experiences as campus users. Issues such as on-site plotting facilities and the need for a better public transportation system were acknowledged but not discussed in detail.

From the discussion notes, a criteria grid was generated (see Table 11). This ensured that a broad range of issues were considered and no major considerations were omitted. The criteria recorded during the group discussion were compared to, and combined with the criteria grid developed during the initial literature review (Annexure F).

Salama (2009a) suggests walk-throughs as a way of becoming familiar with the environment to be assessed, and behavioural mapping of the users to validate the feedback. A walk-through was not necessary as the researcher is familiar with the environment on which the pilot questionnaire was based. Behavioural mapping would have been valuable, but this was not possible because the pilot was implemented at a time of the academic year when typical studio behaviour is disrupted. This was compensated for, to an extent, by asking respondents to report on their studio-use habits in the questionnaire.

Table 11: Attributes generated during group discussion on 15 August 2011

ACCESSIBILITY	
Campus	Strict access control at building entrances
	Card access at campus boundaries
	Freedom of movement within campus / building boundaries
	Traffic control at campus entrances (taxis make movement difficult and dangerous; long queues at peak times)
	Clearly visible signage
	Pleasant spaces in between buildings
	Shaded outside seating facilities
	Grassed areas for sitting
	Maintenance and patrol of perimeter fencing
Building	Toilets reasonably close to studios
	Easy movement between inside and outside
	Being able to see into other departments' spaces
	Easy interaction between students studying different disciplines
SPACES	Group workspaces (4 - 6 persons)
	Model building space
	Common inter-disciplinary social/workspace

	Permanent exhibition space for good student work
	Full-service library / information centre close by
	Private / individual workspaces
FURNITURE AND FITTINGS	Functional and attractive furniture
	Model building facilities and workshop
	Comfortable seating
	Sufficient pin-up boards
	Variety of seating types
	Lockers
FOOD	Food and drinks easily accessible close to studios
	Greater variety of food outlets on campus
INFRASTRUCTURE	Easily controlled temperature settings
	Easily controlled lighting settings
	Easily controlled ventilation settings
	Effective ventilation
	Enough plugs for operating laptops etc.
	Enough data connections
	WiFi connectivity
	Easy access to drinking water
	Acoustic control inside building
	Control of excessive noise from outside building
	Easily used waste recycling facilities
MAINTENANCE	Regular maintenance of building fabric
	Regular maintenance of building finishes
	Regular cleaning
OTHER	Health and fitness facilities (e.g. gym)
	In-house stationary shop
	Inspirational environment
	The building reflects the creativity of its occupants
	Close-by printing facilities
	Reasonably priced printing facilities
	Aesthetically pleasing buildings
	Spiritual / prayer spaces

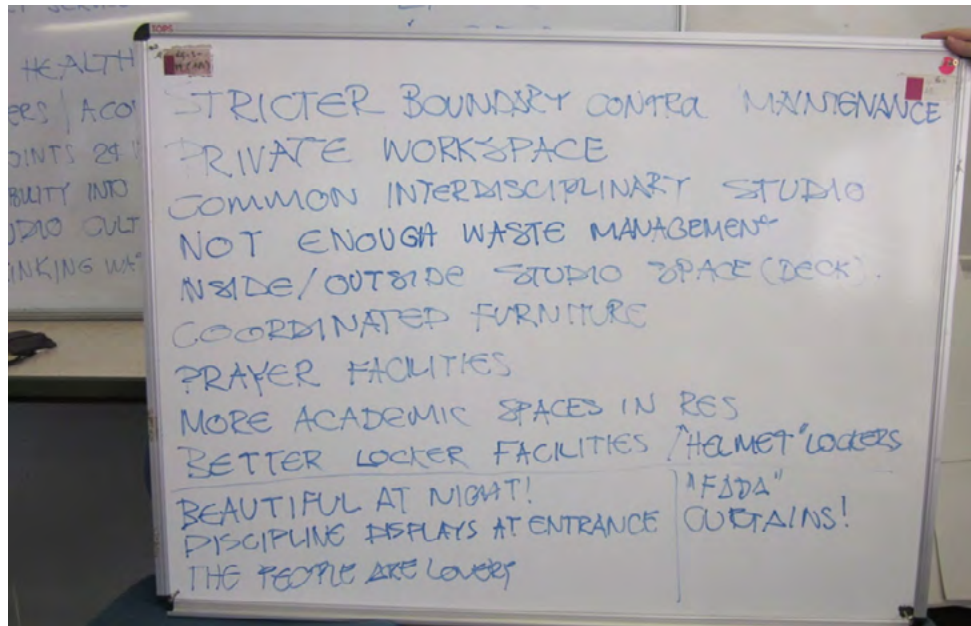


Figure 63: Some of the attributes generated and recorded in a group discussion with third year students at University A on 15 August 2011 (Author, 17.11.2011)

Regression and categorisation

Through a process of factor regression, attribute categories were developed and questions organised accordingly. Five main categories were identified, each containing groups of attributes:

- **Design and physical layout**
 - Spaces and places (15 attributes)
 - Exterior appearance and positioning (4 attributes)
- **Indoor environmental conditions**
 - Air quality
 - Thermal conditions
 - Acoustics and noise
 - Lighting
- **Infrastructure and services (11 attributes)**

- **General campus environment**

- Outdoor learning space
- Informal and social facilities
- Personal safety
- Signage and wayfinding

- **Demographic information**

Similar to Salama's (2009a:86) findings, several of the attributes crossed categories and their final positioning is a matter for judgement by the questionnaire designer. This is illustrated in Chapter 4, where attributes such as "Outdoor workspaces" are alternatively categorised under "Outdoor campus areas", and under "Spatial considerations".

3.3.2 Pilot questionnaire design

Once the criteria, or attributes to be evaluated have been identified, an instrument has to be developed to implement the evaluation in the field. As mentioned before, questionnaire design requires in-depth research and careful consideration of many diverse issues. Few designers of questionnaires for example, realise the importance of the opening question. According to Grover and Vriens (2006:17), the first question "sets the stage" by introducing the topic, gaining respondent confidence and cooperation, and establishing legitimacy. Even the issue of whether the opening question should be an open question, that allows for a written opinion, or a closed question with a rating scale or other non-written response, is debated. Czaja and Blair (2005:[sp]) prefer the use of a closed format (Fig. 61 and 62), as it seems less intimidating. Grover and Vriens (2006:18) however believe that people like to give their opinions and that starting with a written response tends to set respondents at ease. It also allows researchers to pre-screen respondents for familiarity with the topic and past experience early on (*ibid.*:21). Questionnaires are eminently suitable for collecting quantitative data efficiently (Grover & Vriens, 2006:2), but carefully designed open questions can also yield qualitative data to pinpoint problem areas in a given environment, and lead to strategic resolutions. Whichever approach is taken, open questions are more labour intensive to analyse, and covering as much as possible through closed questions is preferable.

The two-part question format required by IPA poses certain challenges for the questionnaire designer. Collecting sufficient data to assess all the factors that contribute to school culture through one questionnaire is probably impossible (factors such as questionnaire length, the exact representativeness of respondent groups, and the complexity of analysing such wide ranging data, all influence questionnaire design). Unless statistically derived values are used (e.g. Deng's [2008] fuzzy set theory method [2.7: Data analysis - disconfirmation theory]), the length of an IPA questionnaire is almost doubled because most questions have to be asked twice.

Response set bias may result from respondents picking up on, or perceiving a pattern in the questions, or not reading the questions properly (Preiser & Nasar, 2007:67). By changing the way in which questions are asked is one effective way of avoiding this problem. In the trial questionnaire, the questions for the two parts are placed in separate tables and worded slightly differently (refer to Annexures B2 - B4).

For the pilot study (Annexure B2), a nine-point rating scale was used, as it was at the time intended to use a method of analysis suggested by Arbore and Busacca (2010), which requires a nine-point scale. Their method, upon further review of the literature, was considered overly complicated and a seven-point scale was used in subsequent formats. Many of the precedent studies implement a five-point scale that reduces the analysis load significantly, but because of particular response to the pilot study, "It is very easy to answer especially with 9 levels of rating" a more finely differentiated seven-point scale was adopted.

In total, an average of 108 responses was gathered per student per questionnaire. This number includes 74 rating scale questions, six Yes/No choices, two open ended questions, seven factual questions, five selections, and four that require a choice between options. The balance of the questions gathered demographic information. As the questionnaire was revised several times the exact number varied. This was especially the case with the last implementation at 'University D' as it was known beforehand that time would be limited for completion of the questionnaire. For that reason, some of the "importance" questions were omitted - a decision that would turn out to have been unwise.

Table 12: Factors to consider in the process of questionnaire and survey design

DATA COLLECTION Questionnaires as a method of data collection; Group discussions as a method of data collection
COGNITIVE PROCESSES
RESPONSE BIAS Motivation, Optimising,,Satisficing, Acquiescence, Primacy effects, Redundancy effect, Memory processes, Sensitivity to question content, Overall credibility of process.
OPEN VS. CLOSED QUESTIONS
SYNTAX AND WORDING Avoid jargon, Be concise, Keep it simple, Introduce one topic at a time, Avoid cueing, Negations and double negatives are confusing, Balanced scales.
QUESTIONNAIRE DESIGN Appearance, Questionnaire length, The opening question, Introduction, Question order, Precedents
RATING SCALES Number of scale points, Labelling of categories, No-response options.
DESIGN PROCESS Study examples, Selection of discussion group members, Drawing up an initial questionnaire, Discussion with experts in the field, A pilot study, Final revision and editing.
ACCOMPANYING DOCUMENTATION Cover page, Documentation required for ethics approval, Data recoding sheets, summary sheets.

Pilot study participant information

Table 13: Pilot study participant data

Group details	Response rate	Gender
4 th year class, University A (n=18)	Handed out: 9 Returned: 9 pilot questionnaires, 7 'questionnaire questionnaires'	Female: 2 Male: 7

Setup and implementation of the pilot study

A questionnaire can be used as part of a structured interview as a framework for an interviewer who leads the respondent through the questions, and records the answers. An alternative is self-administered questionnaires. Because time was usually limited for completing the forms, the latter process was selected for the pilot study survey, as well as for field research at Universities A – D.

The pilot study required participants to answer two separate questionnaires. The first was similar to the trial questionnaire, but with a significant difference: varied question formats were used (Annexure A1), to obtain feedback on the preferred question format. The pilot group were asked to also complete a second questionnaire (the 'questionnaire questionnaire', Annexure A2). The pilot group were asked to give their first impression of the pilot questionnaire and the cover page, layout, rating scale formats, syntax and wording, the length of the questionnaire and the order of questions.

The intention was that the group would complete both questionnaires individually. As only a small number of the class group were present at the time of implementation, a spontaneous 'round-table' discussion / conversation developed. Students completed both questionnaires while discussing their impressions, uncertainties, and responses freely amongst each other and with the researcher. This provided an ideal opportunity to observe the respondents, to ask and answer questions. Notes were taken on problematic and successful aspects of the trial IPA questionnaire.

The unstructured discussion allowed a hybrid of discussion-led and self-administered format. Nine completed first questionnaires were handed back, and seven 'questionnaire questionnaires' were completed (two students arrived later, and did not have time to complete the latter). The outcomes of this second discussion are included in the next section and the responses are summarised in Table 14.

Pilot study feedback

Respondent feedback on the trial questionnaire was generally positive, although several indicated that non-written responses are preferred (Table 14). In response, the first (open-ended) question together with the linked "External appearance" questions, was moved to the end of the first section. The open question format was retained, as several of the precedent studies point out the importance of qualitative information to explain answers to quantitative rating scales. (When this question was moved to a later section in subsequent revisions of the questionnaire, it was often not completed.)

Other changes included 1) rewording questions such as "Do you agree with the following statements ..." which was changed to "How much do you agree with the following statements ..."; and 2) the response code key ("1 = Totally Disagree; 9 = Totally Agree") was reworded, re-punctuated, and re-positioned in various revisions. The responses were studied and once implemented, the trial questionnaire finalised for submission to the Ethics Clearance Committee (Annexure B1).

Ethics clearance

The final step in the process of developing a trial questionnaire for application in the field, was to obtain clearance from the University Ethics Committee. The requirements for ethics clearance, the completed application form, and confirmation of approval in principle, are included as Annexure B1. Unfortunately due to the deadline for implementation, final ethics clearance could not be obtained in time. The further requirements for approval are included in the Annexure.

Table 14: Responses on pilot questionnaire format

1 First impression of questionnaire:

1 It is very easy to answer especially with 9 levels of rating

2 Well laid out

3 Very useful and relevant for informing design of educational institutions

4 Good idea, hope it affects my space

5 Very well described [sic] and easy to understand

6 I felt the questionnaire related a lot to our particular building (UJ) and the questions were very relevant

7 I like that there were boxes to tick and not too many written questions

8 Concise, easy to understand

Respondent ID									SUM	Ave
1	2	3	4	5	6	7	8			
1	1	1	1	1	1	1	1		1.00	
1	0	1	1	1	1	1	1		0.88	
1	1	1	1	1	1	1	1		1.00	
1	1	1	1	1	1	1	1		1.00	

1 = yes 0 = no

2 Does the cover page

Explain purpose clearly

Motivate participation

Explain requirements

Convince about confidentiality

3	4	4	3	4	4	3	4		3.63
3	2	2	1	1	1	1	1		1.50
4	4	4	4	4	3	3	4		3.75
4	4	4	4	2	4	4	3		3.63

1 = Disagree, 4 = Agree

3 Do you agree with the statement:

Page layout clear

Pages too full

Separations visually effective

Headings helpful

4 Select preferred rating scale format:

1	1			1				2
2		1		1		1	1	5
3			1			1		2

5 Select preferred group rating scale format:

113

6 Syntax and wording

Rate opinion about wording:

Jargon	3	1	1	1	2	1	1	1	1.38
Conciseness	2	1	1	2	4	1	1	1	1.63
Ambiguous wording	1	2	3	1	4	1	1	1	1.75
Complex syntax	3	3	1	2	3	1		1	2.00
Double-barrelled questions	2	1	1	1	1	1		1	1.14
Cueing	1	1	1	1	2	1	1	1	1.13

1 = Not a problem 4 = Too much

7 Questionnaire length

Too long	1		1		1				3
Not too long		1		1		1	1	1	5
Reason if Yes									
Not interesting									0
Too many questions	1		1						2
Difficult to understand									0
Pages too full									0
Rating scale too long					1				1

8 Question order

Opening question sets the stage	4	4	4	4	3	3	1	3	3.25
First set easy to answer	4	4	4	3	4	4	1	4	3.50
First set pleasant to answer	3	4	4	3	4	4	1	3	3.25
Smooth progression between sections	3	3	4	4	2	4	1	4	3.13
None makes me feel uncomfortable	4	4	4	4	4	4	2	4	3.75

1 = Totally disagree 4 = Totally agree

Reservations?

I prefer answers that don't require any written paragraph
I don't like writing answers out

3.3.3 Lessons learned: discussion of pilot study questionnaire

The process of designing, creating, administering, and processing a survey demanded more effort and time than was initially realised and this set back the implementation stage. Another important lesson learned, was that the timing of research stages is of cardinal importance to the quality of the information that is collected. The group discussions were conducted towards the end of the academic year (the first investigative discussion in August, the discussion of the pilot questionnaire much later, in late October). By the time that the value of methodologies such as behavioural mapping became evident, classes had already come to end and it was no longer possible.

Despite setbacks and mistakes, the process described in this chapter ultimately resulted in a questionnaire that was ready for testing in the field by early November 2011 (Annexure B2). This process is discussed in Chapter 4: Results, Reports and Discussions.

3.4 CHAPTER SUMMARY

This chapter outlined the process that ended in the first version of the trial questionnaire. The reasons for selecting focus group discussions and a literature review as the primary methods for development a trial questionnaire for this study were explained. Methods of collecting the appropriate quality attributes for use in the questionnaire were reviewed, including focus groups, a literature review, and precedent studies.

Underestimation of the complexities of designing a good questionnaire often result in poorly designed research instruments and subsequently, unreliable data. For that reason, theory of questionnaire design was reviewed with particular emphasis on strategies to avoid response set bias and satisficing.

The Association of University Directors of Estates (AUDE) questionnaire and the “Lessons learned” questionnaire were analysed and assessed for their suitability as templates for this study.

The process of designing the trial IPA questionnaire was described. Finally, the implementation of the pilot study was explained, including the response to feedback.

The next chapter is an in-depth analysis of data gathered at four South African schools of architecture, using various revisions of the trial questionnaire.

4 Results, Reports & Discussions

4.1 Chapter overview

4.2 Outcomes of survey: combined data

4.3 Case Study 1: University A

4.3.1 Survey participant information

4.3.2 Context of survey: building information

4.3.3 Descriptive Analysis: UA quantitative data

4.3.4 Discussion of qualitative feedback

4.3.4 Lessons learned: discussion of IPA questionnaire and revisions

4.4 Case Study 2: University B

4.4.1 Context of survey: building information

4.4.2 Descriptive analysis: UB quantitative data

4.4.3 Discussion of qualitative feedback

4.4.4 Lessons learned: discussion of IPA questionnaire and revisions

4.5 Case Study 3: University C

4.5.1 Survey participant information

4.5.2 Context of survey: building information

4.5.3 Descriptive analysis: UC quantitative data

4.5.4 Discussion of qualitative feedback

4.5.5 Lessons learned: discussion of IPA questionnaire and revisions

4.6 Case Study 4: University D

4.6.1 Survey participant information

4.6.2 Context of survey: building information

4.6.3 Descriptive analysis: UD quantitative data

4.6.4 Discussion of qualitative feedback

4.6.5 Lessons learned: discussion of IPA questionnaire and revisions

4.7 Conclusions

4.8 Chapter summary



*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

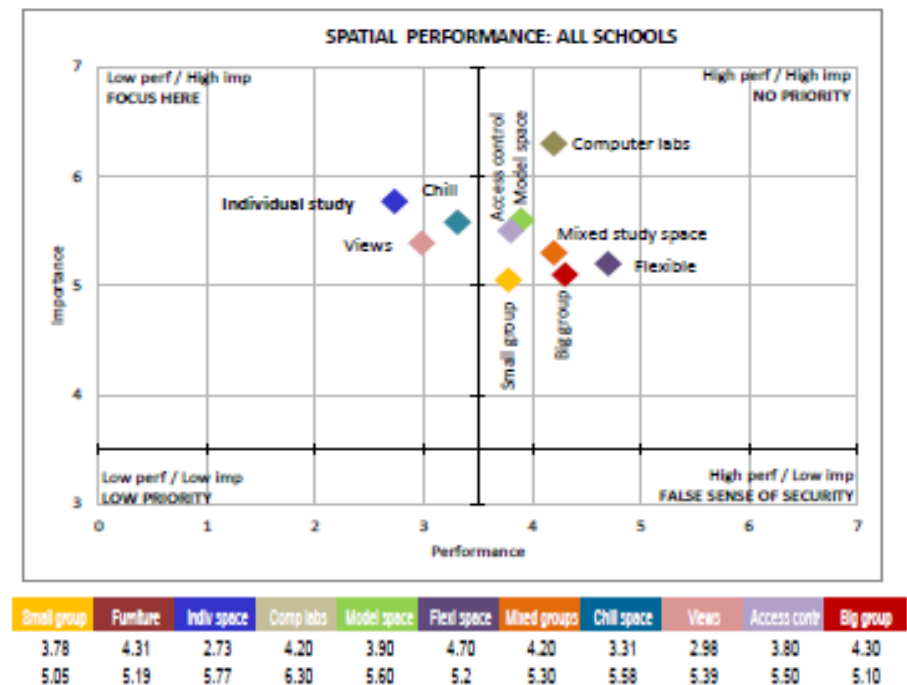
The purpose of this study is to identify those patterns (if any) that occur in the perceptions of architecture students, of their learning environments. There is no intention to compare the performance of the different schools. For that reason, the universities are coded as A, B, C and D in order of 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.

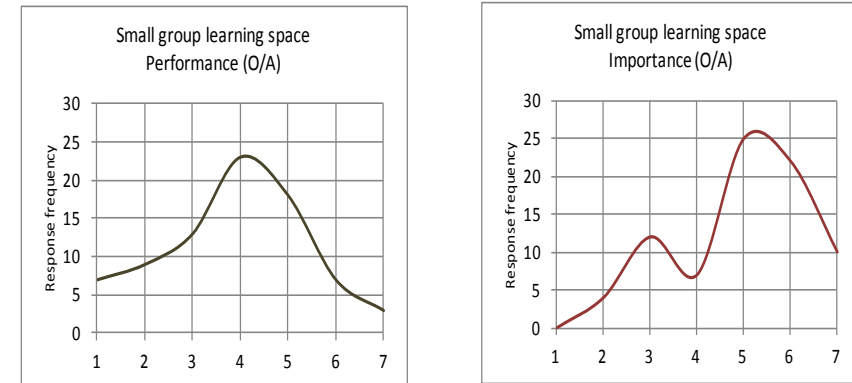
As explained under “Group working spaces” (see 2.4.1: Interior layout and spaces), providing groups with supportive ‘club’ space encourages desired learning behaviour, collective effort and optimised space usage.

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.

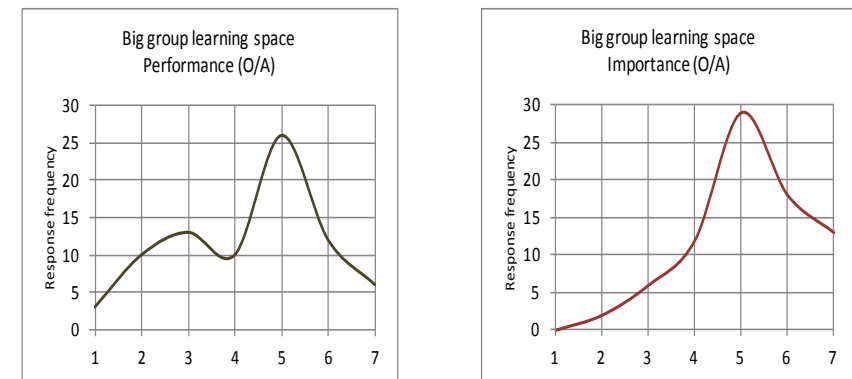
Working spaces for big groups (of more than 5)

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)

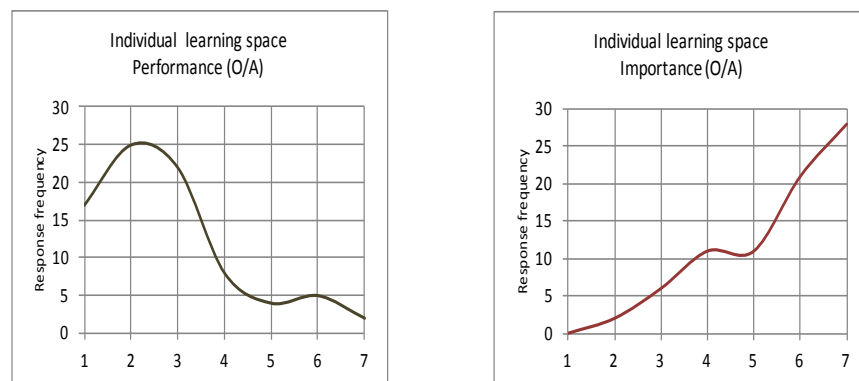


Individual / quiet work places

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)

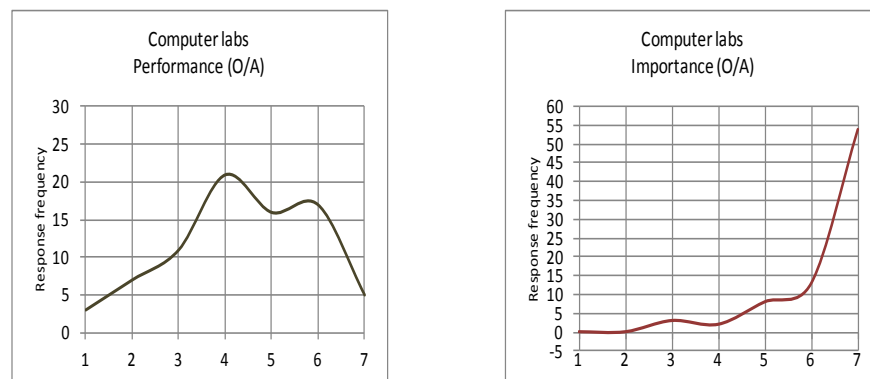


Well-equipped computer laboratories

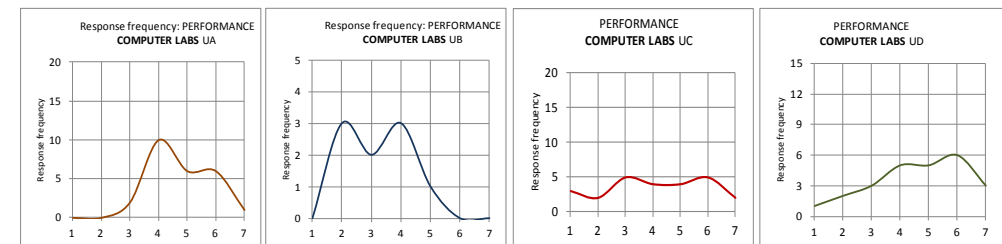
Graphs 5 - 6: The need for well equipped computer laboratories is so overwhelming that the scale for the Importance graph (5b) has to be doubled to accommodate the number of 'Extremely important' (7) ratings.

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

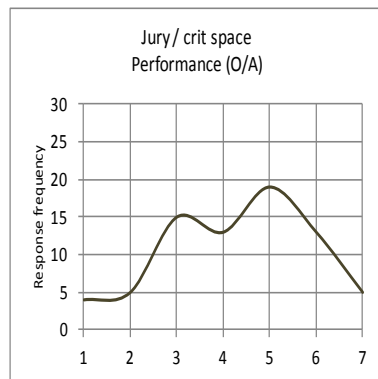


Universities A, C and D should not be complacent about the positioning of this attribute in the I-P matrix (Graph 1). While this attribute generally falls comfortably within the 'No priority' area, its particular position should be more carefully considered. When comparing the Performance and Importance 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).

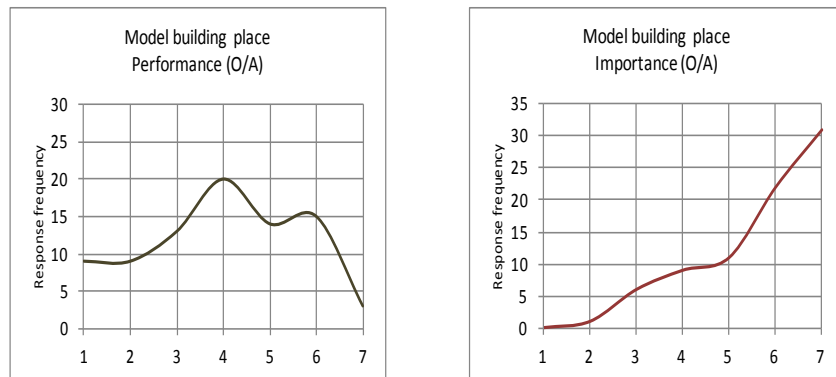
Graph 7: Performance -- Jury / crit spaces (all)



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)



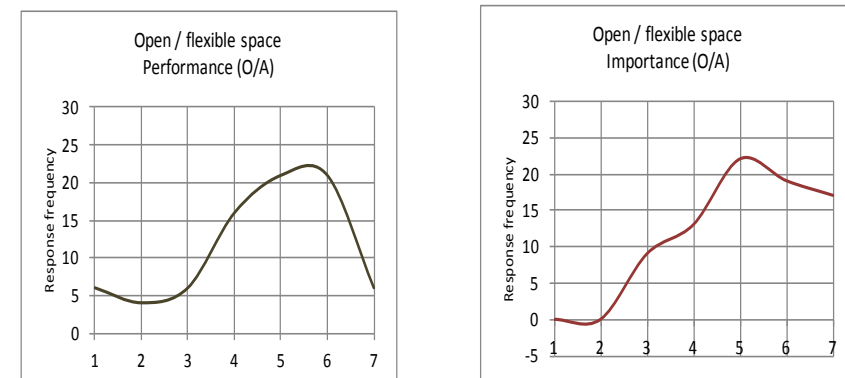
Open spaces for adaptable use

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)

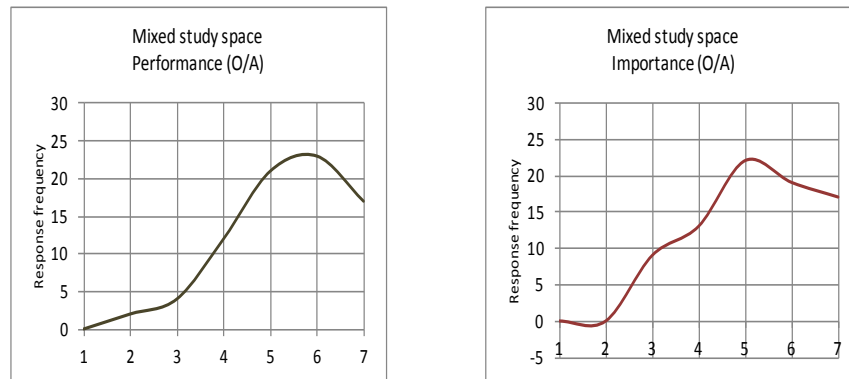


Places where students from different years can work together informally

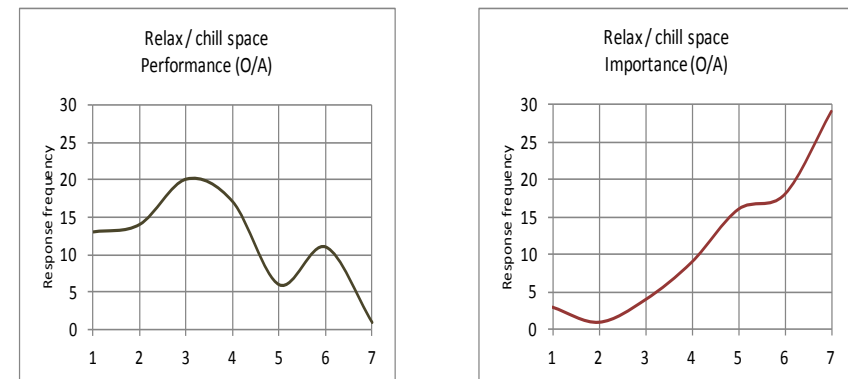
Graphs 10 - 11: The graphs for the combined data (Graph 10) indicate general satisfaction with the provision of spaces where students from different years of study, can work together informally. It is interesting to note however, that while the graphs for combined Importance data (Graph 10a & b) are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

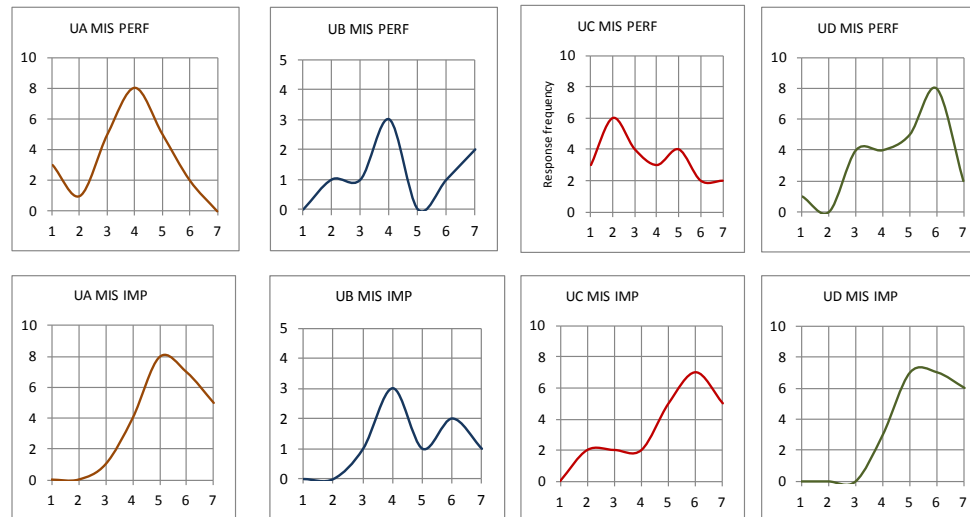
Graph 10a & 10b: Responses - Mixed informal study spaces (all)



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)

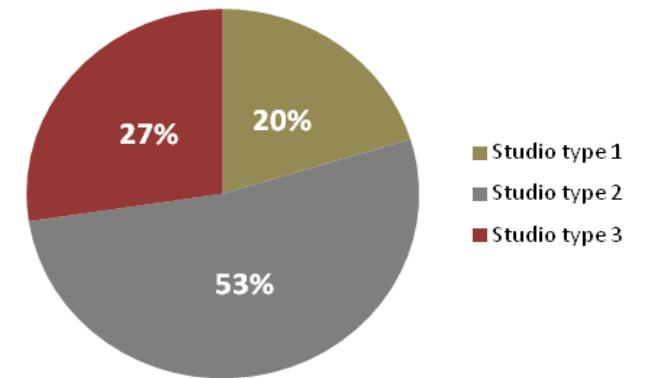


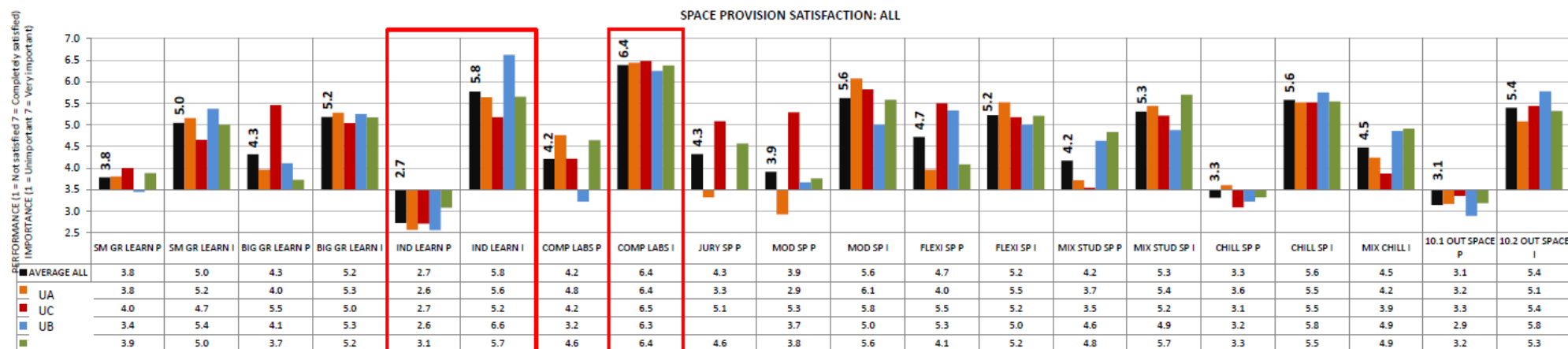
Figure 65: Three different studio formats:

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.

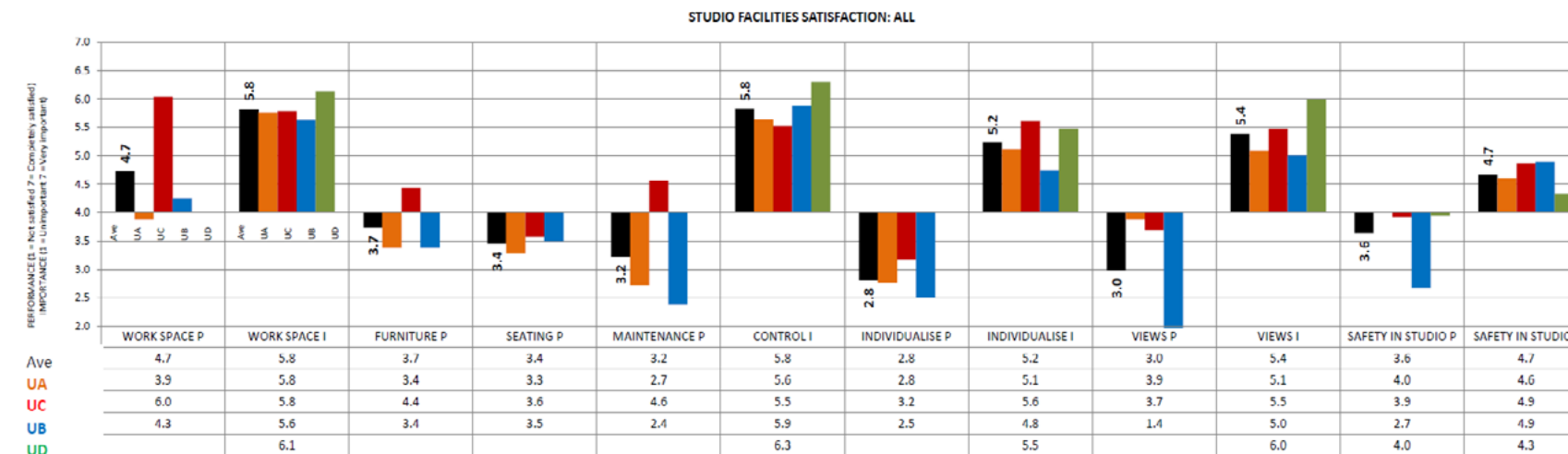
The variations in Performance ratings between schools is encouraging, because this indicates that respondents are carefully considering their ratings and that there is little evidence of satisficing.

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.

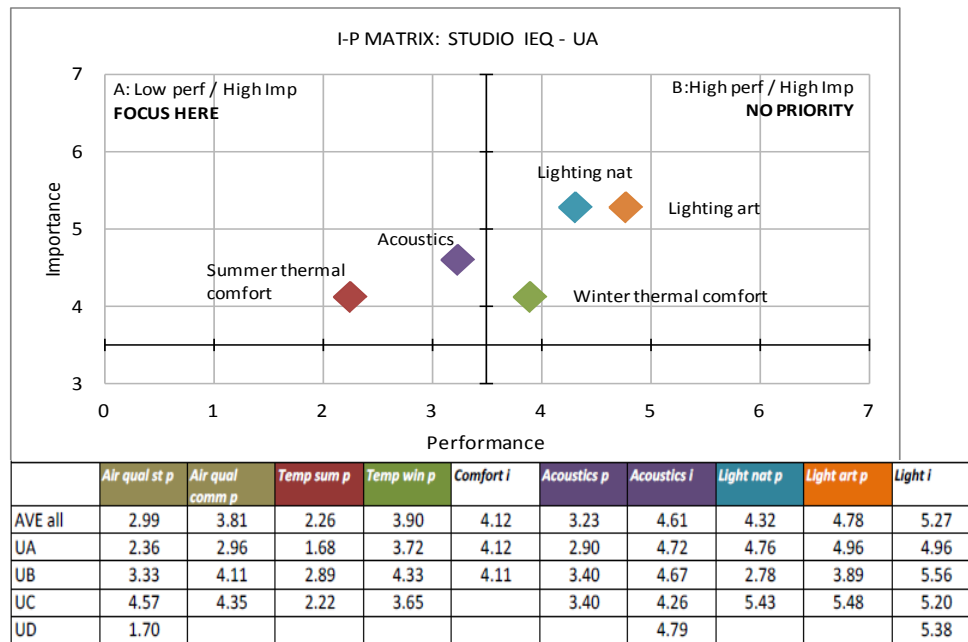
Section 2: Indoor environmental conditions

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.

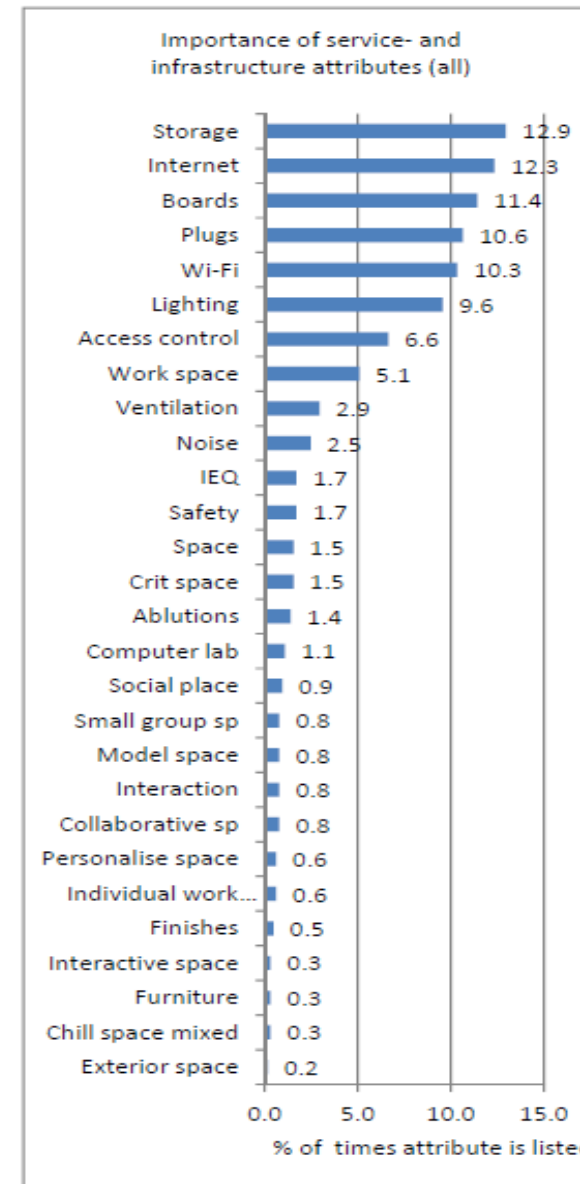
Graph 16: I-P matrix - Studio Indoor environmental quality - all



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?).

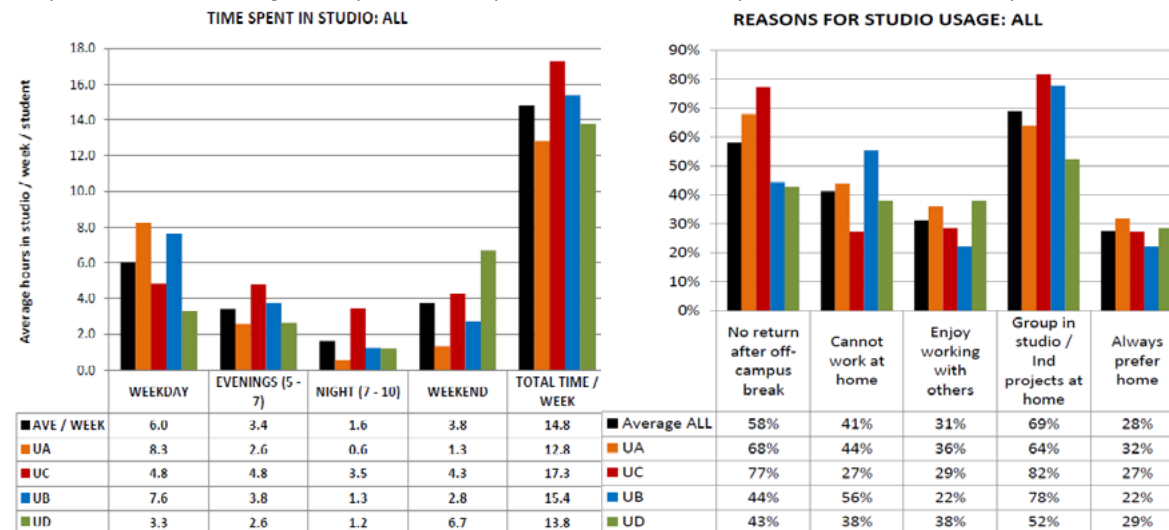
Despite anecdotal evidence of the high importance linked by teachers to long hours spent in studios, the importance to students of having access to studios at all times varies, and is in general surprisingly low. In most cases, the hours that make up the totals and averages for schools are ‘clocked’ 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.

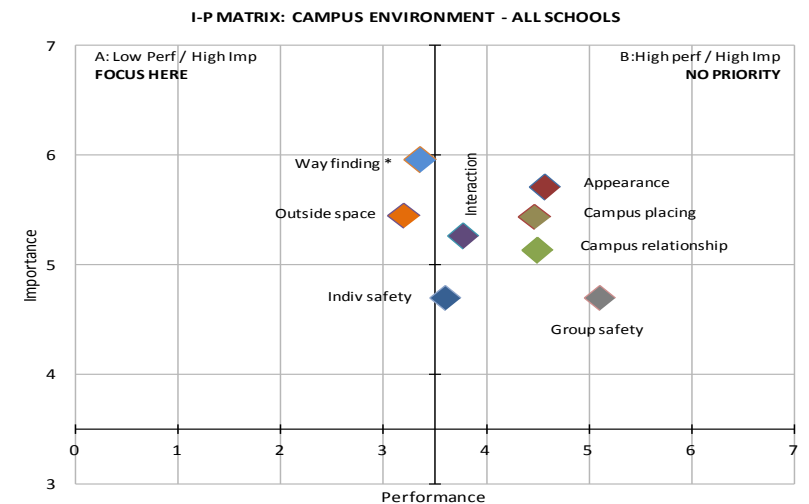
Graph 18a and 18b: Average time spent in studio per week - all schools; Importance – Studio availability



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



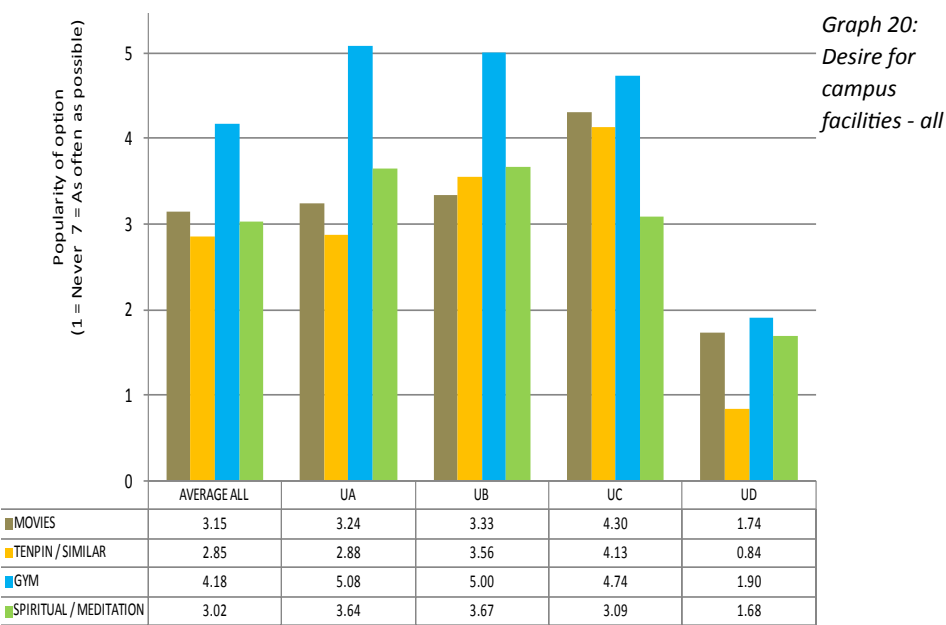
UA Campus environment attributes	Performance	Importance		Performance	Importance
Relationship w/ campus	4.50	5.13	Outside workspace	3.20	5.45
Placing	4.48	5.44	Appearance	4.57	5.71
Wayfinding outside*	3.36	5.96	Interaction with others	3.77	5.26

* 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

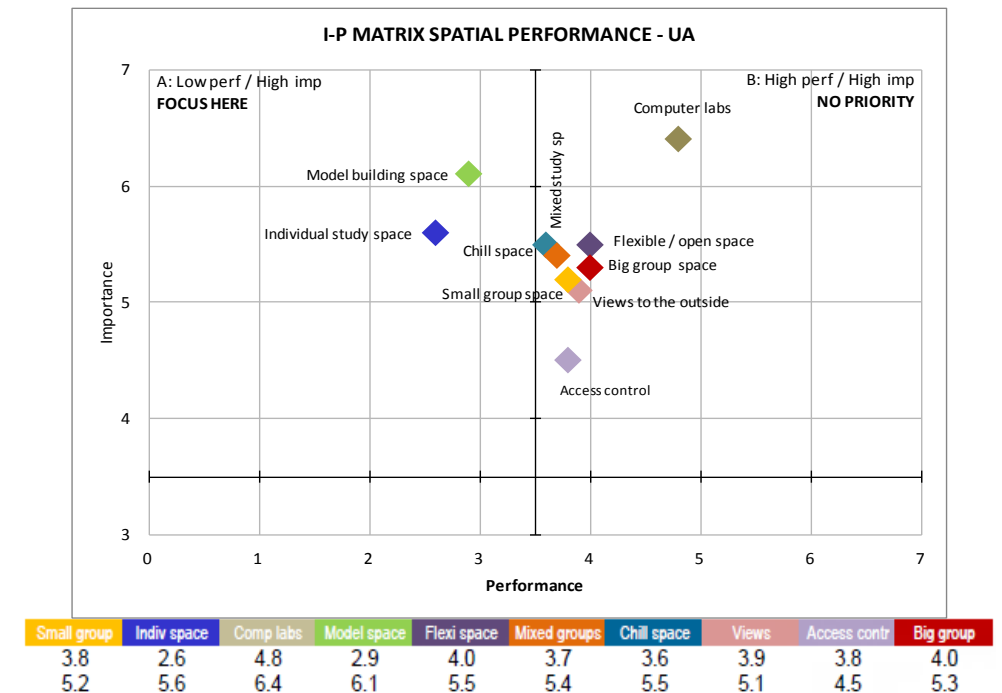
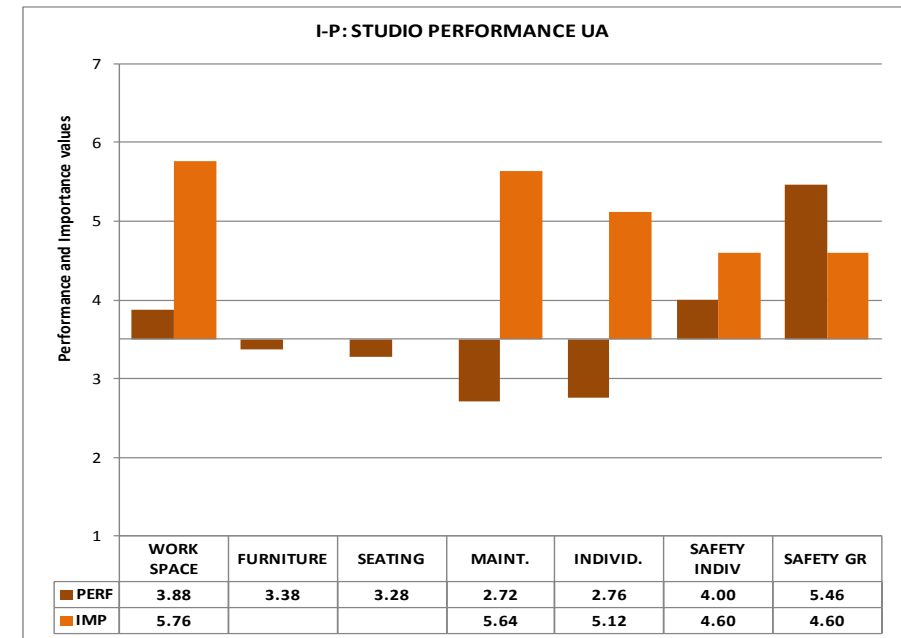




Figure 69: Computer Laboratory at UA (Author, 07.02.2012).

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.

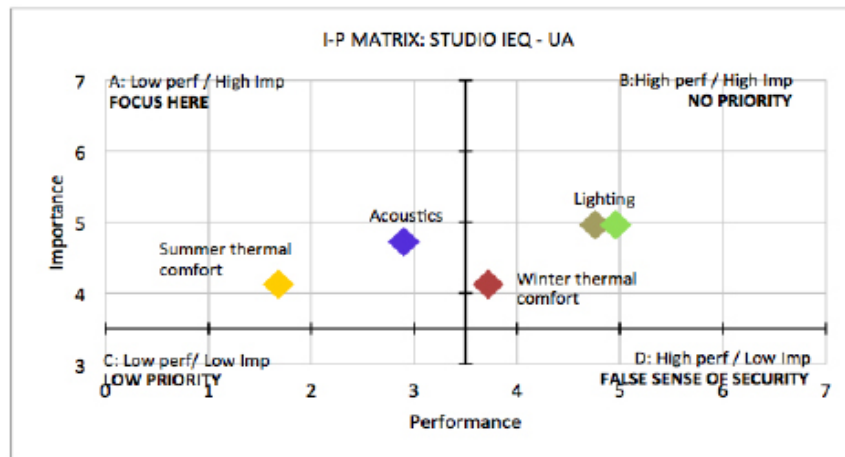
Discussion: Studio IEQ - UA

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)

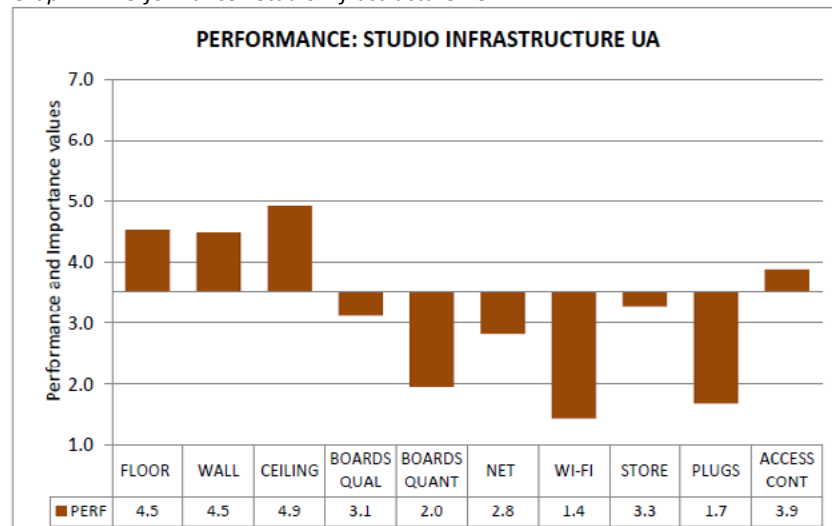


Figure 72: The rectangular shape of a UA studio, with windows on the short side, results in poor natural lighting, insufficient ventilation, and thermal discomfort. (Author, 07.02.2012).

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



Discussion: Campus environment - UA

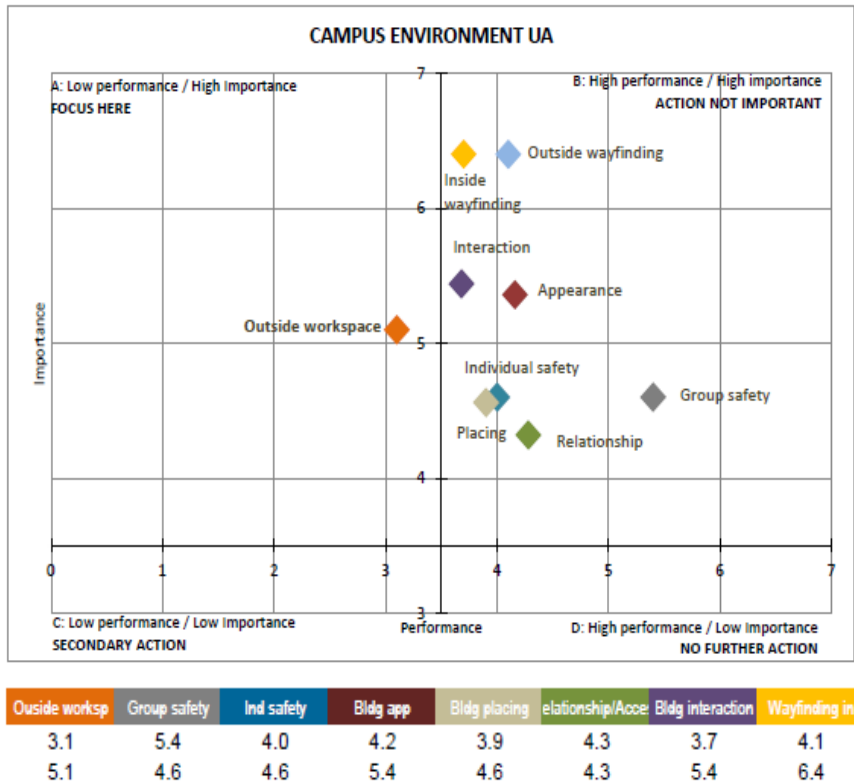
- **Graph 25:** The greatest improvement gap (gap = 1.92) exists for 'Outdoor workspace', which also reflects the lowest performance rating (3.1). This attribute falls within quadrant A of the I-P matrix, indicating that although its importance rating is less than many of the other attributes, the poor 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.)



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

- 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.

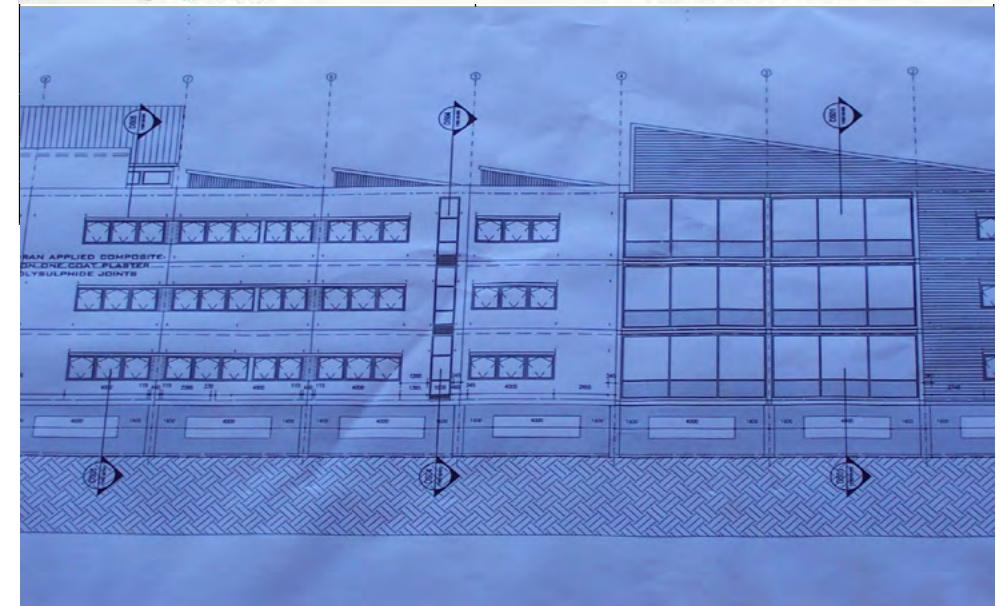
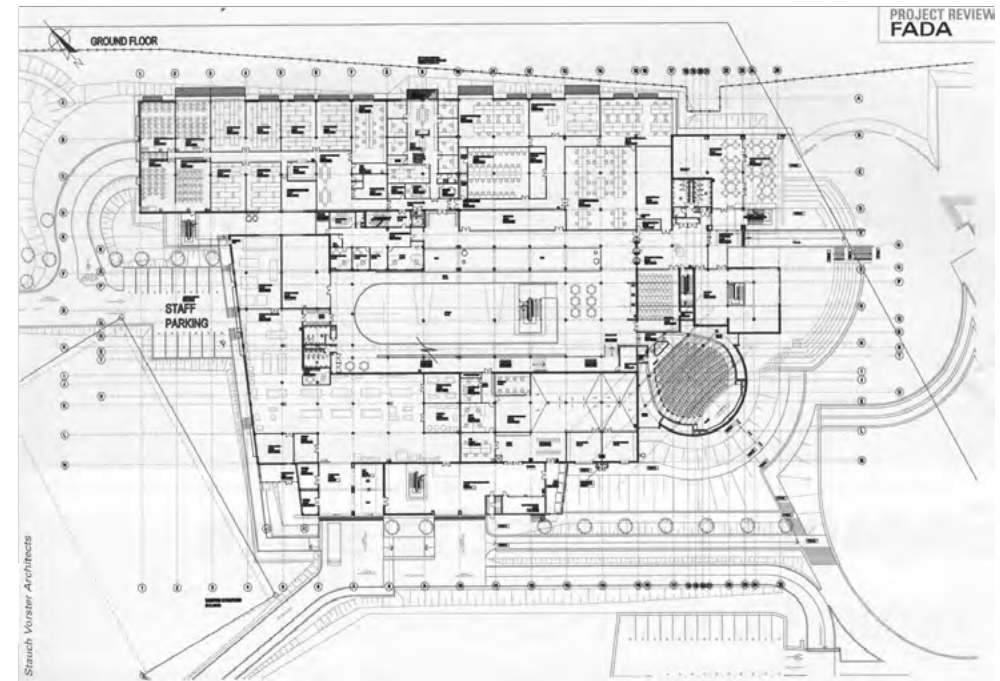


Figure 76a (top): Floor plan, school building, University A

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)

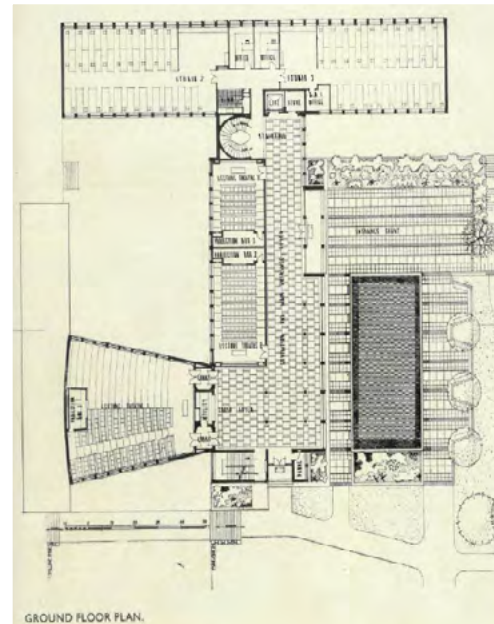


Figure 79: Ground floor plan, original John Moffat school building, UB (Associate architects J Fassler, WD Howie, G Herbert, JM Shunn, U Tomaselli & J Morgenstern) (The John Moffat, 1959:19)



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)

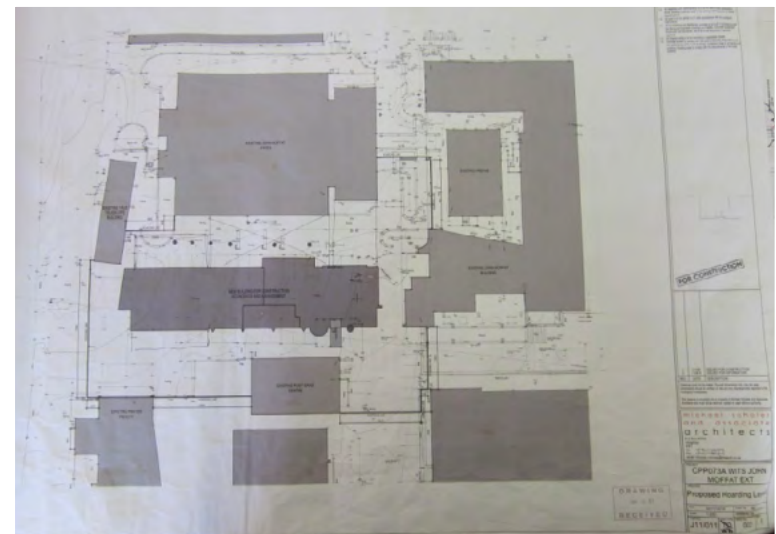


Figure 80b: site plan indicating the various EBE buildings in 2012 (Author, 17.02.2012)

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

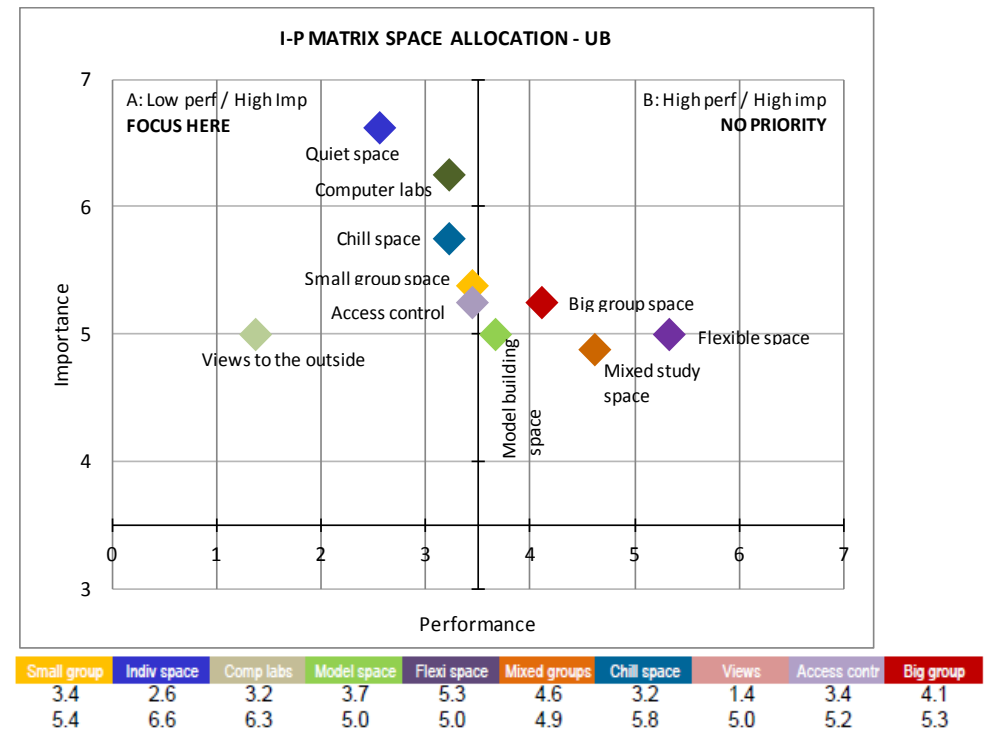


Figure 81: This image illustrates some of the environmental shortcomings identified by UB students, such as awkward spaces under ramps, large open spaces with poor acoustics, and a need for more power outlets. (A Janse van Rensburg, 12.02.2012)



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);

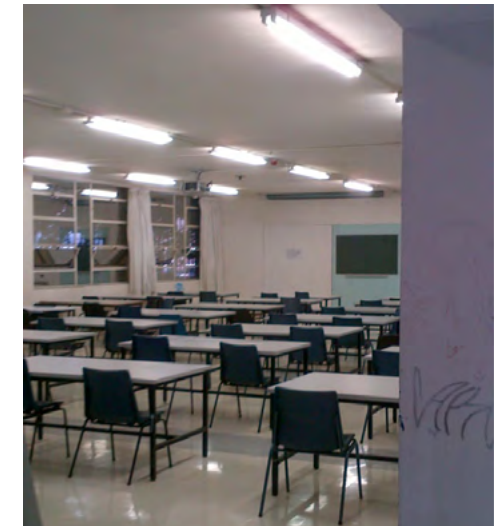


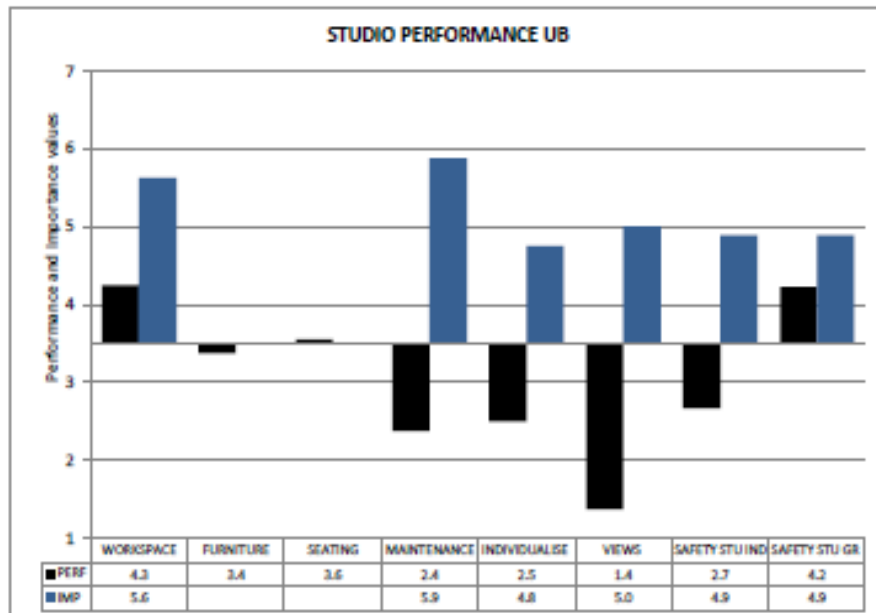
Figure 82b: Poor natural lighting conditions in John Moffat Annex, UB (A Janse van Rensburg, 12.02.2012)

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

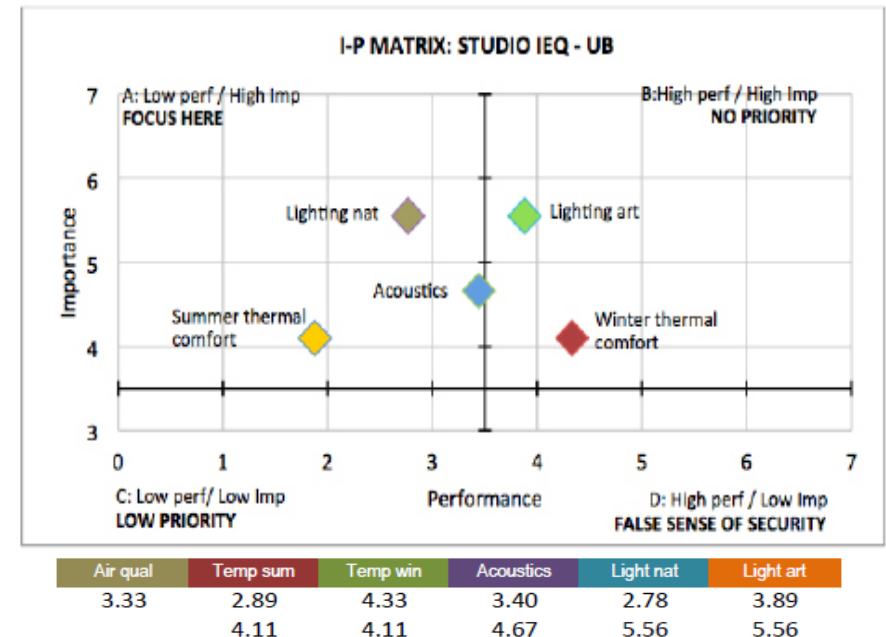


Discussion: Indoor environmental quality - UB

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

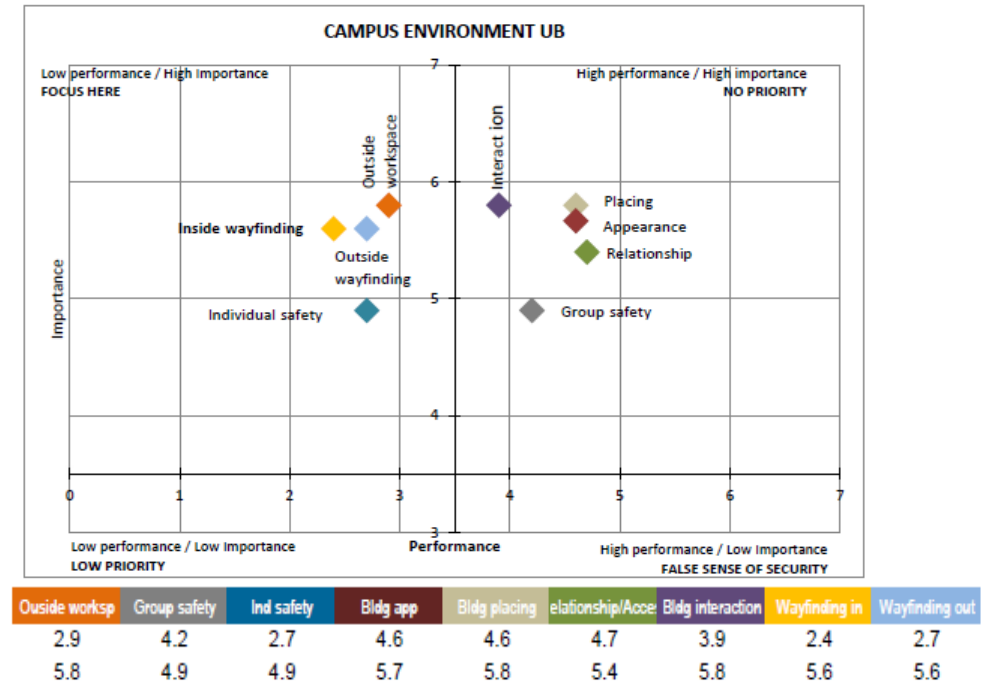


Figure 84: Main entrance and court yard, school building entrance and court yard, 2012 (Author, 17.02.2012)



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

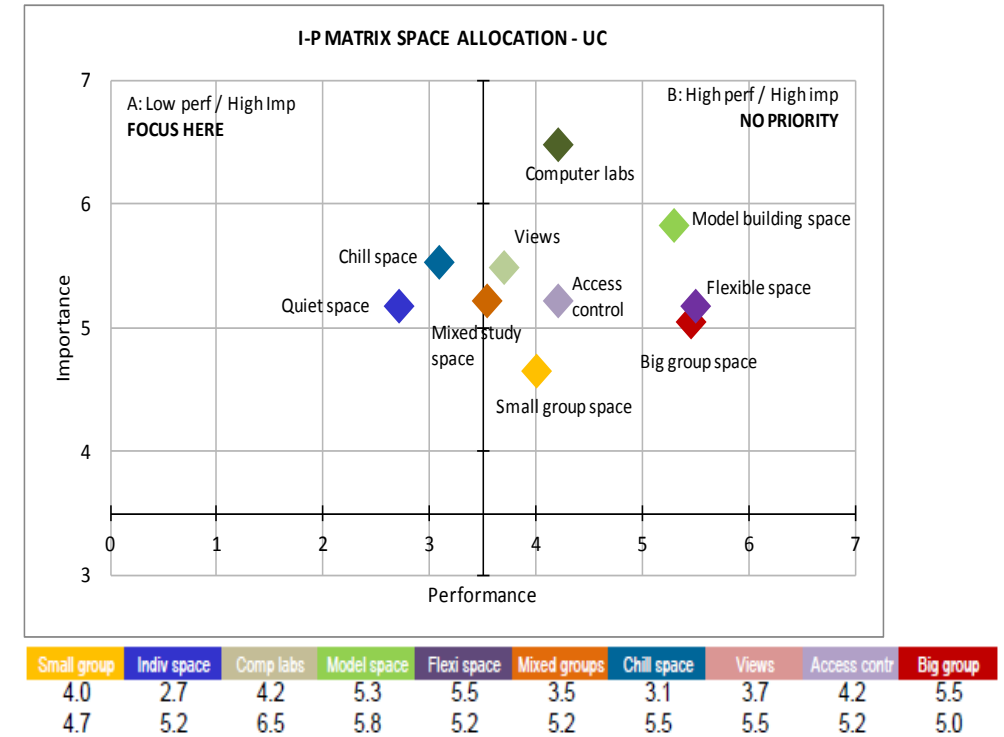


Figure 87: The double volume crit space with semi-private cubicles
(Author, 16.11.2011)



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)

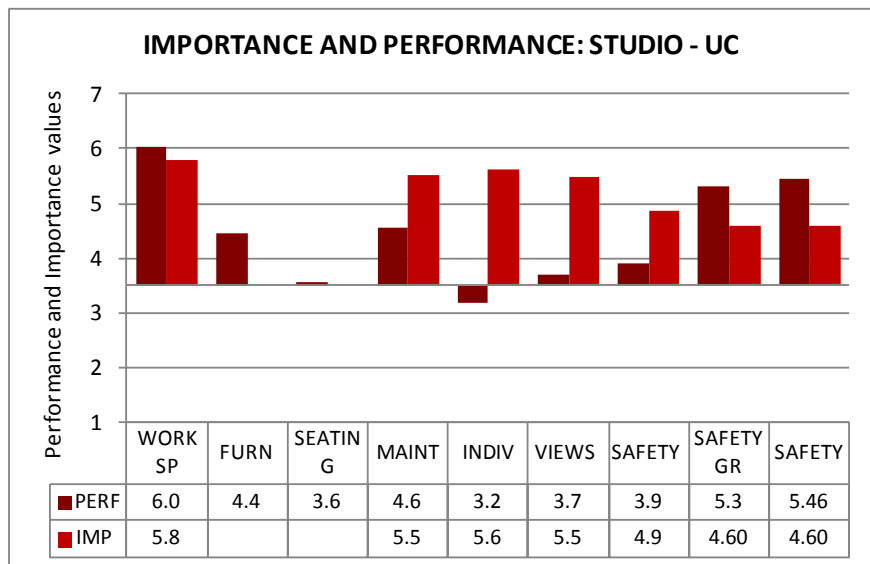


Figure 90: Satisfactory artificial lighting conditions in studio deep space
(Author, 09.11.2011)

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

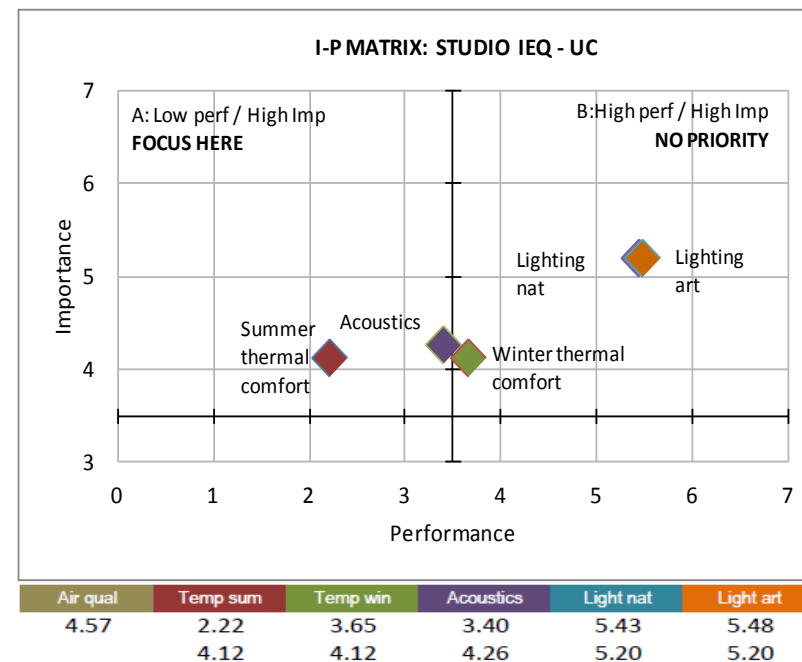


Discussion: IEQ - UC

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

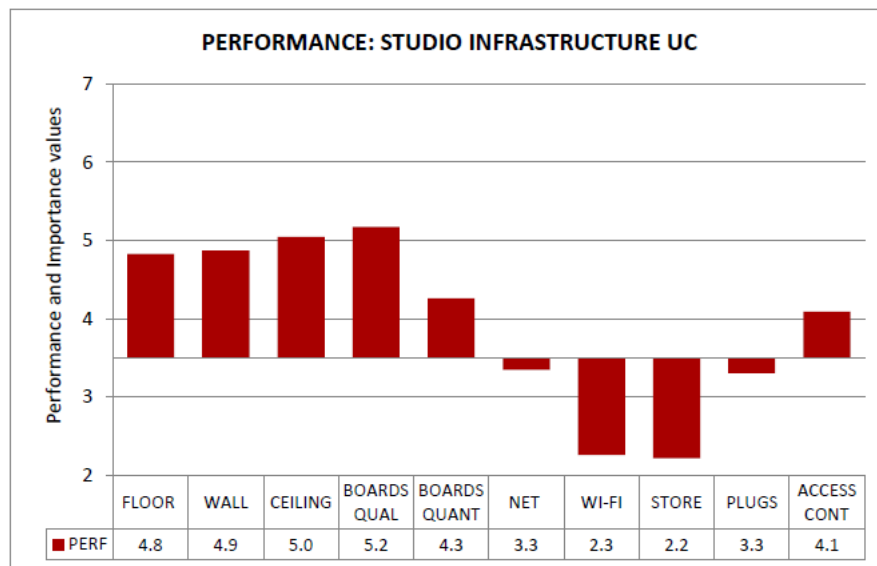


Discussion: Studio infrastructure - UC

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

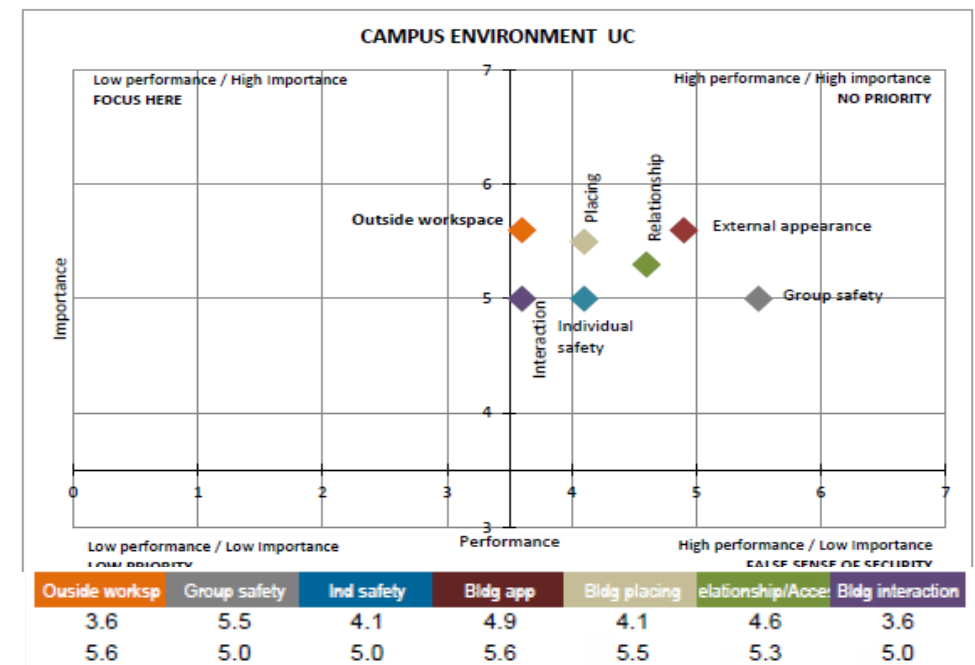


Discussion: Campus environment - UC

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.

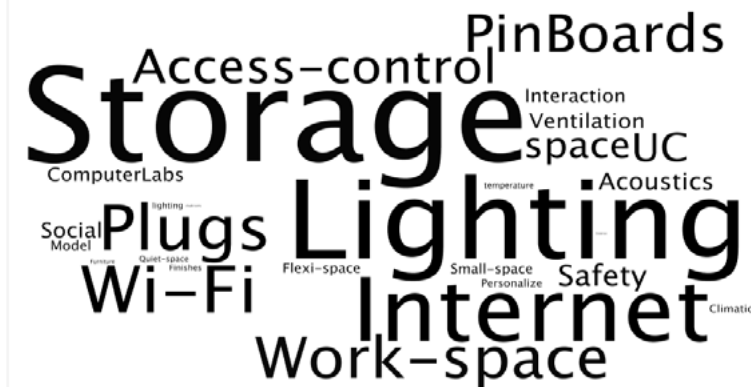


Figure 91: Word cloud - infrastructure - UC

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.

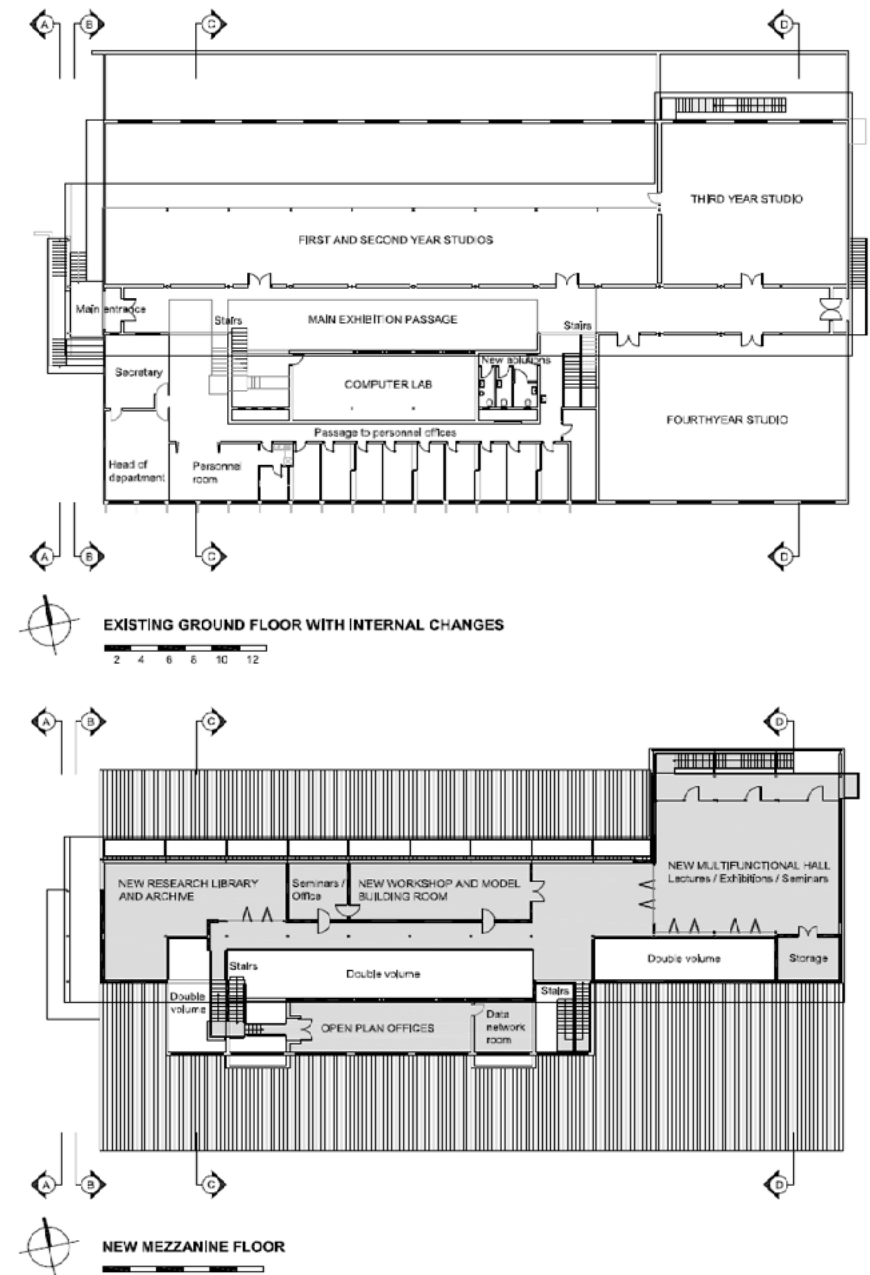


Figure 92a (top): Ground floor plan, renovations to school building at University C (H Pretorius, 08.02.2012)

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)

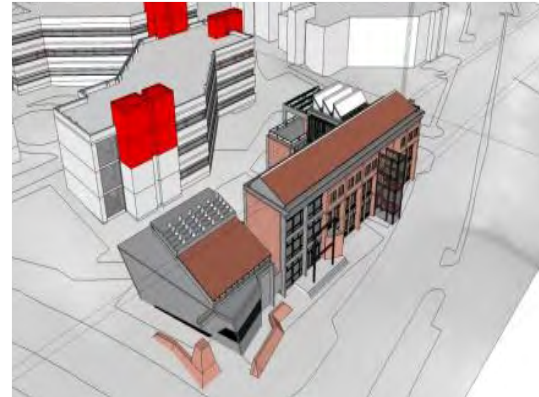


Figure 95: The proposed new extension to the school building (Architects Crafford & Crafford)
(www.fe.tut.ac.za/NewsContent.aspx?id=223)



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

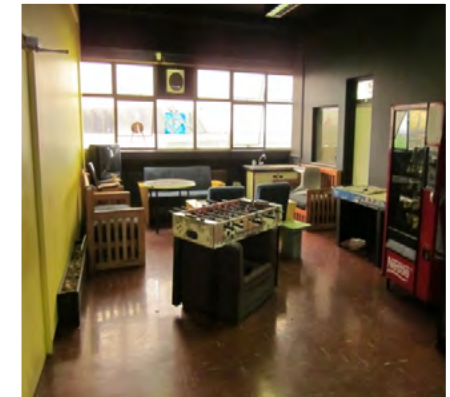


Figure 97: Student chill space, UD
(Author, 29.11.2011)

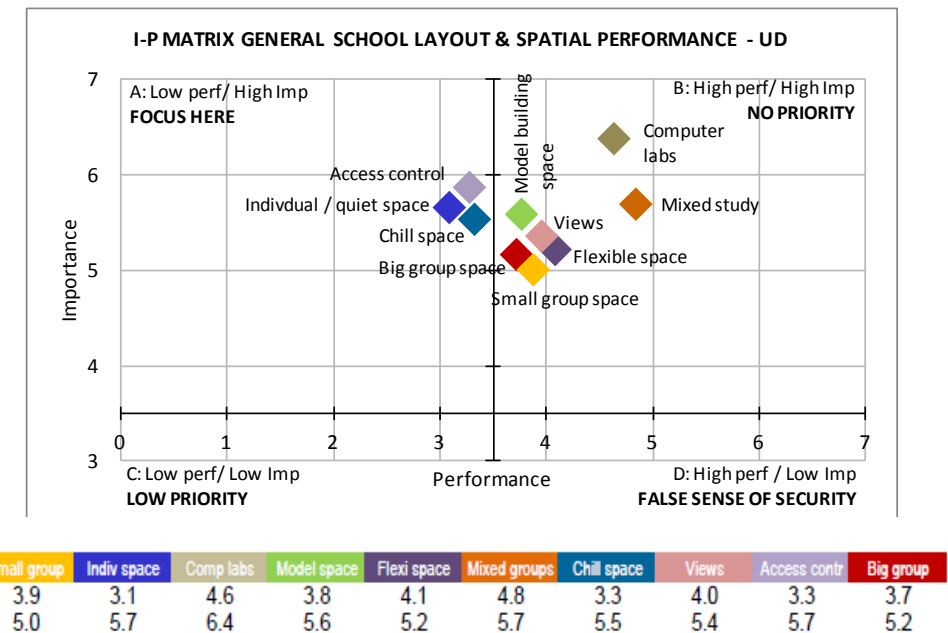
4.6.3 Descriptive analysis: UD quantitative data

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



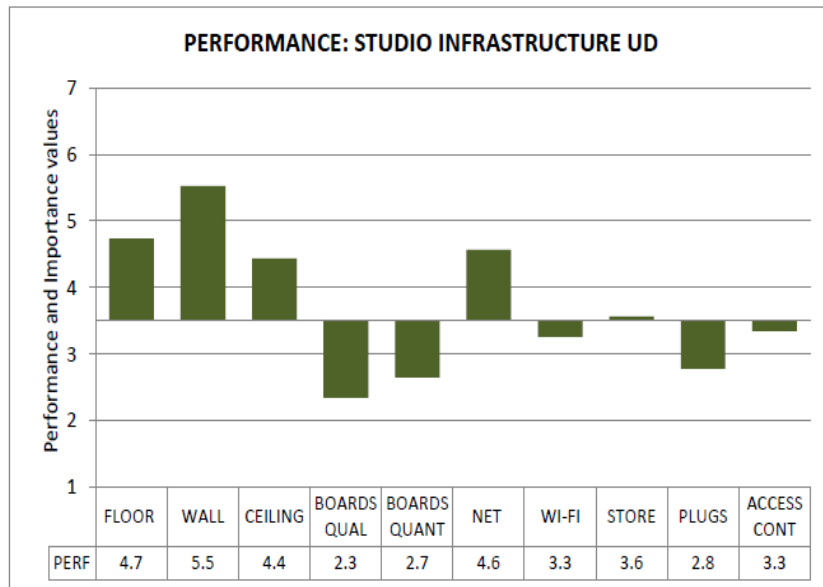
Discussion: Studio conditions - UD

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

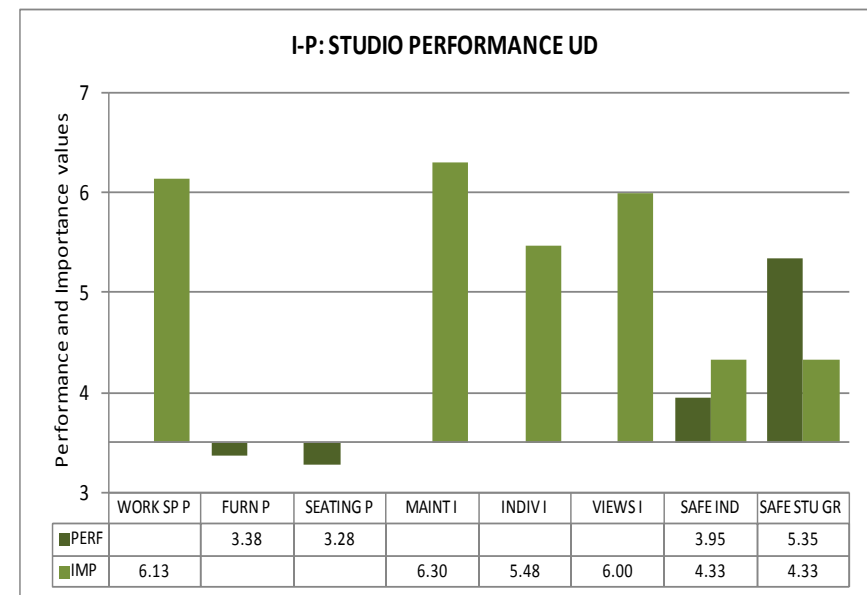


Table 20: Studio conditions - UD

A lot of useless broken furniture, outdated equipment
Very dirty and cramped
Messy studio environment
Internet problems
Very hot
Noise gets too much
When it is cooler
Temperature becomes unbearable
The noise levels during the day make it hard to work
Working at night is a better option [noise] ...
Cannot work in noisy environment - depends on what I am doing
I don't feel comfortable working in the studios
Temperature becomes unbearable

While the possible disadvantages of word clouds have been discussed, it does provide an impression of the words used by students at UD, to describe studio conditions (*Fig. 99*). The value of qualitative data collection is illustrated as students' comments can be compared to quantitative data for a more complete picture.



Figure 99: Word cloud for Indoor environmental conditions - UD



Figure 100 & 101:
Studio conditions, UD
(Author, 02.11.2011)



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

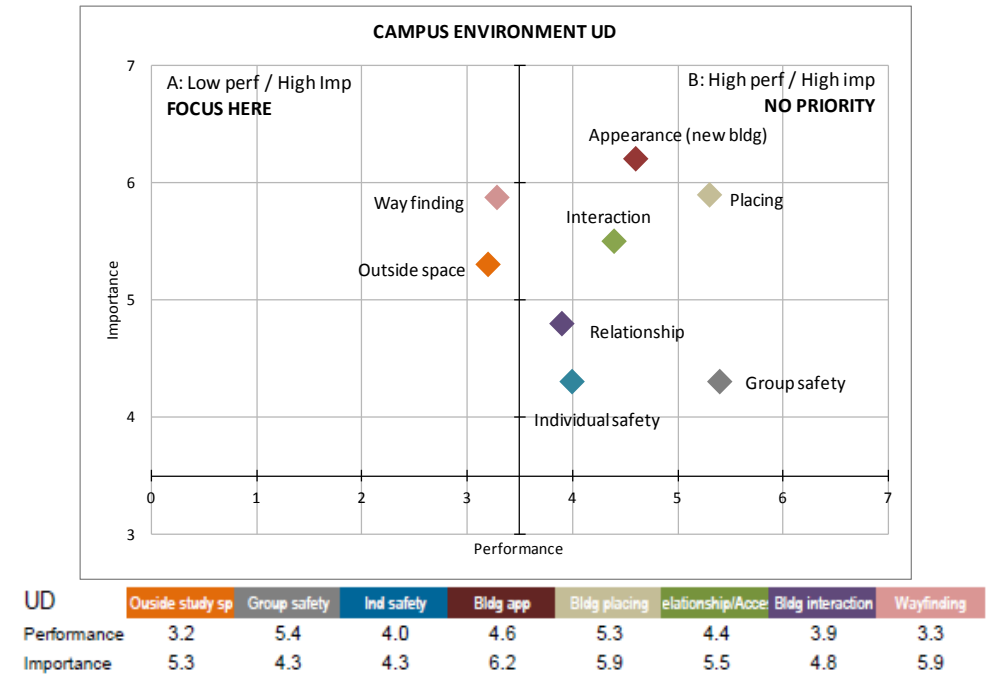


Figure 102: View across campus grounds towards the city center, UD (www.tut.ac.za)

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 appears to be 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:

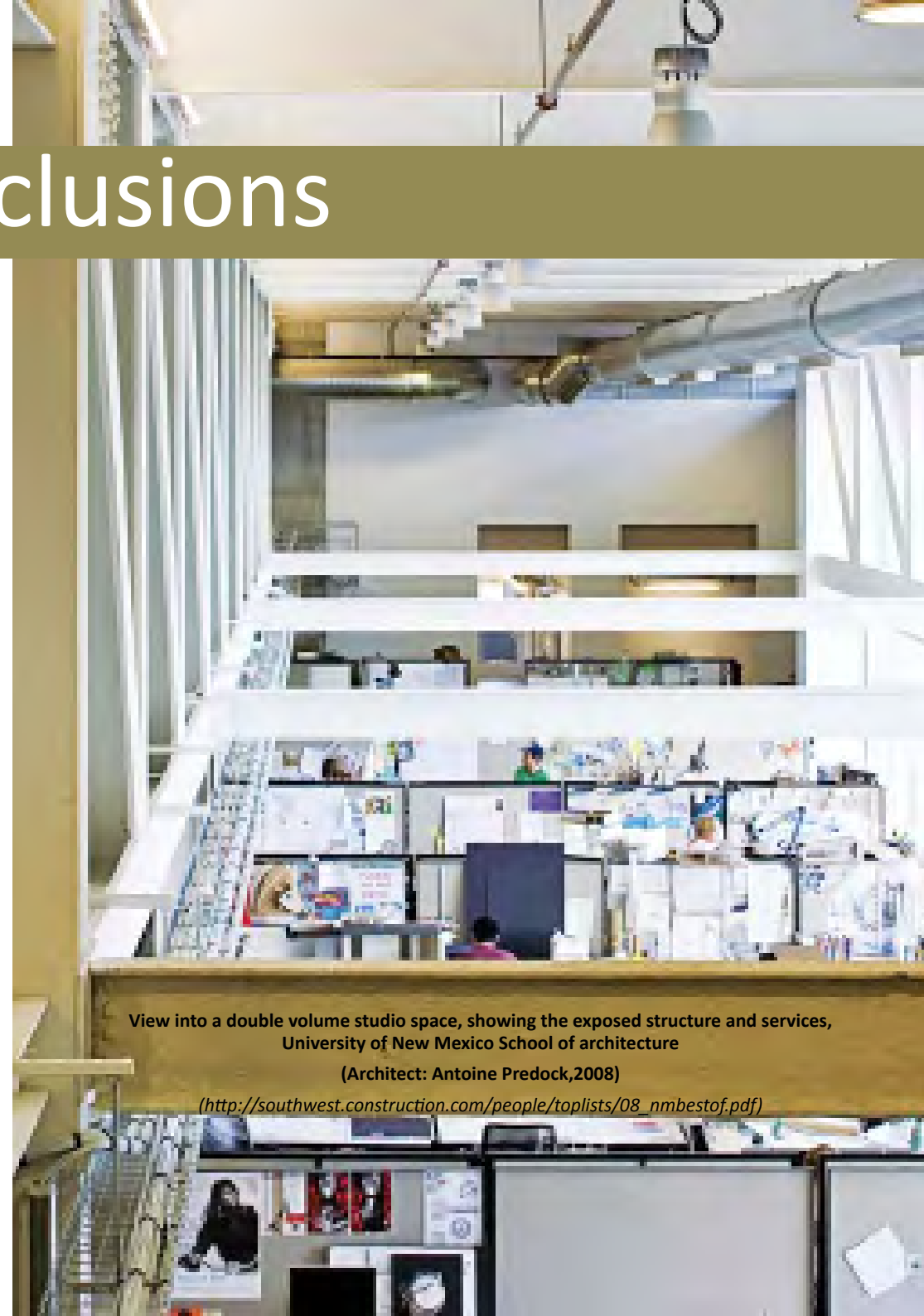
- Survey participant information
- Context of survey and building information
- A descriptive analysis of quantitative data
- Discussion of qualitative feedback
- Lessons learned and revisions to the questionnaire.

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.

5 Summary & Conclusions

- 5.1 Development of the goals and hypotheses
- 5.2 Review of the findings
- 5.3 Strengths and limitations of the research process
- 5.4 Potential applications of the research findings
- 5.5 Conclusion



View into a double volume studio space, showing the exposed structure and services,
University of New Mexico School of architecture

(Architect: Antoine Predock, 2008)

(http://southwest.construction.com/people/toplists/08_nmbestof.pdf)

SUMMARY AND CONCLUSIONS

This study proves that the facilities at South African schools of architecture do not comply with the requirements of students. This conclusion is based on the evidence collected at four schools of architecture representative of the South African architectural education environment: two schools in a major city (one of which is a traditional “research” school, the other a “vocationally-oriented” school in a comprehensive institution); a school located on the outskirts of a medium sized city and positioned within a University of Technology (i.e. a previous Technikon); and finally a school in the ‘traditional’ South African mould of research universities, located in a smaller city outside the Gauteng Province).

The conclusion may be controversial, but is based on an in-depth study of theoretical design principles of design for adult education, published precedents, and empirical research in the field. Fortunately, the study also indicates that a generic instrument, with minor adaptations to suit the particular context of a school, can be used to implement strategies to improve this situation.

5.1 Development of the goals and hypotheses

In Chapter 1: Introduction, the claim was made that students at schools of architecture are generally unsatisfied with their on-campus learning environment. This claim was based on the researcher’s personal experience both as architecture student and -teacher. There are also several published studies on the (dis)satisfaction of architecture students with their school facilities, in the form of Building Performance Evaluations, and specifically Post Occupancy Evaluations.

The initial research goal was, by implementing a survey at one school of architecture, to identify what those shortcomings are. The briefest of literature reviews showed that several such studies have been implemented and published. What was also clear though, was a shortcoming of existing research: students are not asked what they want of their school building and facilities, or what is most important to their wellbeing and success.

After a more detailed review of the literature, and analysis of the study results and research conclusions, it became evident that there are definite patterns in those shortcomings that were identified. A wide range of issues, from general campus level to the positioning of light fittings in architecture school studios are common problems in the physical facilities available to architecture students. The question then arose: why are these problems not systematically addressed in the designs of new schools of architecture, or renovations of existing facilities?

Further analysis of the existing studies lead to the underlying question of this study: what is a suitable method to easily identify those shortcomings that require immediate strategic responses, and those that are problematic but not crucial for success? After reviewing literature on research methodologies, Importance-Performance Analysis (IPA) was identified as a possible methodology to gain this missing knowledge. IPA identifies which environmental attributes are most important for student success and satisfaction, and how these can be provided for in a strategic manner. At this point, the research proposal was submitted for comment: that Post occupancy Evaluation, combined with Importance-Performance Analysis is the answer.

5.2 Review of the findings

The hypothesis was tested in the field, at four schools with diverging geo/physical-, academic, and historical contexts, yet the results were surprisingly consistent as far as the importance of the attribute variables were concerned, and gratifyingly inconsistent as far as satisfaction ratings were concerned.

The consistency in the importance ratings imply that 1) the selected attributes in the survey were appropriate, and 2) that there are proven patterns in their importance. The occasional expressed inconsistencies in responses between student bodies indicated that students were careful in their responses. When there was high standard deviation between schools, there was acceptably low deviation between students of the same school.

If all the performance results had been negative, or positive, it would indicate that respondents were probably satisficing (selecting a response without carefully considering the option) and the results would at best be questionable, and at worst unreliable and useless.

The results, as illustrated with the use of line- and bar charts and also scattergrams, indicate that:

- There are definite consistencies in those attributes that are most important: individual learning places where students can concentrate on complex tasks; workspaces outside of the building in landscaped areas; and the infrastructure to support working on computers.
- The above attributes were also those that are the least satisfactorily provided. This result points towards the accuracy of the non-linear relationship between importance and performance and this should be further investigated.
- The clear patterns in the responses prove I-P analysis easy to implement for strategic responses, and for efficient use of scarce resources.

5.3 Strengths and limitations of the research process

The initial intention was to test the quality of the research instrument – a questionnaire, and a method of responses analysis – at one school of architecture. The weakness inherent in such a small sample, is that the lack of opportunity for comparison and verification can deliver insufficiently convincing results. The survey sample was subsequently extended to include three more schools. The evidence gathered from the four different schools has much greater validity than that from a single student group.

The timing of the implementation – during an unstructured class period, or at year-end portfolio examinations – had both advantages and disadvantages. The main advantage was, that all students in a specific class group were present at the time of implementation. The disadvantage of permitting students to discuss their responses was that there was evidence of some cross-influence of responses, and during examination times students

may not complete the questionnaires in full due to time limitation. Timing has to be carefully considered and a controlled environment with sufficient time, appears to be the best option.

A possible criticism of the data analysis is that there was not in-depth statistical analysis. Some analysis of the raw data such as standard deviation, skewness and kurtosis, and sample variance was done, using data analysis extensions to Microsoft Excel 2010 and the results are available in the annexures. The patterns identified through relatively simple graphic means such as scattergrams, bar charts and line graphs were however considered consistent enough to be used as a basis for analysis and discussion.

A definite negative impact on the likelihood of future implementation of this research was uncovered during the literature review process: the generally poor acceptance of Post Occupancy Evaluation by the architectural profession. The reasons for this problem were briefly discussed, as it has a potential impact on subsequent implementation of the survey at schools of architecture and acceptance of the outcomes, but a solution to that problem is not proposed here. It is a strength of this study, that implementation of POE at schools of architecture, preferably through implementation by students themselves, may have a positive effect on future POE implementation in practice.

5.4 Potential applications of the research findings

This study was done with the particular goal of enabling future research that expands on current methodologies. A questionnaire was developed, that includes the importance of attributes and not only their performance.

This research format can be used in various ways: for longitudinal studies over a number of years (to assess how the conditions and needs of a particular group in a particular school change); cross-sectional studies (how the conditions and needs of similar groups in separate schools differ); or for quick studies to identify the causes of, and suitable responses to a particular problem. The psychometrics of the methodology was purposely kept simple, so that inexperienced researchers such as teachers or student groups can

easily implement the study either for further study or as part of an academic course. The scope of the attributes allow for in-depth investigation but the survey can be adapted to include or exclude certain attributes provided this is done within the parameters of good research practice, as discussed in Chapter 2: Literature review and Chapter 3: Methodology.

By having proven that there are core needs that are universally important (and as it turned out, almost universally poorly provided for), it is proposed that existing schools can address these needs and that designers of future schools can avoid them. Of course, to avoid this situation from being further perpetuated, this research must be repeated regularly as the needs of academic programs and students are dynamic.

Schools can use the outcomes of this study, or of their own implementation of the survey, to justify requirements for additional institutional resources. As has been acknowledged, this study focused on one of many influences on student success. While the methodology is not suitable for quantitative studies, some problems that were highlighted can be used to justify such studies of indoor environmental conditions such as temperature, lighting levels and air quality.

5.5 Conclusion

Two important objectives of this study were met: firstly, it builds on and contributes to multi- and interdisciplinary studies on Post Occupancy Evaluation. Another objective, expanding the traditional scope of IPA application in the HE environment from reporting on student satisfaction with the ‘soft’ service environment to also reporting on the physical learning environment has also been achieved.

This study did not set out to solve problems at schools of architecture on a global scale, or produce a ‘universal’ methodology. What it did set out to prove was that using Post Occupancy Evaluation and Importance Analysis together as a systematic process of data collection and results reporting, generates knowledge that can be used to make the architectural academic community aware of the issues that influence the satisfaction and thus the performance of their students.

The results of this study can contribute much to our understanding of how to design, and manage facilities at schools of architecture. This does not apply only to “brand new” schools (there are precious few of those), but even more importantly, the ongoing improvement of existing facilities.

Based on the above discussion of the outcomes, it is proposed that this study has succeeded in its goal.

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