POST OCCUPANCY EVALUATION (POE) TO THE NEW ACADEMIC BUILDING, UTAR SUNGAI LONG (KB BLOCK)

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A project report submitted in partial fulfilment of the requirements for the award of Bachelor of Science (Hons.) Quantity Surveying

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DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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APPROVAL FOR SUBMISSION

I certify that this project report entitled **"POST OCCUPANCY EVALUATION (POE) TO THE NEW ACADEMIC BUILDING, UTAR SUNGAI LONG (KB BLOCK)"** was prepared by **CHIN HUI LING** has met the required standard for submission in partial fulfilment of the requirements for the award of Bachelor of Science (Hons.) Quantity Surveying at Universiti Tunku Abdul Rahman.

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Date : _____

Specially dedicated to my beloved family

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ABSTRACT

Post occupancy evaluation (POE) is a process of collecting feedbacks based on users' perceptions of the design of the facilities and services in a building to improve the built environment. POE covers not only the satisfaction level of the occupants towards a building's facilities and services but can identify the missing element or inadequate design of the built environment. Possible improvement could be established from POE. In this research, a POE was conducted to the new academic building of Universiti Tunku Abdul Rahman (UTAR) at Sungai Long Campus which has been named as KB Block. The main aim of this study on POE of KB Block is to establish improvement to the facilities provided in this academic building for better learning environment and users' productivities. The areas of study included vertical movement facilities (staircase and lift) and learning facilities (audio visual equipment and informal learning spaces (ILS)) that were provided. This research used survey, interview with architects and walkthrough with building surveyor as the instruments to gather the feedbacks. A total of 435 responses were received from KB Block occupants. The POE findings showed that most of the respondents were satisfied with the staircase (67 %), loudspeaker (62 %), whiteboard (72 % and 79 % in lecture hall and tutorial room respectively), projector and/or projection screen (63 % and 68 % in lecture hall and tutorial room respectively), and ILS (67 %) provided in the block. Dissatisfactions of respondents mainly concentrated on the performance of lift (61 %) and microphone (46 %) in the lecture hall. The dissatisfactions on lift were due to insufficient provision of lifts, which primarily leads to long waiting time at the lift lobby and many intermediate stops while travelling in the lift. A few suggestions had been provided by the respondents to address the issues i.e. to re-programme the lift zoning design, to provide escalator at lower floors and to add more lifts. Respondents expressed their dissatisfaction towards the performance of microphone in the lecture hall mainly due to the frequent breakdown of microphone in lecture hall. The root cause of breakdown is due to loose cable connection of the microphone. The wired microphone if upgraded to wireless microphone, the problem could be solved. Frequent and regular maintenance on microphone is required to minimise the breakdown. In a nutshell, in order to improve the performance of facilities in the block, the university should consider the suggestions given by the respondents for the areas of study above, especially on lift and microphone.

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LIST OF SYMBOLS / ABBREVIATIONS

AV	Audio visual
CCTV	Closed-circuit television
CFS	Centre for Foundation Studies
DARP	Department of Alumni Relations and Placement
DEF	Department of Estates and Facilities
DF	Division of Finance
DOSH	Department of Safety and Health
DSSC	Department of Soft Skills Competency
ECU	Electrical control unit
FAM	Faculty of Accountancy and Management
FCI	Faculty of Creative Industry
FMHS	Faculty of Medicine and Health Sciences
GF	Ground floor
HVAC	Heating, ventilation, and air conditioning
ILS	Informal learning spaces
ISO	International Organization for Standardization
IT	Information technology
ITISC	IT Infrastructure and Support Centre
LKCFES	Lee Kong Chian Faculty of Engineering and Science
PMA	Permit Mesin Angkat
POE	Post occupancy evaluation
RTT	Round trip time
SB	Sub-basement
U.S.	United States
UBBL	Uniform Building By-Laws
UK	United Kingdom
USA	United States of America
UTAR	Universiti Tunku Abdul Rahman

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CHAPTER 1

INTRODUCTION

1.1 General Introduction

Post occupancy evaluation (POE) is a process of collecting feedbacks from the users' perceptions on the design of the facilities and services provided with primary aim of improving the built environment. Such improvement is necessary as the building environment will substantially influence the occupants in their way of performing and learning throughout the day, especially those who always stay more than half of a day in the building (Fisk, 1999). Meir *et al.* (2009) and Pérez-Lombard, Ortiz and Pout (2008) stated that the primary goal of POE is to increase occupant's productivity, optimise the selection of design alternatives and reduce wastage. Thus, the design of questionnaires, detail probing during interviews and a thorough walkthrough of the built environment is crucial for POE.

POE covers not only the satisfaction level of the occupants towards a building facility but can identify the missing element or inadequacy in the design of the built environment. For example, by collecting information from occupants regarding the provision of vertical movement around the building such as using the staircase, designer or building owner/developer can establish whether there is inadequacy to the design when users highlight feeling discomfort when taking the staircase. From thereof, the developer or owner of building should have the data which will provide lessons learnt for future design improvement to the staircase for ease of usage. These are some of the reasons POE should be conducted on every building during occupancy and after completion of more than 6 months.

This research is about a POE that was conducted for the new academic block of UTAR Sungai Long Campus named as KB Block – a new building completed in mid-2015 for students and staff relocated from other UTAR faculties within the Klang Valley. Sungai Long campus currently has two academic blocks, KA and KB city campus complete with all the facilities meant for learning.

A preliminary survey as pilot study was conducted to determine the feasibility of conducting this research and to select the research areas. Twenty students were randomly selected to provide feedback on the facilities provided at the KB Block. Majority of the feedbacks had focused on the vertical movement facilities provided in

the building that included the staircase and lift, and also the learning facilities such as audio visual equipment and informal learning spaces (refer to Table A - 1 at APPENDIX A). The summary of the interviews conducted for the pilot study is shown in Table 1.1.

Table 1.1: Area of Dissatisfaction at KB Block.

Vertical Movement Facilities	Learning Facilities
• Lift – crowded lift, longer waiting time • Staircase – too steep and too many steps between landing	• Audio visual equipment – frequent breakdown of microphone and projector, misplacement of projection screen and reflection on the whiteboard • Informal learning spaces – inadequate tables and chairs

This research paper is on the POE to establish issues that affect users' satisfactions level of KB Block which focused on the above two areas concluded from the pilot study, i.e. vertical movement facilities and learning facilities in the block.

1.2 Importance of the Research

Before this, there had been few POEs conducted but mainly on indoor environment quality, the building facilities and services in UTAR KB Block (Chong, 2017; Pang, 2016; Yong, 2016; David Loh, 2015). None of these studies provide detailed assessment on vertical movement facilities and learning facilities. The areas of study were chosen based on the pilot study done. The author concentrated on these areas instead of general areas to gain insight on users' perceptions of the performance on the said areas, also to find out any design inadequacy and to establish possible suggestion for improvement.

1.3 Problem Statement

A pilot study using survey was conducted to collect feedback from 20 respondents regarding the performance of KB Block academic building. Most of the respondents pointed their areas of dissatisfaction towards vertical movement facilities and learning facilities in the campus. The description of areas of dissatisfaction at KB Block is

shown in Table 1.1. The findings from the pilot study established that a research is required to be carried out in these areas where dissatisfaction were pointed out.

This research aimed to investigate in depth on user's perception towards vertical movement facilities at KB Block. UTAR Sungai Long Stair Climbing Campaign Report (2016) had mentioned the effects of various strategies in stair climbing such as putting up posters to encourage stairs usage, organising stair climbing competition and developing a mobile application for users to record stairs usage and calories burnt. Nevertheless, the report did not cover the root causes of users demotivation to use the staircase compared to using the lift. There were also limitations on the data collection method. Gathering data of flow of movement at staircase and lift through observation and bugs in mobile application led to inaccuracy of data. The author used questionnaire survey, semi-structured interviews and expert's walkthrough methods in this research to ensure validity of data from respondents.

1.4 Aims and Objectives

The main aim of this post occupancy evaluation of KB Block is to establish improvement to the facilities provided in this academic building for better learning environment and users' productivities.

The objectives of this research are:

(i) To determine the users' perception on the performance of vertical movement facilities and learning facilities in UTAR KB Block.

(ii) To investigate whether there exist any design inadequacy and/or the root cause of breakdown (if any) to the existing vertical movement facilities and learning facilities in UTAR KB Block.

(iii) To establish possible improvement based on users' perception for the inadequacies of vertical movement facilities and learning facilities (if any) at the UTAR KB Block.

1.5 Research Methodology

The methodologies to achieve the objectives included using survey as the instrument tool with students, lecturers and staff of UTAR as the respondents or the users of the research areas. Interview with experts such as architects has also been used to probe further information regarding the design of the areas studied. A walkthrough at the

study areas was done with a building surveyor. The detailed analysis of the design followed. Figure 1.1 shows briefly the research methodologies for this research.

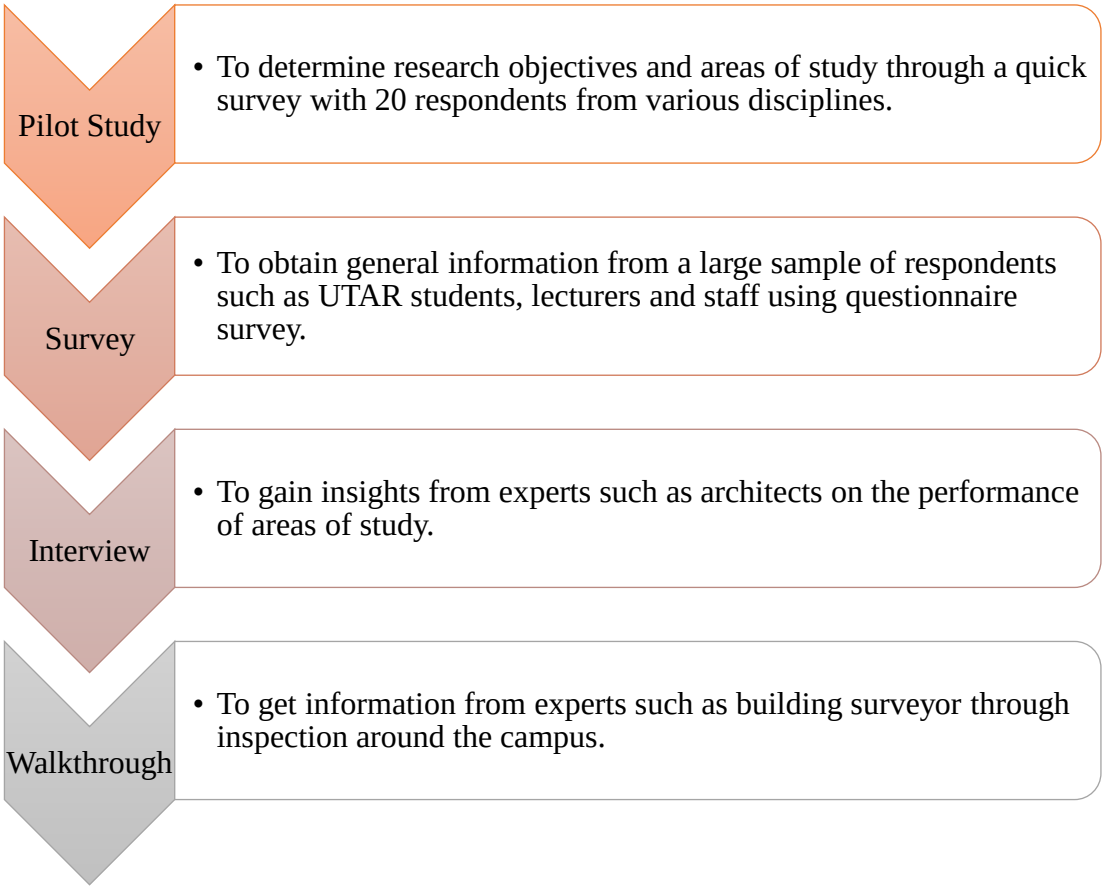


Figure 1.1: Brief Research Methodology of this Research.

1.6 Scope and Limitation of the Research

The scope of this POE focused on two areas of UTAR KB Block – vertical movement facilities and learning facilities. Vertical movement facilities were lift and staircase while learning facilities covered audio visual equipment (microphone, loudspeaker, projector, projection screen and whiteboard) and informal learning spaces.

The respondents of this research were confined to the occupants of UTAR KB Block as such the students, lecturers and staff who occupied and used the facilities of the block. They were the ones who can provide accurate feedback for the purpose of this research.

There were several limitations in this research as shown as below:

i) The author only focus on two areas of study in UTAR KB Block, which are vertical movement facilities and learning facilities due to time constraint

ii) There were limited resources available to obtain feedback from the original design team of this block and professional experts from the industry

iii) The walkthrough only done on selective areas instead of the whole block i.e. walkthrough of vertical movement facilities was conducted on lower floors while walkthrough of AV equipment was done at the available classrooms

1.7 Contribution of the Research

Any identification of design inadequacy and the root cause of breakdown would be to contribute to better future design of educational institution. The lessons learnt from this POE could be referred and reviewed in the future to avoid inappropriate design and to further improve the existing educational institution.

In addition, this POE could further be developed to include other areas such as wayfinding system, space allocation, green and sustainability of the building. A more detailed research on the adequacy of design could be done by collecting feedback from the original design team of the building and other experts who could provide possible improvement to the design.

1.8 Outline of the Research

This research paper is designed to have five chapters:

i) Chapter 1 – Introduction,

ii) Chapter 2 – Literature review,

iii) Chapter 3 – Methodology and work plan,

iv) Chapter 4 – Results and discussion, and

v) Chapter 5 – Conclusions and recommendations.

Chapter 1 introduced the problem statement and areas where POE was conducted that include the findings of the pilot study and reason for choosing only the vertical movement facilities and learning facilities.

Chapter 2 is the literature review of the subject matters that included principles of POE, the background of vertical movement facilities and learning facilities. A

collection of information from past researches, website and books enables the author to explore the above areas. This chapter assisted in the design of the survey form, reinforced the analysis of the data collected and supported recommendations in this research.

Chapter 3 highlights how POE was done for this study and the design of the questionnaires for the survey and interview. Mixed research methodology that included quantitative (survey) and qualitative (interview and walkthrough) methods. Questionnaire and online survey were adopted to obtain general feedback from the targeted occupants in large-scale. Interviews with two architects were conducted to obtain recommendations and solutions for the block focusing on the areas of study. Walkthrough with building surveyor was necessary to obtain different perspective on the areas of study.

Chapter 4 shows the result on the areas of study obtained through questionnaire and online survey, interview and walkthrough. The results were analysed using mode and displayed charts and tables. Secondary data were used to support the analysis. The objectives of the research had been achieved.

Lastly, Chapter 5 summarised the findings which achieved the objectives of this research. Recommendations based on users' perception was highlighted to enable future improvement on the areas of study. Limitations of this research were pointed out and recommendations for future research were stated.

CHAPTER 2

LITERATURE REVIEW

2.1 Post Occupancy Evaluation (POE)

POE is essential to ensure that building occupant's satisfaction level towards a building where he stayed is achieved (Khalil *et al.*, 2011). The purpose to conduct POE is to review the functionality and technicality of the building during occupation period (Blyth, Gilby and Barlex, 2006). POE also is being used to assess the impact of alternative designs on the performance of a building and to determine whether the building functions as expected at the initial target (Bee *et al.*, 2015). In order to successfully carry out POE, the techniques should be as simple and easy as possible, comprehensive, widely applicable, speedy and affordable (Bordass and Leaman, 2005).

Referring to Natasha and Abdul Hadi (2008), basically there are three phases to conduct POE: initial phrase, process phrase and recommendation phase. The steps are shown in Table 2.1 below.

Table 2.1: Progress Flow of POE.

Phrases	Steps
Initial Phrase	Step 1: Building Identify the information background of the buildings and define provided area/ function Step 2: Objective Identify the need for the evaluation and probable aspects of the evaluation
Process Phrase	Step 3: Planning Select planning approaches that will meet the needs of evaluation Step 4: Conducting Carry out the POE – Study observation, interviews, questionnaires Step 5: Applying Apply feedback of findings and recommendation

Table 2.1 (Continued)

Phrases	Steps
Recommendation Phrase	Step 6: Action Action in response to POE

[Source: Natasha and Abdul Hadi (2008)].

At the initial stage, the author conducted a pilot study by having a quick face-to-face interview survey with some respondents to identify whether there is dissatisfaction or suggestion for improvement to UTAR KB Block. The author found that vertical movement facilities and learning facilities are two of the main areas that the respondents have complaints.

In process phrase, the author focused on the two areas of study and plan to approach to evaluation the performance of the areas of study. The author read and critically analysed the literature review in order to plan the evaluation method. Feedbacks were collected from targeted respondents afterward through questionnaire, interview and walkthrough with experts. After data analysis was done, recommendations could be determined.

In recommendation phrase, the recommendations could be applied to increase the satisfaction of the occupants in UTAR KB Block. The solutions of problems were suggested based on the feedback from respondents.

There are many established POE methods available. Building use studies (BUS) methodology was adopted in this research. In general, the method is to conduct a questionnaire survey backed up by interviews and walkthrough. It could be used anytime but often after 12 months the building is occupied (Blyth, Gilby and Barlex, 2006).

2.2 Vertical Movement Facilities

Vertical movement facilities allow occupants to travel from one floor to another floor of a building. The facilities include staircase, lift and escalator. As UTAR KB Block has lifts and staircases, both of the vertical movement facilities were discussed in this research.

2.2.1 Lift

There are a lot of factors effecting the design of lift. These include the building population, number of floors, passenger arrival patterns, number of lift available, type of buildings and so on (Al-sharif *et al.*, 2010).

ISO 4190-1 fourth edition shows the international standard of lift speed and capacity for lift with speed not more than 6 m/s (ISO, 2010). The standard can help the lift designer to determine the optimised lift size in order to save building space. There are a total of six classes of lift – Class I, II, III, IV, V and VI (Table 2.2). Class I lift is to transport people only; Class II lift if to transport mainly people but goods may be carried; Class III is for health care purposes at hospitals and nursing homes; Class VI is to transport mainly goods which are accompanied by persons; Class V is for service lifts with small loads with repeating movement; and Class VI is for building more than 15 floors with heavy traffic with speed 2.5 m/s and above. So, lift at UTAR KB Block is categorized as Class II lift, where the main purpose if to transport people but sometimes goods are being transferred too (ISO, 2010).

Table 2.2: Lift Classes and the Purposes.

Lift Classes	Purpose
Class I	Designed to transport persons
Class II	Mainly to transport persons, but goods may be carried
Class III	Designed for health care purposes
Class IV	Mainly to transport goods which are generally accompanied by persons
Class V	Designed for service lifts with small loads with repeating movement
Class VI	Designed for building with intensive traffic

There are two types of lift performance assessment to determine the quality of lift service – classical performance criterion and modern passenger centric performance criterion (Al-sharif *et al.*, 2010). For classical performance criterion, quality of lift service can be determined by the interval. Interval is calculated by dividing the duration of round trip time (RTT) with total numbers of lift. RTT is the average time taken for a lift car to make a round trip, starting from the main lobby and returning to it. It is calculated by summing the upward journey time, downward journey time, passenger travelling time and door opening time (Srour, 2014). The

quality of lift service can be determined according to the interval as shown in Table 2.3. Generally the interval should be less than 30 seconds (Jochem, n.d.).

Table 2.3: Performance of lift Based on the Interval.

Average Interval (s)	Performance of lift
20 – 25	Excellent
35 – 40	Fair
45	Poor

[Source: Otis, 2012].

For modern passenger centric performance, passenger average waiting time, passenger travelling time, and passenger time to destination are used as a measure to determine the quality of lift service. Passenger waiting time refers to the time spent by a passenger waiting at the lobby once passenger registered a call until passenger entered a lift car. Passenger travelling time represents the time spent by a passenger in the lift while travelling to their desired floor. The sum of passenger waiting time and travelling time is passenger time to destination, which is the total time spent by passenger from call registration until passenger reached a destination (Al-sharif *et al.*, 2010).

Classical performance assessment centred on the lift system rather than concentrating on the passenger. Thus, classical assessment on lift performance has some limitations compared to modern passenger centric performance assessment. The interval time of the lift is calculated taking into consideration that it will return to the main lobby at all time. If the lift reversed its direction half way before reaching the lobby, then, the calculation does not apply (CIBSE Lifts Group, 2011). The classical method does not take into account the passenger's waiting time at the lift lobby nor accurately reflect the lift travelling time to a destination floor. For example, the passenger may have to wait for a long time to be in the lift although the lift's interval from one floor to another is within the acceptable range (Jochem, n.d.). There is also another possibility whereby the passenger at the lobby may have to wait longer when there is more crowd as only one lift car opens while the other will only open after one lift car left the lobby. The lift car does not open simultaneously at the main lobby unless there is existing passenger to the lobby. The assessment thus only applies to demand going up or up-peak demand and it does not cover down peak demand during

the interchange of lectures and bi-directional peak demand during lunchtime (Jochem, n.d.). Therefore, in order to arrive at a most suitable lift design for a building, both classical and modern assessment methods need to be combined.

In order to obtain passenger waiting time and travelling time, simulation of lift design is necessary such as Elevate and Liftsim (Al-sharif *et al.*, 2010; Peters, 1998). Simulation is used to analyse the performance of lift in offices, educational institution, hospital and et cetera by entering basic information such as floor height, number of lifts, lift capacity, lift speed and et cetera (Peters, n.d.). Based on actual current industry standard of 30/60/90, targeted passenger waiting time should be within 30 seconds, travelling time should be within 60 seconds while time to destination should be within 90 seconds (Al-sharif *et al.*, 2010).

Referring to Al-sharif *et al.* (2010), there are two parts in a process to decide on a suitable lift – 1) calculating interval; 2) lift simulation. Once the interval calculation meets the acceptable quality of lift service, the design is then simulated through software. If the simulation does not meet the 30/60/90 criterion, methods such as lift zoning, destinational group control or the use of double decker may be adopted. All the methods are tested until the lift design is within the acceptable interval and meet the requirement of 30/60/90. Table 2.4 summarises the advantages and disadvantages of classical and modern lift performance assessments. Figure 2.1 shows the flowchart of the process of calculating interval and lift simulation.

Table 2.4: Advantages and Disadvantages of Lift Performance Assessments.

Lift Performance Assessments	Advantages	Disadvantages
Classical performance criterion	• Simple and fast • Obtain results instantly	• Only applicable for up-peak algorithm • Results obtained may not be practical • Does not take into account passenger waiting and travelling time • Lift car is assumed to return to the main terminal after each trip • Only suffice for low to medium-rise building

Table 2.4 (Continued)

Lift Performance Assessments	Advantages	Disadvantages
Modern passenger centric performance criterion	• Focus on passenger waiting and travelling time • Applicable for up-peak, down-peak or bi-directional peak algorithm • Various traffic management scenarios could be tested and fine-tuned	• Relatively complex and slow • May require to learn and/or purchase lift simulation software

[Source: Al-Sharif and Al-Adem, 2013**;** Jochem, n.d**.].**

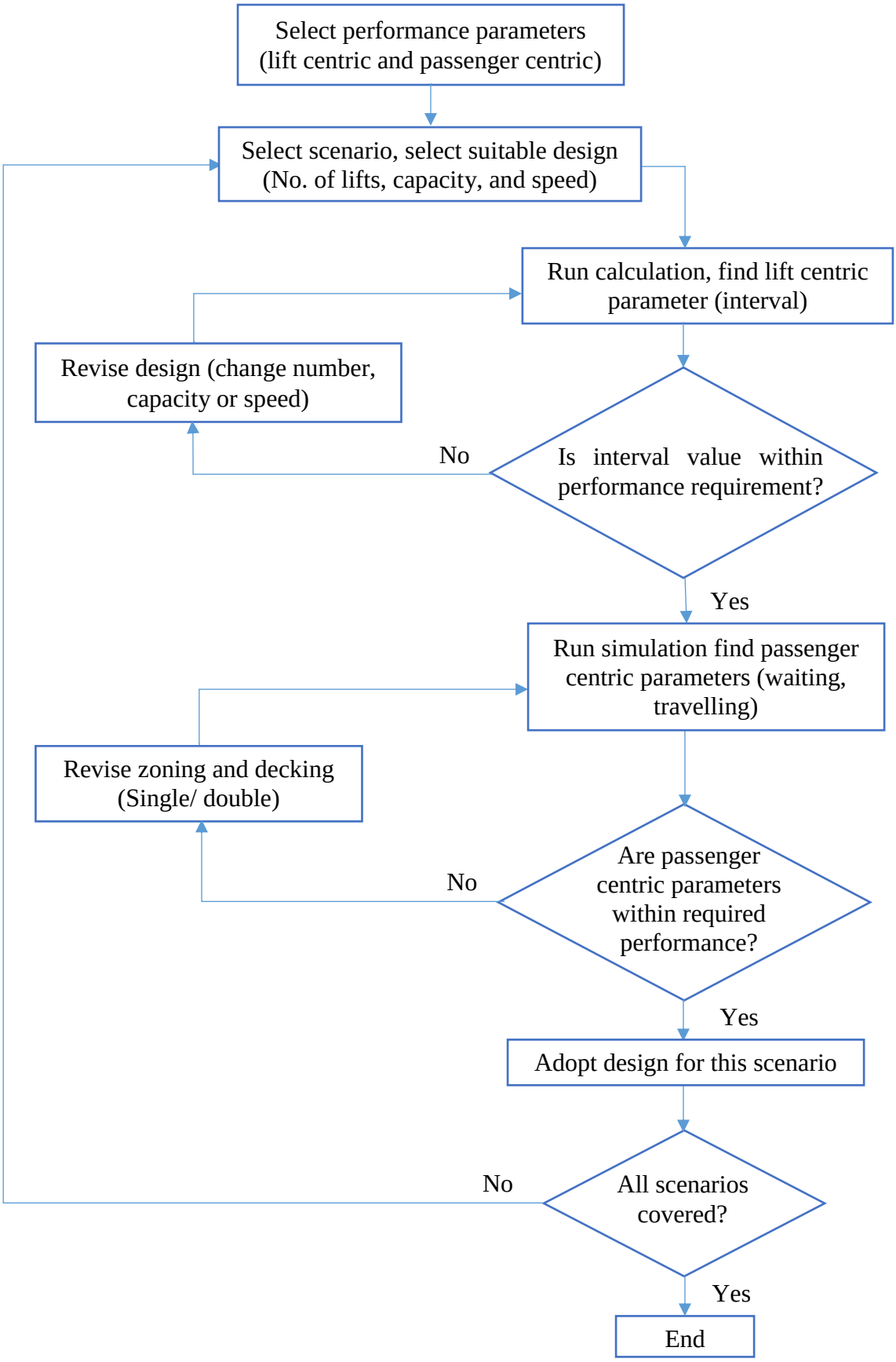


Figure 2.1: Flowchart of lift design analysis

[Source: Al-sharif *et al.*, 2010].

2.2.2 Staircase

Occupants in KB Block use staircase as one of the vertical movement facilities to upper floors. A good design of staircase not only can provide balance to users when climbing, it can prevent miss-stepping and falls. The design of staircase takes stair angle, rise, going, handrail, landings and other factors into account. Figure 2.2 and Figure 2.3 show the section and plan view of a staircase. Figure 2.4 shows the staircase terminology.

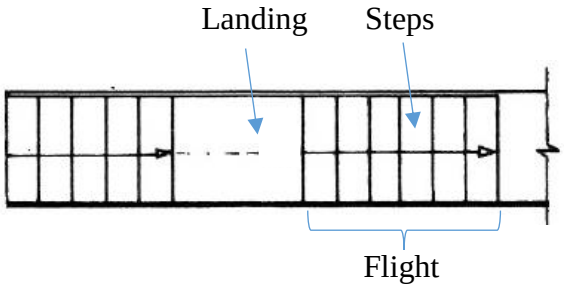


Figure 2.2: Plan View of Staircase

[Source: Staircase Planning, 2010].

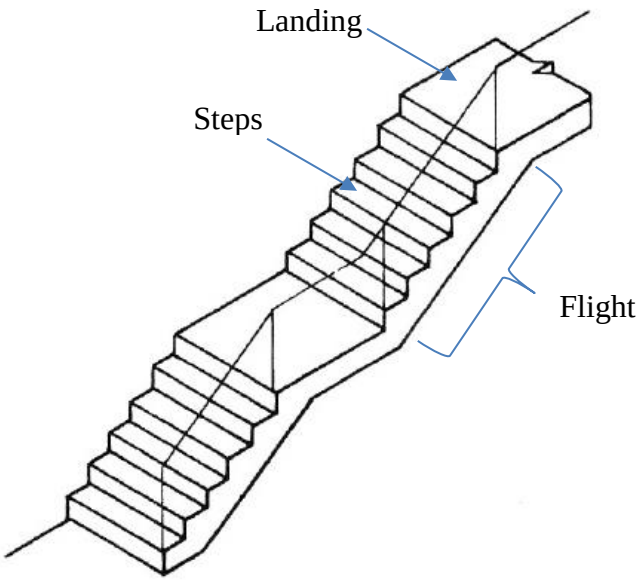


Figure 2.3: Section View of Staircase

[Source: Staircase Planning, 2010].

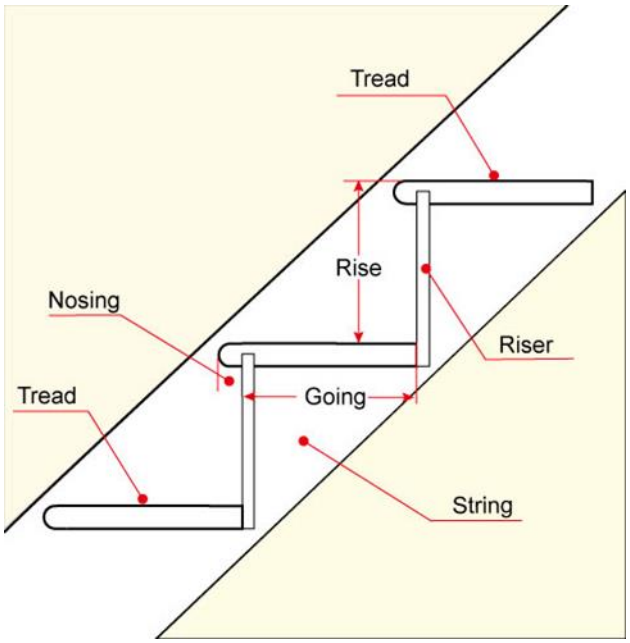


Figure 2.4: Staircase terminology.
[Source: Stair World, 2016].

The angle of a staircase will affect the comfort of users in climbing the staircase. User consumes more energy to climb stairs with a high inclination which is more than 30°, especially during stair ascent which is a more biomechanical task than stair decent (Protopapadaki *et al.*, 2007). High inclination staircase with an angle more than 30° may be hazardous and uneasy to use. The rate of falls, misstepping and injured increases as the angle of staircase increases (Protopapadaki et al., 2007; Tseng and Liu, 2011). Thus, it is an important factor when designing the staircase. The angle of a staircase can be designed by altering the rise and going of the staircase. Rise is the vertical distance between tread while going is the horizontal distance between two consecutive nosing (Figure 2.4).

The formula of angle of staircase is shown in Equation 2.1 and 2.2 below.

$$tan\ \theta = \frac{riser\ height\ (rise)}{tread\ width\ (going)}\ , \theta = angle\ of\ staircase \tag{2.1}$$

$$\theta = tan^{-1}\left(\frac{riser\ height\ (rise)}{tread\ width\ (going)}\right) \tag{2.2}$$

There are some guidelines and requirements for the design of staircase. Researches on staircase design were studied and discussed as below.

In Malaysia, referring to Sarawak Building Requirements by-law 83 to 90, the maximum rise is 180 mm while the minimum going is 260 mm (Sarawak Lawnet, 2008). There is some minor difference if compared to Uniform Building By-Laws (UBBL) of Malaysia. According to UBBL, the rise should not be more than 180 mm and the going should not be less than 255 mm (Uniform Building By-Laws, 2006). Furthermore, Department of Occupational Safety and Health (DOSH) Malaysia suggested that the rise and going should approximate a formula of "two rises plus one going equals to 600 mm" (Department of Occupational Safety and Health, 2007). For example, assume using a rise of 180 mm and a going of 260 mm, 2 × 180 mm + 260 mm = 620 mm, which is approximately 600 mm. If using the rise and going of 180 mm and 260 mm respectively, the angle of a staircase will be 34.7° (calculated using Equation 1 and Equation 2). This angle of the staircase is considered energy-consuming for users according to research done by Tseng and Liu (2011). However, if the rise is decreased to 150mm and the going is increased to 300 mm, 2 × 150 mm + 300 mm = 600 mm, the staircase is fulfilling the requirement by DOSH and at the same time offers the users a more comfortable staircase due to a lower inclination of 26.6°. Thus, it can be concluded that a staircase fulfilling requirements does not necessary considered comfortable for usage. One flight should consist not more than 16 steps (Uniform Building By-Laws, 2006; Majlis Bandaraya Kuching Selatan, 2007; Sarawak Lawnet, 2008) while DOSH Malaysia states that the maximum number of steps per flight between landings is 18 (Department of Occupational Safety and Health, 2007).

Referring to Tseng and Liu (2011) a study conducted in Taiwan, the study suggested that the angle of staircase should be less than 30° and the recommended rise and going are 160 mm and 280 mm respectively. At the angle of 25° to 30°, user consumes the least energy when climbing stairs. The study also concluded that climbing less steep stairs is relatively easier than climbing steeper staircase which is more tiresome. The participants involved in the study had an average height of 1.70 m, which were generally taller than people in Malaysia with an average height of 1.66 m and 1.55 m for men and women respectively (Onion, 2016). Hence, the conclusion of this study could be applied in Malaysia because the Taiwanese participated in the study who was taller than Malaysian was applying low inclination of 25° to 30°, Malaysia should apply the same or lower inclination to achieve energy savings in climbing stairs.

In Hong Kong, the maximum rise of a staircase should be 175 mm while the minimum going should be 225 mm. For greater ease of use, 150 mm rise and 300 mm going should be adopted for an internal staircase with heavy circulation (Buildings Department, n.d.). If the dimension of rise and going are 150 mm and 300 mm respectively, the angle of staircase is 26.6°. The average height of people in Hong Kong is 1.734 m for men and 1.601m for women (Disabled World, 2016; Height, n.d.). Generally, people in Hong Kong is higher than Malaysian and they apply low staircase inclination of 26.6°, so the staircase design requirement could be adopted by Malaysian.

An ergonomic staircase is designed in such a way to reduce users' fatigue when climbing the stairs. According to a report in India, an ergonomic staircase should provide full heel support for all size of feet, which the rise should range from 155 mm to 165 mm and the going should range from 300 mm to 350 mm (The Confederation of Indian Industry, n.d). The angle of a staircase should range from 25.2° to 27.3° according to their requirement. The average height of Indian is similar to Malaysian, which is 1.65 m for men and 1.52 m for women. The concept of ergonomic staircase could be applied in Malaysia.

Referring to a research in New York, USA, the recommended angle of a staircase is between 30° to 35° (Linear Staircase Design Projection, 2014). The staircase requirement in New York states that the rise should not be more than 230 mm and the going should not less than 280 mm (American Bureau of Shipping, 2013). The average height for American is 1.75 m for men and 1.63 m for women (Onion, 2016). The recommended angle of a staircase may not be suitable to be applied to Malaysia as American is generally 5 % taller than Malaysian.

Referring to a research in Canada, a staircase is safe to use if the maximum rise is 178 mm and the minimum going is 280 mm (Jane, Donna and Nancy, n.d.). The average height of Canadian is 1.76 m for men and 1.63 m for women (Disabled World, 2016). Surprisingly in this research, the staircase was to be designed at a less inclined condition although the height of Canadian is almost as tall as American. The research mentioned that around 33 % of seniors fell at least once per year. Moreover, people who die from falling when using staircase were seniors aged 65 years or older. So, it can be concluded that the research was more concerning on the safety use of staircase for the seniors. The steps should be in consistent height to avoid falling. The chance of fall and fatigue increases if there are 10 or more steps without landing (Jane, Donna and Nancy, n.d.).

Referring to Held *et al.* (2008), there should be maximum 12 steps between landing if the going less than 350 mm to enable the user to rest and recover physically for user who has trouble in moving. It was also expected that the staircase should have a standard rise of 150 mm and going of 300 mm without protruding nosing to meet the needs of disabled people. These standards were mainly applied for secondary school students in UK who might be shorter on average than UK adult. For secondary school students in UK ranged from 11 years old to 16 years old according to On Average (2016), their average height for boys was 1.64 m while the average height for girls was 1.60 m. The study is applicable in Malaysia since Malaysian adults shares almost the same average height with UK's high school students.

Table 2.5 summarizes the recommended staircase requirement from various researches at different country. The researches do not necessary reflect the mandatory requirements of their countries.

Table 2.5: Recommended staircase requirements from various researches at different country.

Country	Average Height (m)	Rise (mm)	Going (mm)	Angle (°)	No. of steps per flight
Canada	1.63 to 1.76	Maximum 178	Minimum 280	-	Maximum 10
Hong Kong	1.601 to 1.734	150	300	26.6	Maximum 12
India	1.52 to 1.65	155 to 165	300 to 350	25.2 to 27.3	-
Malaysia (DOSH)	1.55 to 1.66	Two rise plus one going equals to 600		-	Maximum 18

Table 2.5 (Continued)

Country	Average Height (m)	Rise (mm)	Going (mm)	Angle (°)	No. of steps per flight
Malaysia (Sarawak)	1.55 to 1.66	Maximum 180	Minimum 260	-	Maximum 16
Malaysia (UBBL)	1.55 to 1.66	Maximum 180	Minimum 255	-	Maximum 16
New York, USA	1.63 to 1.75	230	280	30 to 35	-
Taiwan	1.70	160	280	Less than 30	-
UK	1.60 to 1.64	150	300	26.6	Maximum 12

From the studies above, it could be concluded that the recommended maximum rise ranged from 150 mm to 180 mm, the recommended minimum going ranged from 255 mm to 350 mm and the angle of a staircase should be less than 30° in overall, except the study from New York. The study of New York is less suitable to be applied in Malaysia as the average height of people from New York in the research was 5 % taller than the average height of Malaysians. Besides, the recommended rise and going of the research from New York were higher than the other countries listed in the table above. The recommended rise, going and angle of staircase in New York may only be applied to them but not for Malaysians. It can be summarized that a staircase which meets the standard requirements may not be a comfortable staircase for some users. The recommended angle of a staircase in another country may be different due to the varying height of people at different country.

All the mentioned studies above showed that the dimension of the rise and going should be uniform. This is because as people climb the staircase, they remember the dimensions of steps and their brain will automatically place their foot on the next

step assuming the next step has the same dimension as the previous steps. If they move the same distance but the step is not in the same place, this may lead to tripping and falling (Matthews, n.d.). If the rise of a step is relatively higher than other steps, people may trip during stair ascent or their foot may have a harder impact on the next step during stair decent which may cause injury to the foot (The Mercury News, 2012; Inspectapedia, n.d.). The maximum variance of rise and tread of steps is 0.375 inches, which is 9.525 mm (International Building Code for Stair Treads and Risers, 2014; Luckado, 2012; Stairs4u, n.d.; Logan, n.d.; Haring, n.d.; Inspectapedia, n.d.).

There are other requirements on staircase which include the provision of properly fitted handrails at both sides and provision of non-slip and suitable staircase finishes (Buildings Department, n.d.). Other than that, proper lighting should be provided at the staircase as poor stair lighting may lead to tripping. This is because the staircase users may misjudge the location of each steps without proper illumination at the staircase (The Staircase Experts, n.d.). Besides, diffusers should be provided for the staircase to deliver ventilating air and evenly distribute the flow of air (Staircase Planning, 2015). Handrails are constructed to provide balance to staircase users (Department of Occupational Safety and Health, 2007).

The requirements mentioned above are some of the suggestion and it varies from countries to countries. It is necessary to find out the suitability of such regulations in certain country before trying to fulfil the requirement as people's preference may affect the suitability.

Stairs climbing exercise offers health benefits to the staircase users. For example, stair climbing for 7 minutes per day could halve the heart attack risk over 10 years. The exercise could lower mortality risk by 33 % by just climbing 8 flights per day. Moreover, stairs climbing offers positive impact on users' health such as reduces cardio risk by at least 30 % and helps to build muscle and control weight, besides cutting carbon and et cetera (Step Jockey, n.d.). Thus, the occupants are encouraged to take the staircase to improve their health. Nevertheless, overweight is not advised to take the staircase to minimise stress on their hearts (DeseretNews.com, 1989).

2.3 Learning Facilities

Learning facilities in this research context include audio visual aids and informal learning space in KB Block. Audio visual aids motivate learning and teaching process, making the process interesting and effective (Rasul, Bukhsh and Batool, 2011).

Informal learning spaces provide allows students to gather, discuss, study and relax between lectures (Student Life, n.d.).

2.3.1 Audio Visual Aids

Audio visual aids focused in this research include microphone, loudspeaker, projector, projection screen and whiteboard. This was because based on the pilot study, these facilities often breakdown or being complained by the respondents. These audio visual aids are significant in the learning process because they can help to increase student's concentration and provide motivation for students to learn (Ashaver and Igyuve, 2013). For example, with the help of audio aids such as projecting pictures and animation or drawing during classes, students could visualise their study material and interest may be aroused so that they could focus on the matter. Lecturer could explain their material easily as a picture is worth a thousand words. Furthermore, lecturers could deliver lesson more effectively to the whole class by amplifying their voice using microphone and loudspeaker. Referring to Rasul, Bukhsh and Batool (2011), students and lecturers agreed that audio visual aids do provide great assistance for them in the learning and teaching process.

In general, there are four types of learner – visual learner, auditory learner, read-write leaner and kinesthetic learner (Ericksen, K., 2016). Visual learners like to get exposed to pictures, charts or graphic; auditory learners prefer things to be explained to them verbally and through communication; read-write learners enjoy reading and writing and they interact with texts; kinesthetic learners prefer to learn through hands-on and demonstration (Ericksen, K., 2016).

It is important for a presenter to incorporate various teaching methods to cater the needs of all the four types of students as much as possible. For instance, a presenter could include images and graphics to stimulate the interest of visual learners. Communication with auditory learners may be inconvenient in a large lecture hall, microphone and loudspeaker could be adopted to ease communication. Read-write learners benefit from studying the material projected on the projection screen and written on the whiteboard. Kinesthetic learners learn more effectively when they are asked to answer questions on the whiteboard.

Based on the pilot study and observation by the author, there was less participation from the students during their learning processes in UTAR KB Block. Lectures often delivered knowledge through verbal communication from a distance,

so words spoken have to be delivered clearly. Students must see the study material clearly from the projector screen or whiteboard and more importantly, to hear clearly of what would be delivered by the lecturers. Problems arise when there is difficulty in hearing lecturer's delivery of knowledge. Besides, although study material is always provided at the intranet to allow students to download, the lecture progress greatly depends on the material shown on the projector screen or whiteboard as lecturer may have to teach based on figures such as graphs, images and slides. Besides, lecturer may write formulas or draw something on the whiteboard which may not be accessible by all the students, especially those who sit very far from the whiteboard. Thus it is important to have functional projector screen, speaker and microphone in a lecture room.

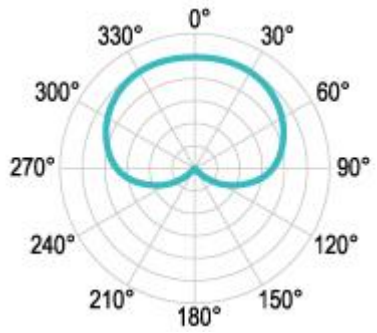
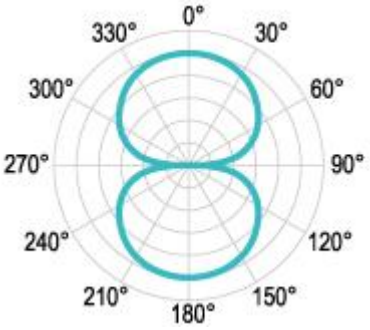
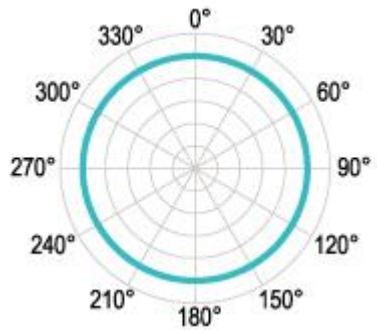
2.3.1.1 Audio Aids

Speech-to-noise ratio is the relationship between the desired sounds from the speaker to the unwanted noise. Adults with normal hearing would require at least +6 dB to hear spoken message clearly. For instance, for students to hear at least 65 dB voice from the lecturer (which is a standard decibel required for speech delivery 1 m away from the lecturer), the maximum background noise should not more than 59 dB (65 dB – 6dB = 59 dB). Normally, the noise level in a full working classroom is ranged from 45 dB to 55 dB, referring to (Audio Enhancement, 2009). Students who sit 1 m away from the lecturer could clearly receive the spoken messages from the lecturer, but not necessary same to those students who sit far behind from the lecturer in a huge lecture room. To solve the problem, sound enhancement equipment has been developed. Sound enhancement equipment such as microphone and loudspeaker was discussed in the following paragraph.

Microphone is one of the sound enhancement equipment used to amplify lecturer's voice so that students sitting far behind the lecture room could receive the sound from the lecturer. Microphone directionality is one of the important characteristics that should be looked into when choosing a microphone because sometimes, acoustic feedback may be occurred in the lecture room. Acoustic feedback happens when a microphone picks up the sound output from a loudspeaker, re-amplify the pick-up sound, output to the loudspeaker and gets picked up by the microphone again (Errede, n.d.). This will disturb the sound distributing towards the students. Identifying the suitable microphone directionality could help to solve the problem.

Microphone directionality is divided into three categories, which are unidirectional, bidirectional and omnidirectional as shown in Table 2.6.

Table 2.6: Types of Microphone Directionality and its Purposes.

Microphone directionality		Description
	Unidirectional	Microphone mainly receives sound of the person speaking, suitable for speech delivery
	Bidirectional	Microphone receives sound from front and rear, usually used between two persons who are face-to-face, i.e. during interview
	Omnidirectional	Microphone receives sound from all directions, suitable to be used for choirs or music performance on stage

[Source: Yamaha, n.d.; Conversor, n.d.]

During lectures, in order to prevent acoustic feedback, a unidirectional microphone should be chosen so that only the microphone is only sensitive towards the sound produced by the lecturer, but not the audience. The microphone should also be used as far away as possible from the loudspeakers (Errede, n.d.).

Other than microphone directionality, choosing the right type of microphone is critical to make the speech delivery process effective and efficient. Wired microphone sends audio signal to the speaker through a cable. Wireless microphone such as handheld, lapel and headset microphone requires a transmitter and a receiver to function. Transmitter converts audio signal of a person to radio signal while the receiver converts the radio signal sent from the transmitter back to audio signal without the use of cable. Transmitter is available in two forms – handheld transmitter and bodypack transmitter. Handheld transmitter is integrated within the handheld microphone. Bodypack transmitter is lightweight and it could be easily clipped to clothing, suitable for lapel and headset microphone which the user wants to be hand-free while talking or singing (Shure, 2014).

Figure 2.5 shows the image of a headset microphone with its bodypack transmitter. Table 2.7 describes the advantages and disadvantages for wired and wireless microphone to aid people in choosing the most suitable microphone.

Figure 2.5: Headset Microphone with its Bodypack Transmitter.
[Source: Cyber Market, n.d.]

Table 2.7: Types of Microphone.

Type of Microphones	Advantages	Disadvantages
 **Wired Microphone**	• No worry on battery life and frequency selection • Easy troubleshooting available as root cause of breakdown is easy to be identified	• Limited mobility • Increase cable trip hazards

Table 2.7 (Continued)

Type of Microphones	• Advantages	• Disadvantages
	• More economical than wireless microphone	
 **Wireless handheld microphone**	• Free to move around to make interactions • Eliminate cable trip hazards • Avoid cable-caused problem • Staging is more presentable	• Only functions within a limited range of distance • Requires batteries, thus operation time is limited • Limited frequency selection limits the numbers of wireless microphone used at the same time and place • Wireless interference may occur • Easily get stolen
 **Headset microphone**		
 **Lapel microphone**		

[Source: Boly Electronics, n.d.; Petruccelli, 2016; DeJong, 2013, A Quick Guide to the Pros & Cons of Wired and Wireless Microphones, 2014]

The suitability of a microphone depends on the user's need. If a lecturer always stands or sits still at a specific place to deliver a lecture or movement is minimum, a wired microphone should be sufficient. If a lecturer has to use whiteboard frequently to write formula other than speaking, a wireless handheld microphone could be adopted. Sometimes a lecturer wants to get attention from students or ensure the students are concentrating in the class, he or she tends to walk around the class to make interaction with the students while some lecturers likes to move his or her hand freely while speaking. For the above situation, it is best for the lecturer to choose either a

headset or a lapel microphone because the transmitter could be clipped to clothing instead of carrying with hand, so he or she could be hand-free. Nevertheless, the disadvantages of each option should be taken into consideration while choosing a microphone. For example, limited frequency selection limits the numbers of wireless microphone used at the same time and wireless interference may occur. These happened when a radio frequency microphone is used. This could be solved by providing a wireless FM system with switchable frequencies to allow the users to select interference-free channels (AudioLinks, 2016). Nevertheless, the coordination becomes another problem for a larger university. Infrared wireless handheld microphone could be adopted instead of radio frequency wireless microphone as it would solve the radio frequency problem and it provides a low cost signal security feature (Liles, 2012).

There are some precautions to be taken while using microphone. A person should never tap or blow into a microphone under any situation because microphone is very sensitive towards sound. If a microphone reacts, such as producing high-pitched sound without any input from a person, the volume of loudspeakers should be reduced to minimize the problem caused by acoustic feedback (Nintendo, 2009). Although windscreen placed inside a microphone could reduce the sensitivity of a microphone from large sound, a user is advised not to place their mouth too near to the microphone (Steam, n.d.).

Malfunction of microphone could be caused by mistakenly plugging the microphone into the wrong port on sound card. Sometimes a driver update may be required from manufacturer website to use a microphone. The microphone should be configured with the Windows in computers properly to make the microphone works. This could be done through the control panel on the computer. Besides, bad voice quality may be occurred due to faulty cable or loose connection with the computer (Steam, n.d.). When using a wireless microphone, inference of microphones may be happened. This is caused by the “crushing” of frequency with another wireless microphone. So, frequency has to be adjusted to fix the problem. Most wireless bodypack transmitter has an antennas, or a small wire protruded from the transmitter. User has to make sure that the antennas are not damaged or touching a human body which absorbs signals, as it could affect the wireless signal. The batteries of a microphone should be replaced frequently too (Instructables, 2012).

Loudspeaker is another sound enhancement equipment that could improve learning and teaching process. For example, lecturers may suffer vocal fatigue when they use their voices intensively for a long period of time which leads to increased absenteeism. Loudspeaker could aid them by amplifying their sound so they do not need to shout throughout their teaching process. The equipment could also increase student participation, comprehension, and attractiveness (PC Werth, 2014). The opposite of a microphone, a loudspeaker which is also a receiver, converts the radio signal sent from the transmitter back to audio signal. There are few types of indoor loudspeaker – column loudspeaker, ceiling loudspeaker and wall loudspeaker (The Institute of Sound and Communications Engineers, n.d.). Table 2.8 shows the description for various types of loudspeaker suitable to be used in a lecture hall.

Table 2.8: Types of Loudspeakers Suitable to be Used in Lecture Hall.

Types of Loudspeakers	Descriptions
 **Column loudspeakers**	• Comprises few small loudspeakers inside a loudspeaker cabinet • Able to transmit constant output to a farther distance (20 m in general) evenly provided it is hang at least 2 m from the floor level • People who is near to the loudspeaker will hear louder sound, but this effect is offset by raising the loudspeaker above them • Avoid to place a loudspeaker near to the wall to minimize reflection of sound which will cause echo
 **Wall loudspeakers**	• Wall loudspeaker is used when ceiling loudspeaker is not possible to be installed due to high ceiling condition or inaccessible for wiring • Able to transmit sound to a shorter distance – 4 m, suitable for small or medium room

Table 2.8 (Continued)

Types of Loudspeakers	• Descriptions
	• Could be used as a support to the main speakers to provide sufficient intelligibility throughout a big hall • Loudspeaker should be arranged in staggered form along the longer side of wall to provide wider sound coverage • Should be placed 1.8 m to 2.0 m above the floor level, with spacing between 4 to 6 m
 **Ceiling loudspeakers**	• Install to evenly project sound in a large area when ceiling is low enough or wall loudspeakers is not sufficient to provide such coverage • Area of coverage depends on the height of the loudspeaker mounted on the ceiling • Should conform with fire authorities regulation as in the event of fire, some of the ceiling loudspeaker stops flame and smoke being induced into ceiling void • Could be hidden and not visible from people

[Source: B&H, n.d.; Yamaha, n.d.; Pro Acoustics, n.d., The Institute of Sound and Communications Engineers, n.d.]

A lecture hall with ramped fixed seating requires a pair of column loudspeaker to be placed in front of the hall because column loudspeakers can project sound to a longer distance than using wall loudspeakers. The column loudspeakers should be hung 120° in the horizontal plane and 30° in the vertical with at least 2 m high from the floor level and spacing of at least 15 m to be effective (Figure 2.6). Wall speakers could be installed if column loudspeaker alone is not sufficient for a big lecture hall. Ceiling loudspeakers are suitable only for lecture hall which its ceiling height is low, which is less than 3.5 m high from the floor level (The Institute of Sound and Communications Engineers, n.d.). Figure 2.7 shows an example of loudspeakers placement in a lecture hall (Audio Visual System Solutions for Education, 2015).

Precaution should be taken to avoid acoustic feedback which may be occurred if the loudspeaker's cable runs alongside with microphone's cable for more than 1 m because of signal induction from the loudspeaker. To achieve listener intelligibility, the sound from both the performer and the loudspeaker should hear like they are originated from the performer, but not from the loudspeakers. For example, if loudspeakers are located far away from the performer and are producing louder sound than the performer, all the sounds appear to come from the loudspeakers. This could be achieved by properly designing sound reinforcement system (The Institute of Sound and Communications Engineers, n.d.).

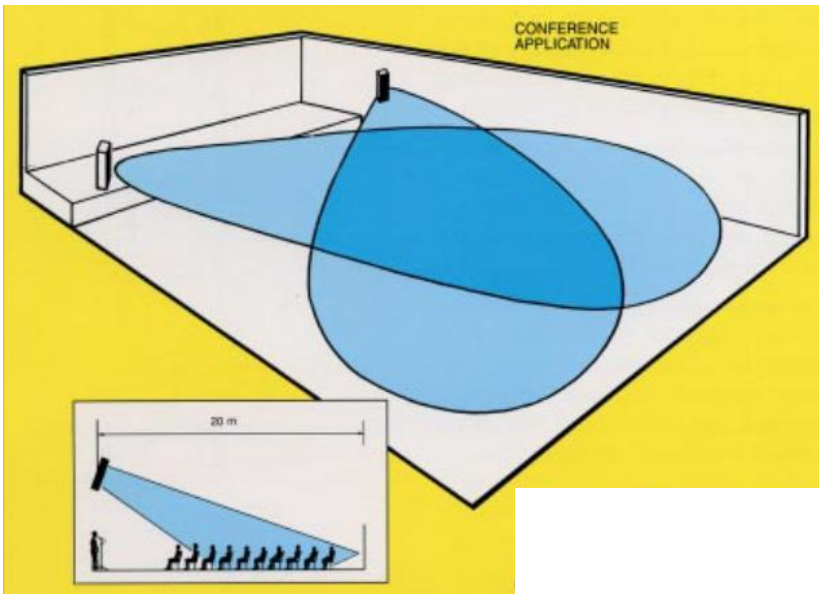


Figure 2.6: Column loudspeakers placement in Lecture Hall.

[Source: The Institute of Sound and Communications Engineers, n.d.]

Figure 2.7: Loudspeakers placement ideas in a Lecture Hall.

[Source: Audio Visual System Solutions for Education, 2015]

2.3.1.2 Visual Aids

There are various visual aids available in an education section to improve teaching and learning process. One of them is the writing board used to write and draw during lecture. Chalkboard, whiteboard and interactive board are discussed in Table 2.9.

Table 2.9: Types of Writing Board Available as Visual Aids in Teaching and Learning.

Types of Writing Board	Advantages	Disadvantages
 **Chalkboard**	• The cheapest among the three options • Supply of chalk is easily available • Better readability with white characters on black background	• Dusty which may cause allergy • Chalk may dirty user's clothes • Limited colour of chalk available • Non-ergonomic for left-handed user
 **Whiteboard**	• Relatively cheaper than interactive board • Vibrant colour of marker pen is available • Projector can project on the whiteboard acting as projector screen • Relatively easier to write and erase than chalkboard • Has magnetic surface to stick information on whiteboard	• Black character on white background often decrease readability with growing distance • Marker pen inks smudged on body or clothes are difficult to be cleaned • Surface reflects light, leading to glare causing visual impair and astigmatism • Non-ergonomic for eft-handed user • Marker pens has odour

Table 2.9 (Continued)

Types of Writing Board	• Advantages	• Disadvantages
 **Interactive whiteboard**	• Touchable surface, supports multi touch operation • Very convenient – could easily save, erase, highlight and et cetera • Wirelessly connect with other devices • The uses of colour, images, figures, websites and so on are easily available • Promote effective communication among students by improving student engagement • Saves inks of marker pen and chalks	• Expensive • User has to spend time in learning and operating the interactive whiteboard • Does not guarantee to increase student's performance • Costly - maintenance

[Source: Overly, 2016; Smart, n.d.; ScreenBeam Touch 90 – Miracast interactive whiteboard, 2016; Ramani, 2011; Brown, n.d.; Anon, 2014; Smartboard 680I Interactive Whiteboard Package Interactive whiteboard for Hire, 2011; TU Delft, 2014].

The use of chalkboard is gradually substituted with whiteboard since mid-1980s. Although chalkboard is still common in some old school, whiteboard is used instead of chalkboard most of the time due to its convenience to use shown in Table 2.9 (Concordia University, 2016). As technology is becoming more and more advanced, interactive whiteboard solution has been introduced to aid teaching and learning processes of lecturers and students respectively. It was firstly introduced in 1991 by Smart Technologies. Until year 2016, Google and Microsoft have created their interactive whiteboard – Jamboard and Surface Hub respectively (Overly, 2016). It has

many functions, including delivering lessons directly from the interactive whiteboard, recording notes and drawings on the whiteboard and importing them into a documents in computer, conveniently gathering responses from students and so on (Sanford, 2012). The interactive whiteboard has visual touch technology which will track the motion of users, convert the signal and interpreted by the computer. User can scroll, zoom, copy, write, drag and click on the whiteboard, like using a touch screen computer (En.cybernetyx.com, n.d.). Although interactive whiteboard does not guarantee to improve student's performance, student may feel more satisfied in a learning environment with such technology provided. Effectively using this technology encourages student engagement and collaboration (Schipper and Yocum, 2016). Figure 2.8 shows the use of interactive whiteboard in group discussion.

Figure 2.8: Interactive Whiteboard used in Group Discussion.
[Source: Overly, 2016]

The writing boards mentioned above could be mobile or mounted to walls (Reid, 2007). Referring to U.S. Department of Defense (2012), the mounting height of boards is between 560 mm to 915 mm above floor level. For user's height ranged above 1.60 m, writing boards could be mounted 915 mm above floor level. The top of writing boards is maximum 2100 mm from the floor level. If the writing boards are mounted too low, those sitting far behind the lecture and classroom have difficulty in reading the writing board and tall people have to bend their body to write on the writing board. However, the recommended height depends on the average height of the user community – children, adults and/or disabled users (Smart, 2010). Figure 2.9 shows the recommended mounting height of writing boards for various height range of users. This is applicable for portable writing boards.

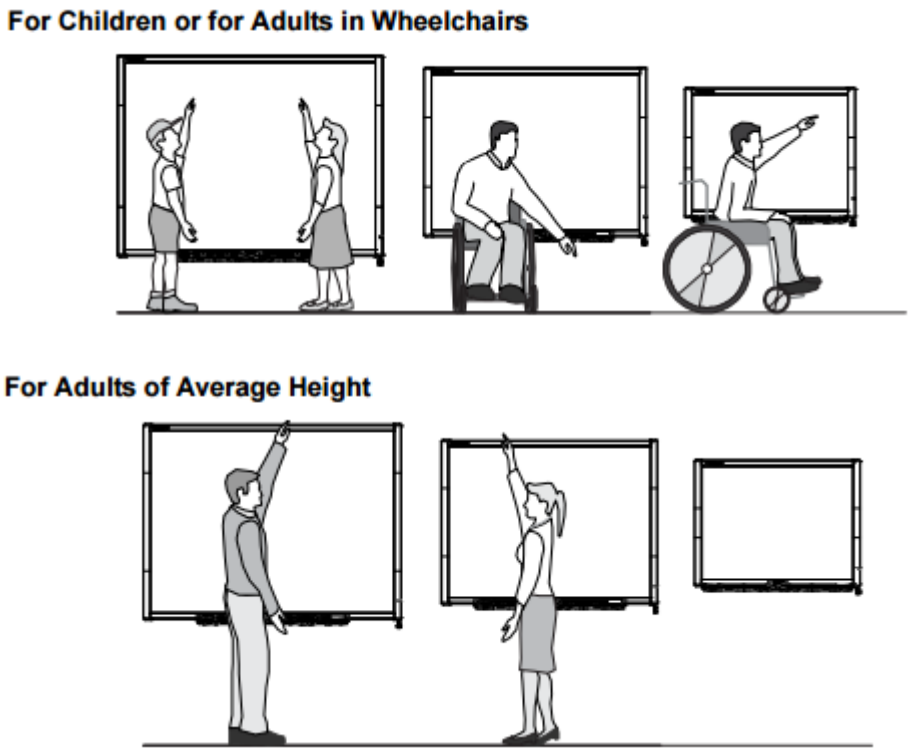


Figure 2.9: The Recommended Mounting Height of Writing Board for Various Height Range of Users.
[Source: Smart, 2010].

Other than writing boards, projector and projection screen is also a common visual aids in lecture hall and classroom. One may think that a plain white wall would be good enough for the image to be projected onto thus able to save the cost of projection screen. However, projection screen has optical coatings that enhance the properties of the image such as the highlight, contrast and colour saturation. Besides, the black frame around the sides of the screen could boost the visual quality of the image. A projection screen is long lasting, so it is a good choice to invest in a high quality projection screen (Powell, 2003).

There are some requirements in installing projection screen to increase readability. The requirements include the numbers of projection screen, the horizontal and vertical viewing angle and et cetera. For example, a minimum of two projection screens should be installed in a lecture hall (University Committee of Instructional Facilities, 2007). This is because student's suitable viewing area for text recognition should be within 50° from the centre of their eyes (Figure 2.10). For students who sit in the front row near to the left and right wall in the lecture hall, rotating their eyes are

not sufficient. They need to rotate their neck to read the projection screen in the middle of the room. Once their necks turn more than 35°, they may face severe neck stress. To achieve ergonomics, two screens should be placed in front of the lecture hall. Referring to Figure 2.11, the green zone shows viewing area that is within 35° neck rotation while the red zone depicts viewing area that exceeds 35° neck rotation. In order to cater for the needs of students at the utmost left and right front row, two projector screens are only sufficient. Referring to Gardiner (2015) in Figure 2.12, a 90° viewing cone, measuring 45° from both edges of projection screen should cover all the seating in a lecture hall or classroom. This is to ensure all the students could read the projected materials.

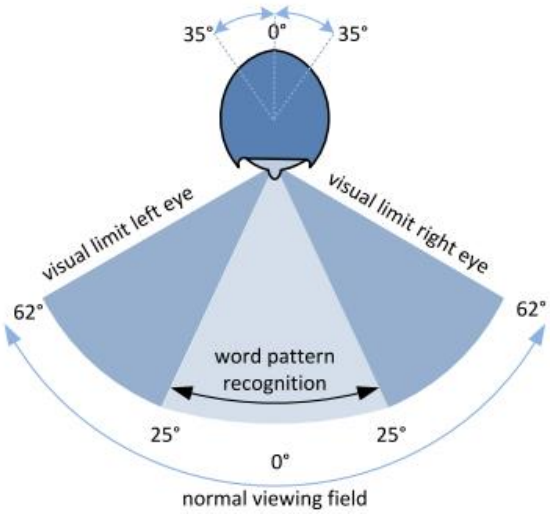


Figure 2.10: Horizontal Viewing Area for Text Recognition.
[Source: TU Delft, 2014].

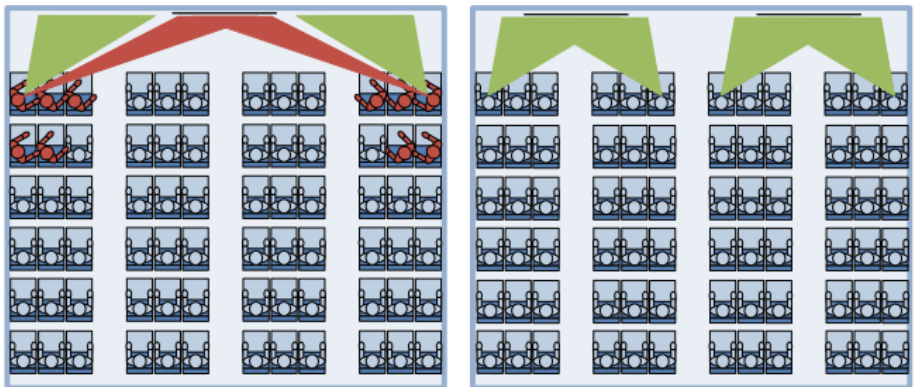


Figure 2.11: Horizontal Viewing Angle with One Centred Positioned Projection Screen and Two Projection Screens.
[Source: TU Delft, 2014].

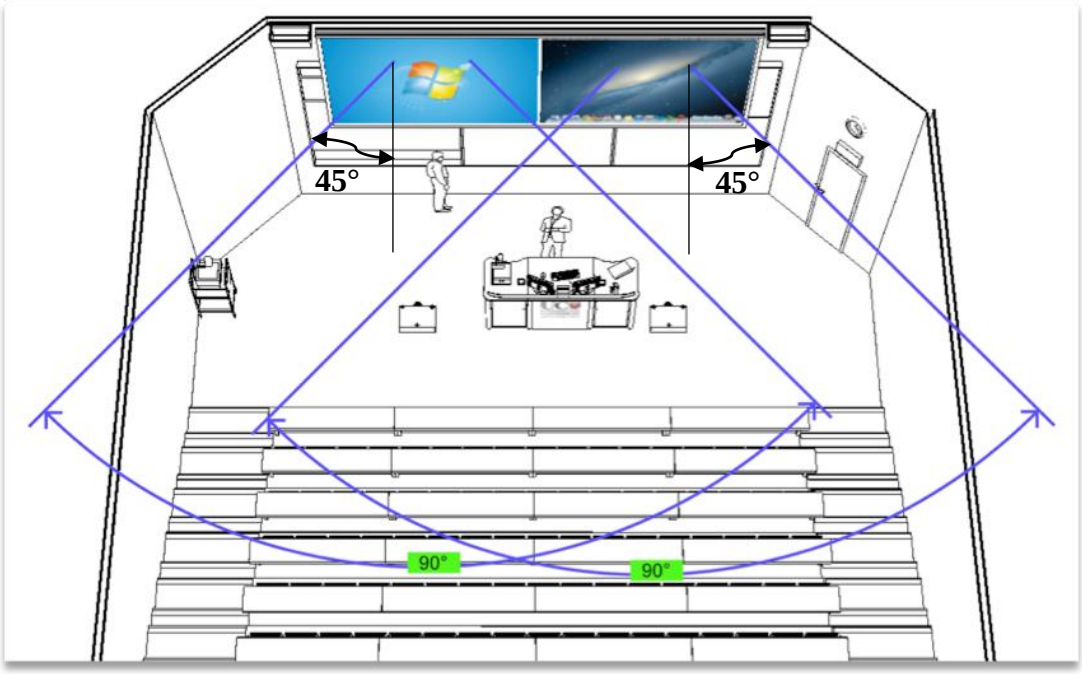


Figure 2.12: All seating in Lecture Hall Should be covered by the Viewing Cone. [Source: Gardiner, 2015].

The vertical angle for student sitting in front to the top of projection screen should be around 15° from the horizontal floor level at student viewing height as shown in Figure 2.13 and Figure 2.14 (Gardiner, 2015; TU Delft, 2014).

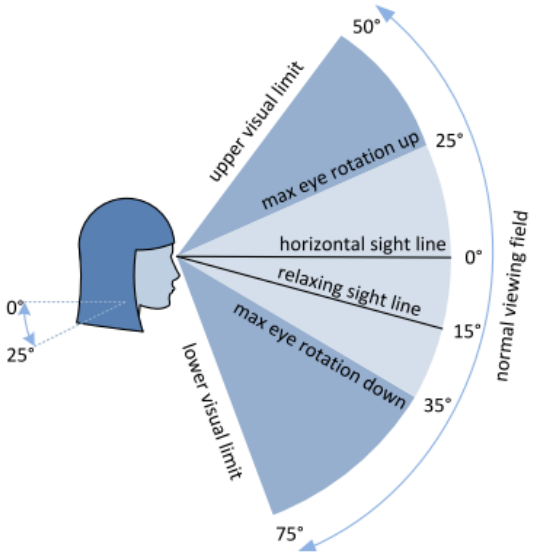


Figure 2.13: Horizontal Viewing Area for Text Recognition. [Source: TU Delft, 2014].

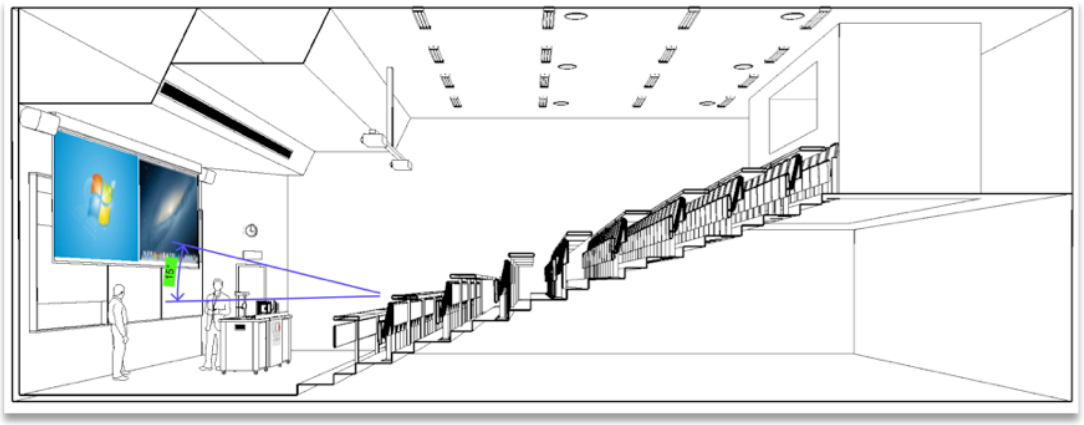


Figure 2.14: The Maximum Vertical Angle from the Horizontal Floor Area at Student Viewing Height.
[Source: Gardiner, 2015].

The image projected from the projector on the projection screen should be bright and clear. Sometimes, the projected image is not bright enough or easy to be seen by the audience. This is due to the low brightness rating of the projector which is below 800 lumens (Think Outside The Slide, n.d.). The projector may originally have brightness rating of more than 800 lumens, but the bulbs in the projector slowly lose power over time. The longer is the projector has been used, the lower is its brightness. Thus, a new projector may be required to replace the old one, else bulb can be replaced, but this option is more expensive (Think Outside The Slide, n.d.).

In order to coordinate the AV equipment above, an AV asset management could be adopted. AV asset management is a centralised system to monitor and manage AV equipment. For example, it enables AV operation team to receive alerts and notifications immediately when device goes offline suddenly while not functioning properly. This enables the AV operation team to troubleshoot AV problems immediately, which is very helpful in minimizing time-wasting while the user tries to fix the equipment by themselves or look for the AV operation team (Audio Visual System Solutions for Education, 2015).

2.3.2 Informal Learning Spaces

Informal learning refers to learning that does not occur in any formally organized learning programme, such as during the lecture (Kumar and Bhatt, 2015). Majority of learners nowadays not only passively receive knowledge from lecturers but more

actively involved in participatory and experimental learning (McDaniel, Trzpuc and Glissendorf, 2014). Active learning could be done by teaching others, practise by doing, group work or demonstration as shown in Figure 2.15. Peer learning happens when students learn from each other or teach each other. Students reinforce and master their knowledge when they try to teach others (Briggs, 2013). Active learning is to be promoted when students interact with each other and the process usually happens outside the classroom, usually in informal learning spaces. Informal learning spaces (ILS) refer to a social area where students can spend time in a group for discussion, study, or rest while waiting for the next lecture. Learning is not just restricted in a classroom, students learn when they shares ideas or revise outside the classroom. A study shown that more learning takes place in ILS instead of in the classroom (Cunningham and Walton, 2016) ILS highly contributes to overall satisfaction of students with university facilities (Thor-Erik Sandberg Hanssen Gisle Solvoll, 2015). There are few factors affecting satisfaction of user towards the ILS in a university such as quantity of ILS provided, proximity, comfort, accessibility to resources and purpose of ILS (Riddle and Souter, 2012; Harrop and Turpin, 2013; Scannell *et al.*, 2016).

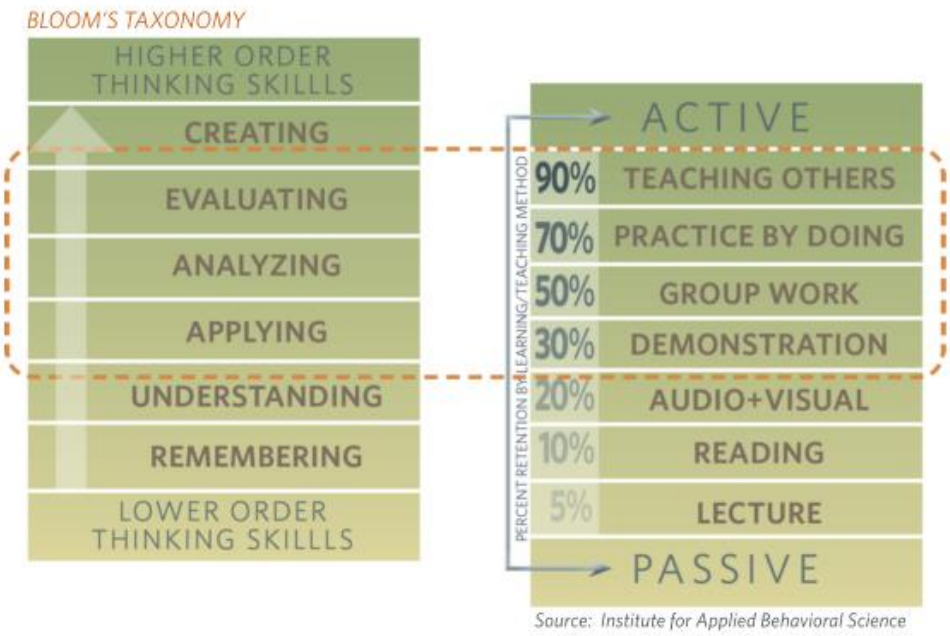


Figure 2.15: Learning Framework and its Relationship with Passive and Active Learning.

[Source: McDaniel, Trzpuc and Glissendorf, 2014].

ILS should be provided in universities as a station for students to hang around. Students need to travel around to find a suitable place to sit, rest or study when they do not feel like going to other places. Students get frustrated when there is lack of ILS available in their university (Riddle and Souter, 2012). When there is limited ILS available in the university, the chances for students to learn informally decrease.

During a short break while waiting for the next class, students may utilise their time to rest or study at a nearby place instead of travelling to another farther place. Quick tasks before other events such as checking emails, completing tutorials, reading before attending a lecture could be done within the interval (Harrop and Turpin, 2013). Thus, proximity of ILS to the next activity, usually nearby lecture hall and classroom may attract students to stay at ILS. If student preference on location of ILS is determined, improvement on that ILS should be implemented.

Student's satisfaction towards ILS in university also depends on the comfort of ILS. In ILS which consists of soft and cosy furniture, comfortable seating, appropriate temperature and sufficient lighting increase participation of students in that area (Scannell *et al.*, 2016). According to GE Lighting Pressroom (2013), a "layered" lighting design could be introduced to achieve a minimum of 500 lux for reading and writing. It is a design pairing lower levels of ambient light with task lighting, in which higher illumination is brought nearer to the working surface while reducing the lumens needed to light the entire space. Variety of table sizes and background atmosphere is important as they influence student's choice on the use of ILS for group work or individual work purpose. For instance, if the size of tables is sufficiently large and seating arrangement is suitable for face-to-face communication, students may utilise the space for group discussion or social interaction. If the surrounding ambient is quiet, individual work and study may be more suitable compared to an area where the background noise is high, depends on student's preference. Suggestions to improve comfort in ILS such as incorporating vegetation and soft material could be adopted (Scannell *et al.*, 2016).

Resources in this context refers to the IT facilities, visual aids, food and drinks. Accessibility to wireless network, plug socket or personal computer is required by certain students while they are in ILS (Harrop and Turpin, 2013). Such accessibility allows students to obtain information through online easily. If students are using their laptop, plug socket may be required to charge their laptop when they stay at the ILS for a long time. Students will not be forced to quit their works if batteries are not

sufficient. Chalkboard or whiteboard could be provided to assist students in discussion. Policies to allow food and drinks in ILS could be implemented as study shown that food and drinks help students to stay concentrated while studying (Harrop and Turpin, 2013).

Purpose of ILS could be divided into community and retreat. Community refers to social interaction among peers. Students may consider social interaction is important while learning and discussion is necessary. Students tend to join their friends who are studying, so they find places where their friends are. Students may find learning more interesting in a vibrant environment. On the other hand, retreat is an attribute of students who prefer to look for ILS which provides privacy and quiet study. Some students like to study by themselves quietly and they consider social interaction as disturbance. They tend to look for enclosed spaces such as meeting room and library for individual study. Depends on student's preference, density, privacy and noise level in ILS could be adjusted for different purpose (Scannell *et al.*, 2016).

Student's satisfaction towards ILS could be surveyed to obtain suggestions and improvement towards ILS in university. Figure 2.16 to Figure 2.18 shows some examples of ILS which the author considers them as good ideas. The ILS in Figure 2.16 is suitable for group study as one table consists of five seats. Whiteboards are provided almost everywhere and even on the curve wall. Soft furniture provided gives a cosy feeling to the user.

Figure 2.16: Informal Learning Spaces at University of Southern California in Los Angeles, California.
[Source: Raths D., 2016]

Figure 2.17 shows some innovative ideas for ILS (Architecture and Design, 2015). Provision of ILS could be anywhere in a building, such as the corridors outside the classroom. Whiteboards are provided on the wall and concrete seating is

constructed along the corridors. Students could start their discussion directly if they think of something important at that moment. Along the wall of the classroom, seats could be provided for students to sit down to rest, revise or discuss. This is convenient for students who are waiting for the next class nearby. Figure 2.18 shows an ILS in an open space. A lot of tables and chairs are provided so students or lecturers always have space to study and discuss.

Figure 2.17: Informal Learning Spaces at Loreto College Cruci Building in Coorparoo, Brisbane.
[Source: Architecture and Design, 2015].

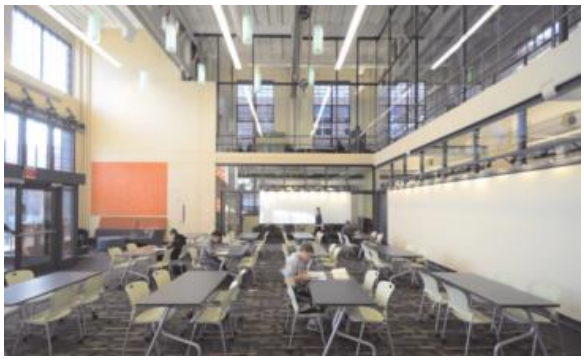


Figure 2.18: Informal Learning Space in University of Minnesota, United States.
[Source: McDaniel, Trzpuc and Glissendorf, 2014]

2.4 Summary

In conclusion, it is important to conduct POE to review the functionality and technicality of the building during occupation period. Once the areas of study were focused, literature review on these areas was done to find out the secondary data for analysis later. Literature review enables the author to review whether the problem is worth to be analysed by finding similar studies and researches done previously. The

author decided to explore the users' perception on the two areas of study, followed by the design inadequacy, root cause of breakdown (if any) and the possible improvement on these areas.

CHAPTER 3

METHODOLOGY AND WORK PLAN

3.1 Introduction

In this chapter, topics on the selection of the research method, research process, instruments of survey and data analyses procedures were discussed. Mixed research method was used in this research to collect both the quantitative and qualitative data. The steps of research process were developed to guide the author to conduct this research. Instruments of research adopted include questionnaire survey, interview and walkthrough. Quantitative data were obtained through questionnaire survey. Qualitative data were gained through questionnaire survey (open-ended questions), interview and walkthrough. After data were collected, data analyse methods were developed. For quantitative data, mode was selected as the most suitable measure of tendency while for qualitative data, content analysis was carried out.

3.2 Selection of the Research Method

Generally, there are two methods of data collection – qualitative and quantitative. The differences between the two should be clearly understood before choosing a research method. Table 3.1 shows the differences between the two methods of data collection.

Table 3.1: Differences between Qualitative and Quantitative Research Method.

	Qualitative	**Quantitative**
Purpose	To obtain an in-depth feedback from respondents	Generate statistics allows for generalization
Characteristic	Involves words, inductive reasoning	Involves numbers, deductive reasoning
Instruments of survey	Interview, focus group	Questionnaire, experiment
Sample size	Small, sample is non-representative of the population	Large, sample closely resembles the population

Table 3.1 (Continued)

	Qualitative	Quantitative
Duration of survey	Longer	Shorter

[Source: Mukesh, Talib and T, 2013]

Mixed research method combines both the quantitative and qualitative research methods. The primary data was collected through questionnaire survey, interview and walkthrough. This enabled the author to obtain feedback from two perspectives – from general respondents and experts. The qualitative results obtained could be used to assist the author in interpreting the findings of quantitative results in order to obtain a comprehensive understanding on the areas of study.

This research was more towards qualitative research in order to gain in-depth information to reach the research objectives, which was not only asking for feedback but to identify the design inadequacies, root causes of breakdown and improvement towards the areas of study. In order to collect in-depth feedback, interview and walkthrough were conducted to support the results from questionnaire survey (Bradford, 2015). Although the duration of interview and walkthrough was longer than a 10-minutes questionnaire survey, the feedback obtained was more in-depth.

As the author was a full-time student, the sequences of data collection were done concurrently to save time. During data analysis, the data were integrated and interpreted to fulfil the research objectives.

3.3 Research Process

Research process consists of eight steps which are problem identification, formulation of research objectives, literature review, selection of research instruments, design of questionnaire and selection of sample, collection of data, data analysis and completion of research (Figure 3.1).

Firstly, identifying the problem could help the author to define the area of study in a research. In this research, problems were identified through a pilot study conducted from February 2016 to March 2016 to collect general feedback from respondents on UTAR KB Block. Areas of study such as vertical movement facilities and learning facilities were identified as there was more negative feedback on these areas.

After problems were identified, research objectives were formulated to guide the author throughout the research. Three research objectives were identified for this research which were to obtain feedback from respondents on the performance of vertical movement facilities and learning facilities in UTAR KB Block, to determine design inadequacy and the root cause of breakdown if any and to suggest possible improvement on the facilities.

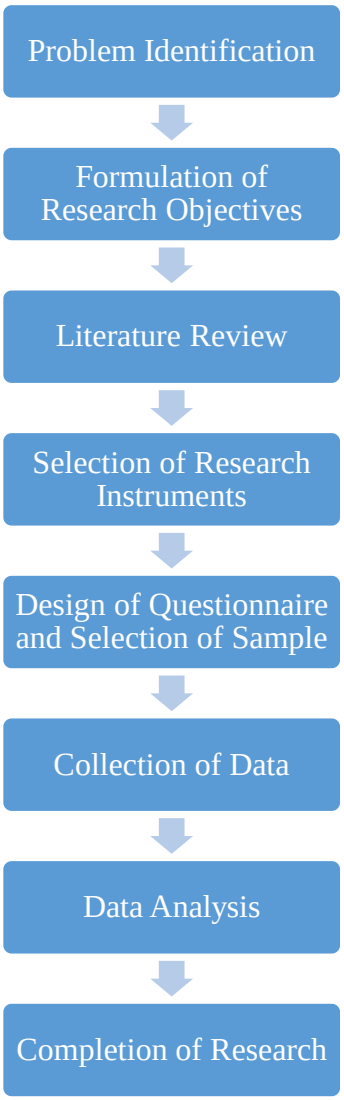


Figure 3.1: Eight Steps of Research Process.

[Source: Research Methodology, n.d.]

Literature review was to explore on other studies or similar research done which was relevant to POE. POE is to evaluate whether the facilities fit the requirement,

such as for learning to take place. Literature review was used as secondary data to support the primary data in data analysis.

Research instruments were then selected to collect primary data. There were three types of research instruments which are questionnaire survey, interview and walkthrough. Questionnaire survey was used to collect mostly quantitative data while interview and walkthrough is used to collect qualitative data. A combination of research instruments was required in order to obtain different perspective of feedback from general respondents and experts.

Questionnaire for survey and interview and inspection list for walkthrough were then developed. Questionnaire for survey consisted of mostly closed-ended questions which enabled the respondents to fill up the survey form quickly. Questionnaire survey was printed for respondents to fill up. Online questionnaire survey was developed to invite more respondents to provide feedback. Questionnaire for interview were mostly open-ended questions which was used to guide the author to probe the feedback from the experts. Interview with experts were made in order to obtain professional feedback. Inspection list was prepared with the guidance of a building surveyor. Around four hundreds occupants such as students, lecturers and staff were targeted samples for questionnaire survey. Two experts from architectural background were invited to provide their feedback during interview. The author planned a walkthrough around UTAR KB Block with a building surveyor to inspect the areas of study.

The research was completed when the data obtained were analysed and the research objectives were achieved. Recommendations from the findings were summarised, future possible researches were developed and limitations of this research were identified. At the end of this research, the conclusion was related back to the research objectives set by the author at the beginning of this research.

3.4 Instruments of Research

As mentioned above, three instruments were used in this research – questionnaire survey, interview and walkthrough. Respondents such as students, lecturers and staff occupying UTAR KB Block were the targeted sampling for questionnaire. Interview and walkthrough with experts are conducted to obtain technical feedback and critical suggestion and improvement towards the areas of study.

3.4.1 Questionnaire Survey

Questionnaire survey was developed to mainly fulfil the first objective of this research, which was to determine users' perception on the performance of vertical movement facilities and learning facilities in KB Block and partly, to investigate whether there is existence of design inadequacy and the root cause of breakdown and to establish possible improvement to such inadequacies. Questionnaire survey was used due to its ability to collect a large-scale information from the respondents in low cost and to obtain unbiased responses in a short period of time (Kumar, Talib and Ramayah, 2013). More closed-ended questions are asked than open-ended questions so that statistical analysis could be done at later stage. Another reason was to avoid frustration and impatient of respondents while filling up the questionnaire.

A total of 400 questionnaire survey were printed and distributed manually to the sampling such as students, lecturers and staff occupying UTAR KB Block. The author went to the library, informal learning spaces, 3rd floor and 8th floor offices to distribute the questionnaire. In order to obtain more feedback from the occupants, online questionnaire survey was developed at an online website such as Google Form and disseminated in social website i.e. Facebook. As the author was a full-time student, the author distributed the printed questionnaire survey, conducted interview and walkthrough during the break time in between or after lectures. The questionnaire survey was attached at APPENDIX B.

3.4.1.1 Selection of Questionnaire Respondents

A sample should be drawn to represent the entire population so that the findings are applicable to the population (Mukesh, K., Talib, S. and T, R., 2013). Such sampling is necessary as it is very time-consuming to contact the whole population, which is the occupants in UTAR KB Block, one by one to get their responses.

The population in this research is students, lecturers and staff occupying UTAR KB Block. The general public is not part of the population because they did not spend much time in the building thus could not provide accurate feedback. Respondents were selectively drawn from the population so that the results obtained could be generalised to the population. Questionnaire survey was distributed to students, lecturers and staff from various faculty in UTAR KB Block who are mainly from Lee Kong Chian Faculty of Engineering and Science (LKCFES), Centre for Foundation Studies (CFS)

and Faculty of Creative Industry (FCI). This is because majority of the occupants of KB Block is from the three faculties.

The sample size is influenced by the population size, margin of error and confidence level (Krejcie and Morgan, 1970). To select sample size, the above factors were assumed in Table 3.2.

Table 3.2: The Assumptions Made to Determine Sample Size.

Factors in Determining Sample Size	**Description of Factors**	**Assumptions**
Population size	Number of occupants in UTAR KB Block	10,000
Margin of error	The plus-or-minus percentages of results obtained	5 %
Confidence level	Certainty of the results	95 %

[Source: Creative Research System, n.d.; Research Advisors, n.d.]

Table 3.3 depicts the suitable sample size based on the above assumptions. Thus, a sample size of 370 is required.

Table 3.3: Sample Size Selection Chart.

Population Size	**Confidence level = 95 %**			**Confidence level = 99 %**		
	Margin of error					
100	80	94	99	87	96	99
500	217	377	475	285	421	485
1,000	278	606	906	399	727	943
10,000	370	1,332	4,899	622	2,098	6,239
100,000	383	1,513	8,762	659	2,585	14,227
500,000	384	1,532	9,423	663	2,640	16,055
1,000,000	384	1,534	9,512	663	2,647	16,317

3.4.1.2 Questionnaire Development

Questionnaire was developed to obtain data that could be analysed to fit the research objectives. Most of the questions developed were closed-ended to enable the respondents to answer in a short period of time. A few open-ended questions were developed to obtain more in-depth feedback, such as questions on the suggestion for improvement. The questionnaire was divided into 3 main sections – demographic information, vertical movement facilities and learning facilities. Table 3.4 shows the questionnaire development of this research.

Respondents' satisfaction towards the performance of vertical movement facilities and learning facilities were collected to achieve the first objective of this research. For questions on lift, staircase and ILS, the respondents were provided with four options – "satisfied", "tend to be satisfied", "tend to be unsatisfied" and "unsatisfied". The purpose of giving these 4 options were to avoid the respondents to answer "I don't know". Most of the occupants would use these facilities and they should have feedback towards them, either positively or negatively. On the other hand, for questions on AV equipment, three options were given – "yes" (satisfied), "no" (unsatisfied) and "I don't know". The author considered that not most of the occupants would use or familiar with the AV equipment, thus they may not be clear about the performance of such AV equipment. Thus the respondents were allowed to answer "I don't know". If there exists dissatisfaction of occupants on one or more facilities, the design inadequacy could be determined based on occupants' feedback. On the other hand, although most of the respondents provided an above-average level of satisfaction, there may still have those who reported a below average or poor experience with the facilities. In this case, it would be worth digging into to identify the reason of dissatisfaction.

The audio equipment i.e. microphone and speaker is only available at lecture hall and lecture room but unavailable in other venues such as tutorial room, studio, computer lab and laboratory. Thus, the questions would focus on lecture hall only. The visual equipment i.e. projector, projection screen and whiteboard was available at a few venues but the questionnaire only focused on the lecture hall, lecture room and tutorial room because most of the respondents used these areas frequently. Visual equipment of other venues i.e. studio, computer lab and laboratory would be observed during walkthrough. It should be noted that there was no projection screen in the lecture hall, thus only the performance of projector would be asked in the questionnaire.

Table 3.4: Questionnaire Development of this Research.

Questions	Purposes	Objectives
Section 1 – Demographic Information		
Gender	To find out the height of each gender and its relation to the comfort of using staircase.	-
Faculty/ Centre/ Division	To make sure the responses obtained are mostly from those faculties from KB Block in order to ensure data reliability.	-
Duration of occupation	To assure that the data obtained is from the occupants who are familiar with the facilities and services of the building to ensure data validity.	-
Hours spent in the block per week	To identify the time spent by the respondents in the block in order to shows the significance of this research and data validity.	-
Height of respondents	To study the relationship between height of a person and comfort level while using staircase.	-
Physical condition of respondents	To study the relationship between physical condition and respondents' capacity when using facilities. It is also to establish whether the building is designed to cater for special needs persons in line with the government policy or building code.	-
Identity of respondents	To ensure that the respondents are those who occupied and used the facilities of the building to ensure validity of data and to determine their preference over the facilities.	-

Table 3.4 (Continued)

Questions	Purposes	Objectives
Common study or work place	To identify the traffic movement and the areas that would be mainly affected due to design inadequacy or existence of breakdown and where the improvement should be focused.	-
Section 2 – Vertical Movement Facilities		
Preferred mode of travel	To confirm that most of the occupants do like to use vertical mechanical transportation system and to emphasise that possible improvement to equally distribute the flow of movement should be done.	1, 3
Section 2A – Lift		
Reason of choosing lift as preferred mode of travel	To understand respondents' behaviour in choosing lift, i.e. this will concur data on the physical condition and why mechanical vertical transport important to high rise building.	1, 2
Satisfaction on lift performance	To obtain respondents' perception on the performance of lift.	1
Tolerable waiting time for lift	To investigate what is the common acceptable waiting time and to determine whether there is a need to improve the performance of lift.	1, 3
Tolerable travelling time in lift	To study what is the common acceptable traveling time and to determine whether there is a need to improve the performance of lift.	1, 3
Preferable lift operating system	To find out the satisfaction on current lift operating system and any improvement needed.	2, 3

Table 3.4 (Continued)

Questions	Purposes	Objectives
Other feedback on lift	To allow the respondents to determine any area that requires improvement and to provide suggestions to the system.	1, 2, 3
Section 2B - Staircase		
Reason of choosing staircase as preferred mode of travel	To concur the tolerable waiting time for lift i.e. long waiting time at lift lobby was experienced by the occupants.	1, 2
Satisfaction on staircase design and function	To obtain respondents' perception on the design and function of staircase.	1
Problem faced while using staircase	To find out whether there is design inadequacy and a need for staircase design improvement.	2, 3
Motivation to take staircase	To suggest activity or improvement to minimise dependency on vertical mechanical transport.	3
Other feedback on staircase	To allow the respondents to determine any area that requires improvement and to provide suggestions to the staircase.	1, 2, 3
Section 3 – Learning Facilities		
Section 3A – Audio Equipment (Microphone and Loudspeaker)		
Satisfaction on audio equipment	To obtain respondents' perception on the performance of audio equipment	1

Table 3.4 (Continued)

Questions	Purposes	Objectives
Frequency of breakdown of audio equipment	To determine the capacity level of equipment and root cause of breakdown (if any) and whether there is a need to maintain the equipment frequently.	2, 3
Provision of audio equipment	To investigate sufficiency of audio equipment provided which will answer adequacy of design.	2, 3
Preferred type of audio equipment	To find out whether there is a need for audio equipment improvement or upgrade.	2, 3
Other feedback on audio equipment	To provide a chance to the respondents to determine design inadequacy and to suggest possible improvement to the equipment.	1, 2, 3
Effect of breakdown on learning and teaching process	To establish the relationship between the breakdown of audio system and its effect on respondents' learning or teaching process.	2
Section 3A – Visual Equipment (Projector, Projection Screen and Whiteboard)		
Satisfaction on visual equipment	To obtain respondents' perception on the performance of visual equipment.	1
Frequency of breakdown of visual equipment	To investigate the adequacy of system specification and to figure out whether there is a need for improvement to the visual equipment. This is also to determine the root cause of breakdown (if any) and whether there is a need to frequently maintain the visual equipment.	2, 3

Table 3.4 (Continued)

Questions	Purposes	Objectives
Provision of visual equipment	To find out whether sufficient quantity of visual equipment is provided at the classroom.	2, 3
Location and height of visual equipment	To determine whether location and height of visual equipment are satisfactory and enable better teaching and learning.	2, 3
Preferred type of visual equipment	To establish whether existing visual equipment is adequate for teaching and learning and to recommend preferred choice for teaching and learning.	2, 3
Other feedback on visual equipment	To allow the respondents to establish any area that requires improvement and to provide suggestions of improvement.	1, 2, 3
Section 3C – Informal Learning Space (ILS)		
Frequency of visiting ILS	To concur that ILS is preferred and important to the occupants.	1
Satisfaction on ILS	To obtain respondents' perception on ILS.	1
Importance of ILS in learning process	To determine the significance of ILS in learning process and any improvement to the ILS should be adopted.	1, 3
Reasons that ILS is important or not important	To establish a guideline to improve the ILS and to find out the area of dissatisfaction.	2

Table 3.4 (Continued)

Questions	Purposes	Objectives
Provision of ILS	To find out whether proper ILS is provided and to suggest improvement or upgrading for better usage of facilities for learning.	2, 3
Proximity of ILS to the next activity	To determine the importance of proximity of ILS to the next activity.	2, 3
Comfort of ILS	To establish whether the furniture, seating arrangement, temperature and lighting at ILS is suitable and comfortable.	2, 3
Accessibility of ILS to resources	To find out whether the ILS is accessible to wireless network, plug socket, food and drinks.	2, 3
Environment of ILS	To determine the suitable seating arrangement for ILS users, i.e. group or individual seating.	2, 3
Importance of each factors of ILS	To investigate the important areas to be focused for improvement in the future to improve users' satisfaction on ILS.	2, 3
Floors where more ILS is required	To establish the floors that more ILS should be provided and improved.	2, 3
Other feedback on ILS	To determine any area that has to be improved and how it should be improved.	1, 2, 3

Referring to a survey done by Survey Monkey, the longer is the survey, the time spent by the respondents on each question decreases (C. B., 2011). Survey

abandon rate rises when the survey requires seven to eight minutes to be completed. Completion rate also falls from 5 % to 20 % (C. B., 2011). Thus, the author has to ensure that the survey designed should be able to be completed within 8 minutes.

3.4.2 Interview

Interview was conducted to collect a more in-depth and wider range of feedback from respondents that is not able to be done through questionnaire. Interview is useful to explore a person's thought or view towards the areas of study because interview focus on exploration of one's perspective (Mukesh, K., Talib, S. and T, R., 2013). The author used probing technique to obtain further information from the interviewees. Interview should be conducted properly to avoid biased results.

In this research, the interviewees were selected based on their professional background to provide accurate and reliable feedback. Both interviewees are recognised professional architects in Malaysia and they are the building users. Interview was conducted face-to-face and opinions from interviewees were recorded with their consent. A set of eight open-ended questions (refer to APPENDIX C) similar to questionnaire was developed so that the interview could be conducted without deviation from the research objectives. Interviewees were free to express their opinions on vertical movement facilities and learning facilities. Questions such as their thoughts on function and design of the services and facilities, the existence of design inadequacy and/or root causes of breakdown and possible improvement on the services and facilities were developed. The feedback or content of interview was recorded in verbatim. A verbatim, also known as a transcript, is the exact words originally expressed by the interviewees and it is written or typed in a document. The verbatim was to be categorized according to interviewees under several sections and interpreted using content analysis.

3.4.3 Walkthrough

Walkthrough with a building surveyor aims to identify usability problem, good design solutions, and possible improvements towards the areas of study. It is similar to inspection, direct feedback and rating are done throughout the process. The author may visually see the design inadequacy when building surveyor points it out during the walkthrough, hence created a better understanding of the feedback from building

surveyor. The building surveyor can identify the problems and provide valuable feedback on the spot based on their experience (Allaboutux, n.d.).

The author invited a professional and qualified building surveyor with experience of 15 years to walkthrough around the building where the vertical movement facilities and learning facilities located. Areas such as lift and staircase were examined in terms of its design and function. Areas where the learning facilities are provided such as lecture hall, tutorial room, practical lab, computer lab, studio and open spaces were part of the area of walkthrough. Table 3.5 depicts the walkthrough area with building surveyor. Each type of areas was chosen one venue to visit. The areas involved in the walkthrough were indicated in red boxes from Figure 3.2 to Figure 3.9.

Table 3.5: Summary of Walkthrough Areas.

Areas of walkthrough	**Venue**
Vertical Movement Facilities	
Lift Staircase	From ground floor to 3rd floor
Learning Facilities	
Lecture hall/ room	KB208, KB520
Tutorial room	KB517
Computer lab	KB607
Practical lab	KB505
Studio	KB622
Open spaces	At 4th floor and 8th floor

Approximately two hours were required for the walkthrough. A list of criteria or inspection to be done was prepared after discussion with building surveyor before the walkthrough. The list was used by the building surveyor to comment on the facilities. During the walkthrough, photos were taken as evidence of the feedback from building surveyor. Perception of building surveyor on the performance of facilities, design inadequacy (if any) and suggestions on improvement to the inadequacy of facilities were noted.

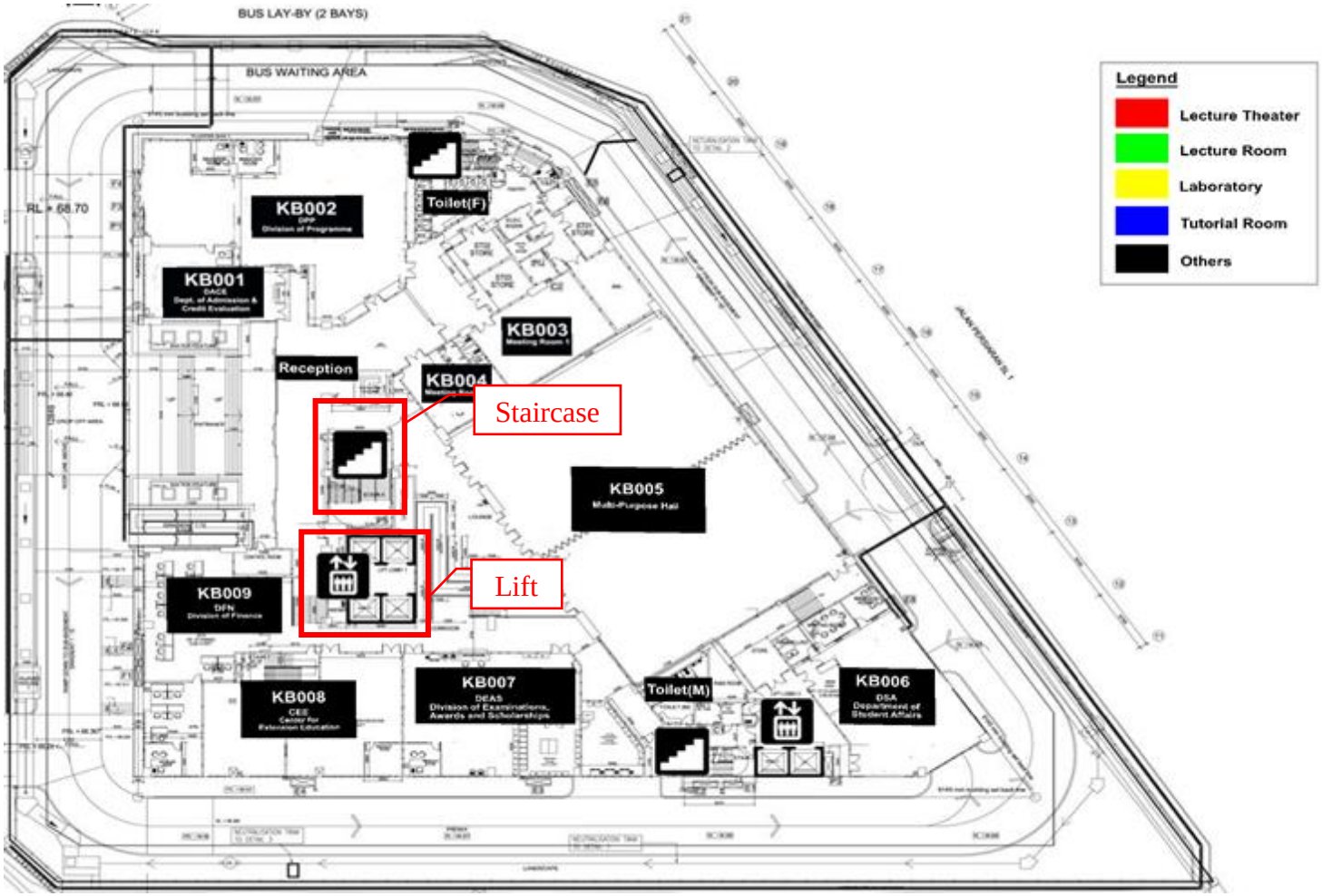


Figure 3.2: Sungai Long KB building floor plan – ground floor.

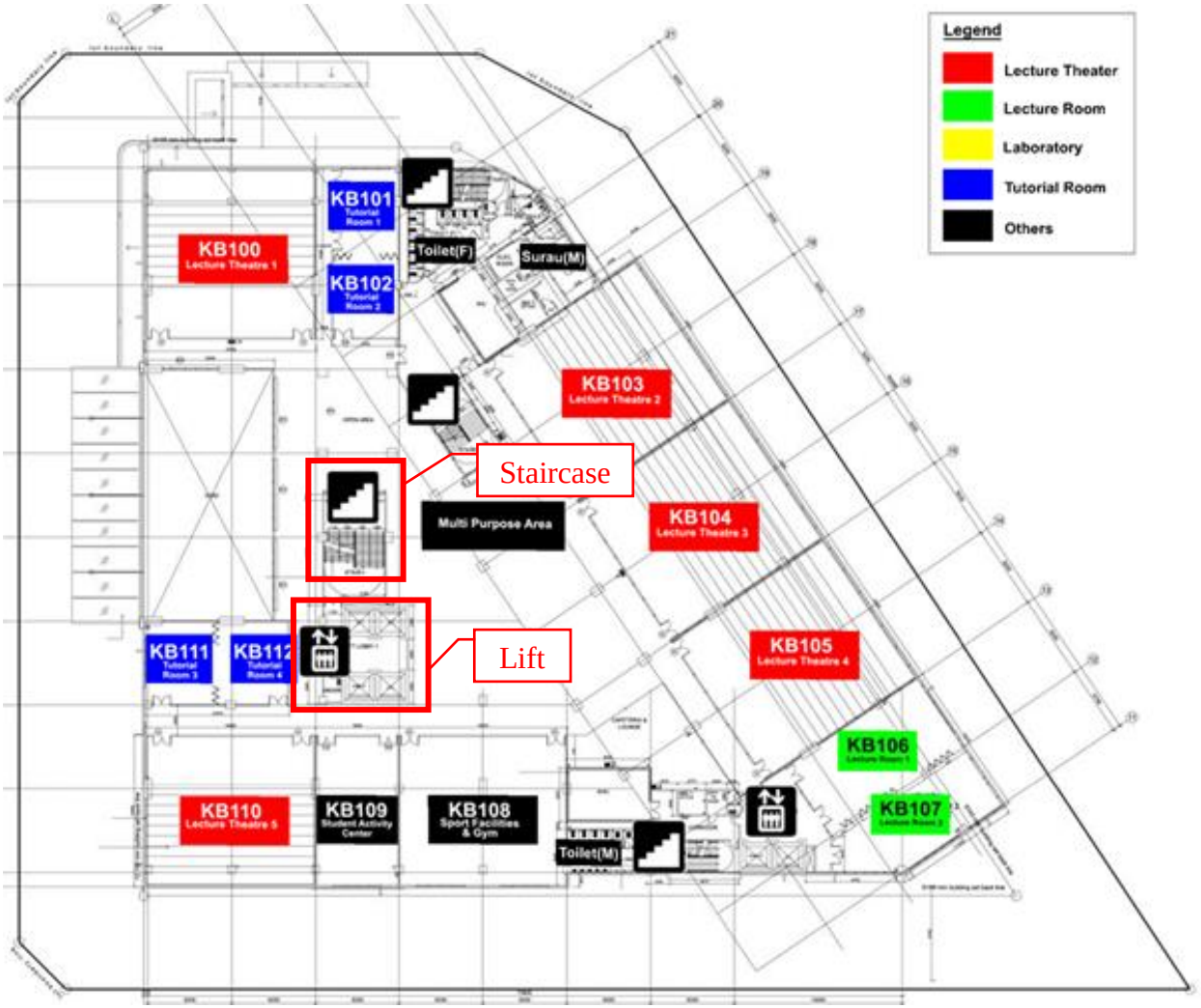


Figure 3.3: Sungai Long KB building floor plan – 1st floor.

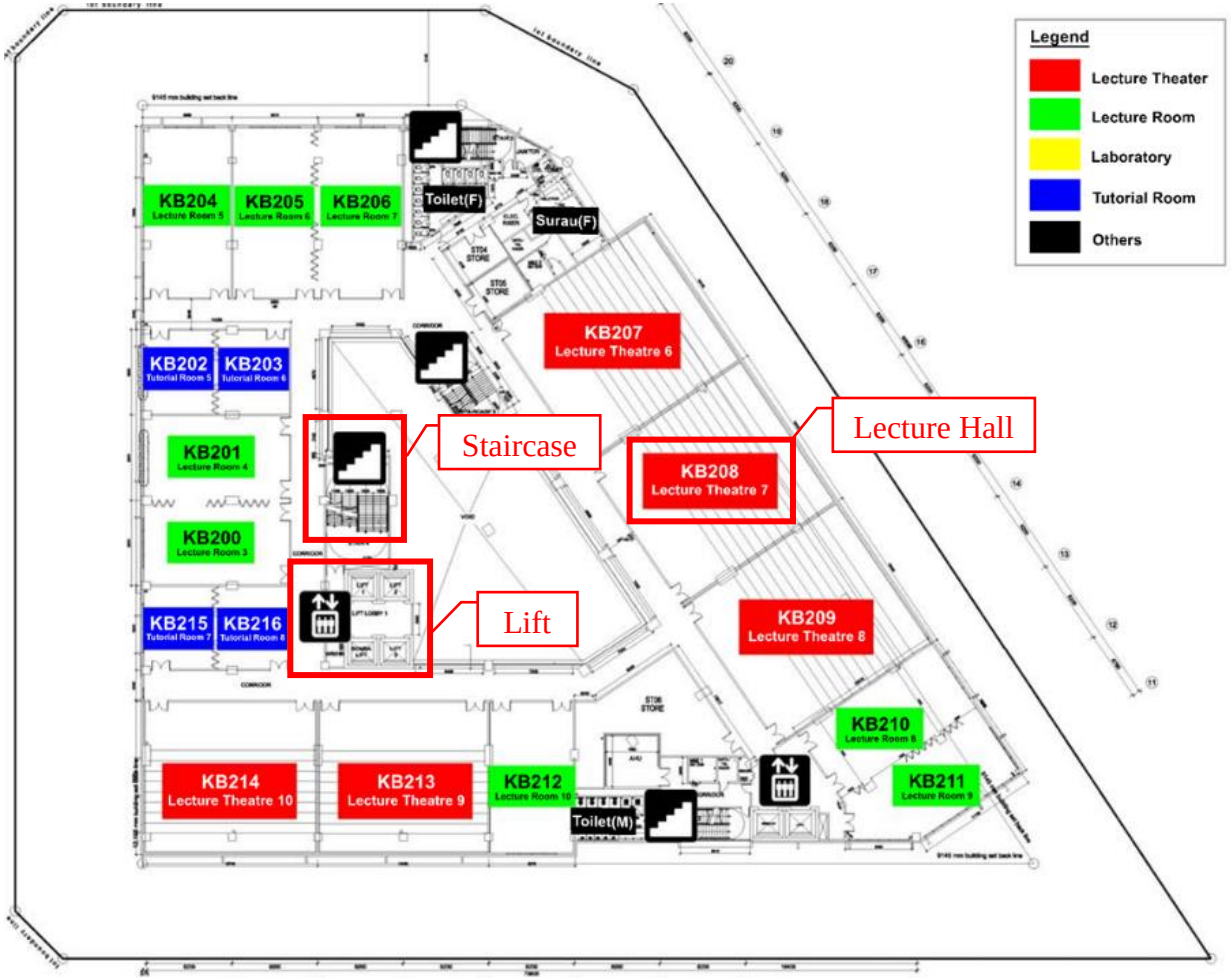


Figure 3.4: Sungai Long KB building floor plan – 2nd floor.

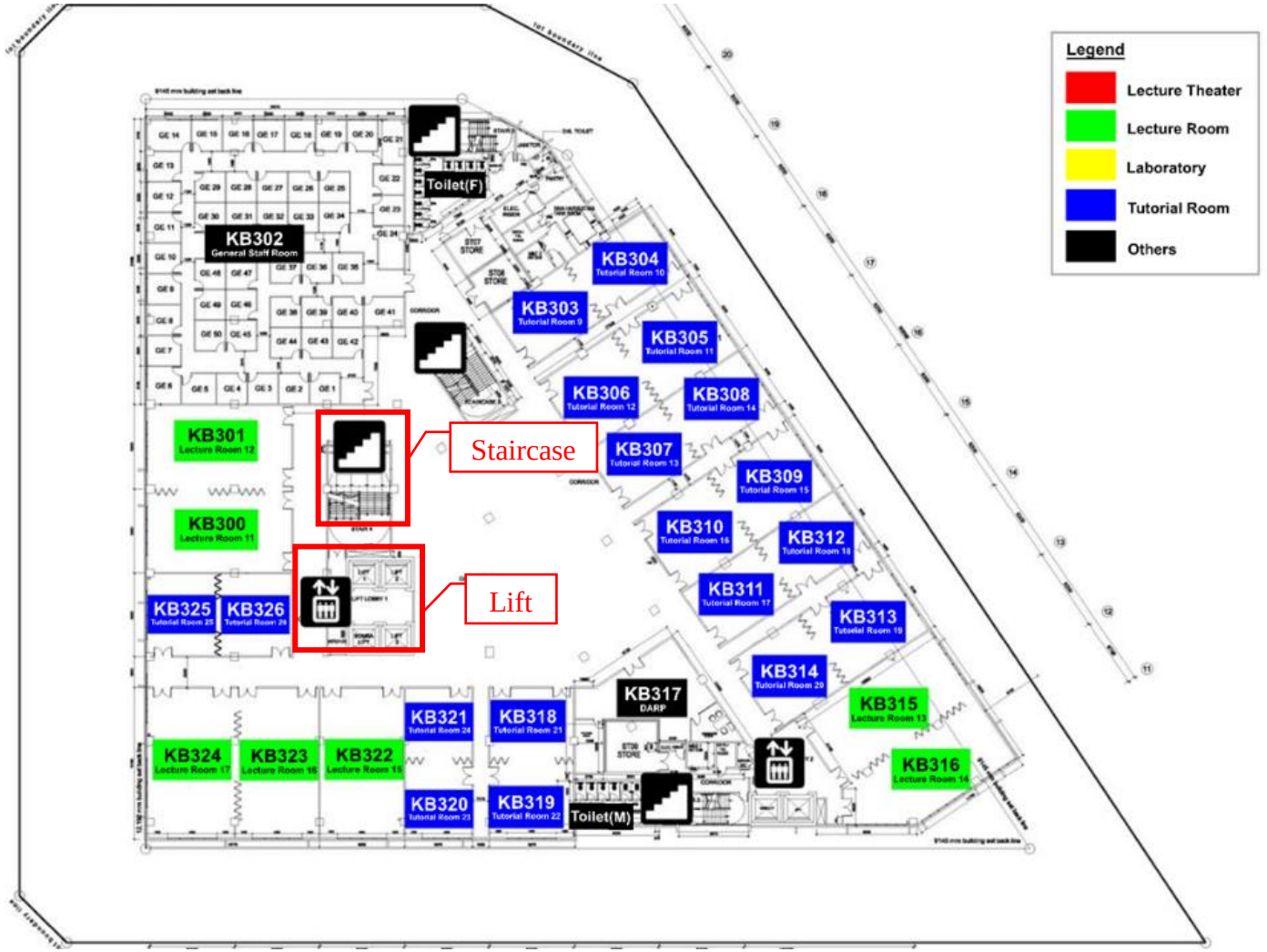


Figure 3.5: Sungai Long KB building floor plan – 3rd floor.

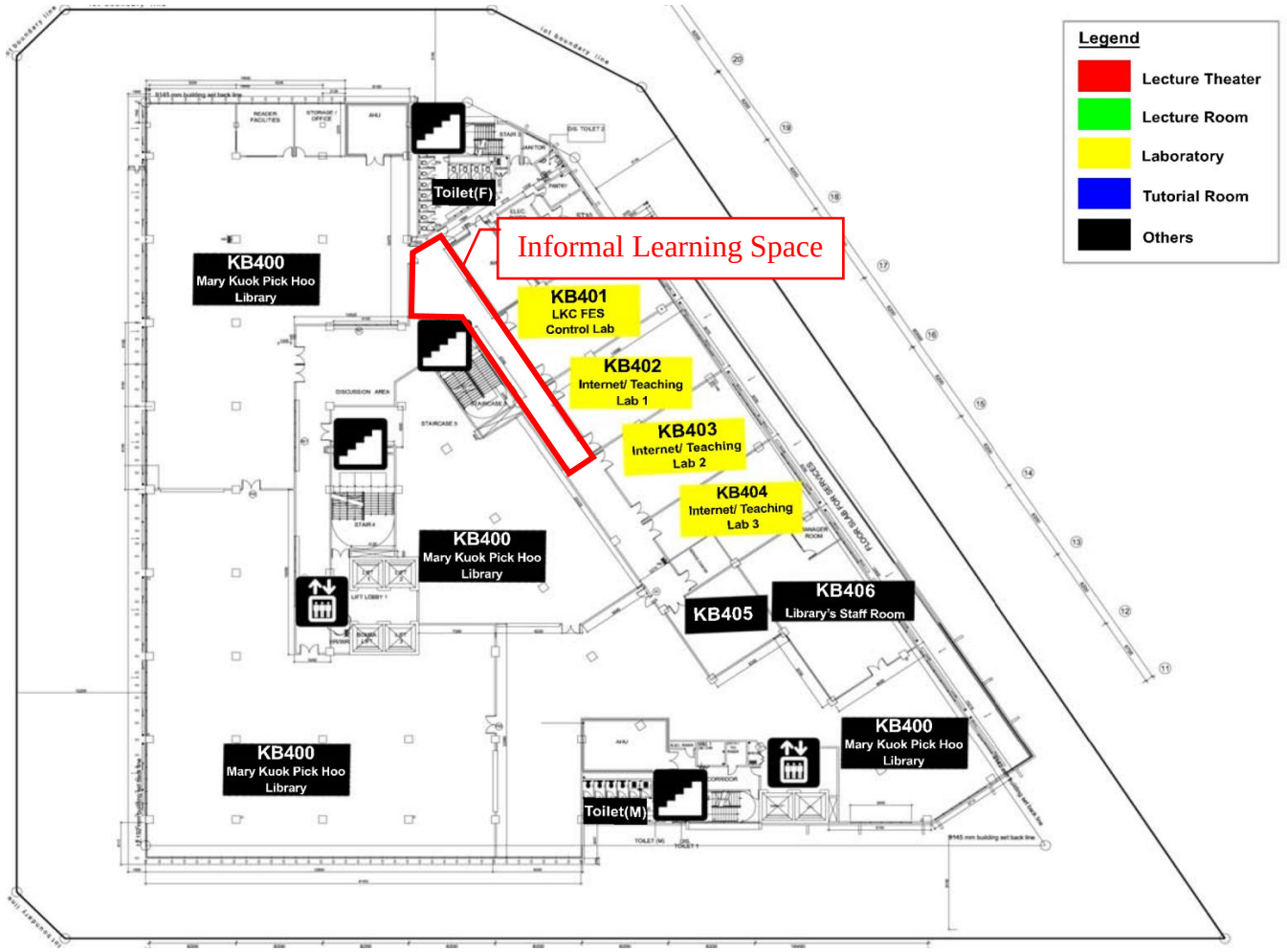


Figure 3.6: Sungai Long KB building floor plan – 4th floor.

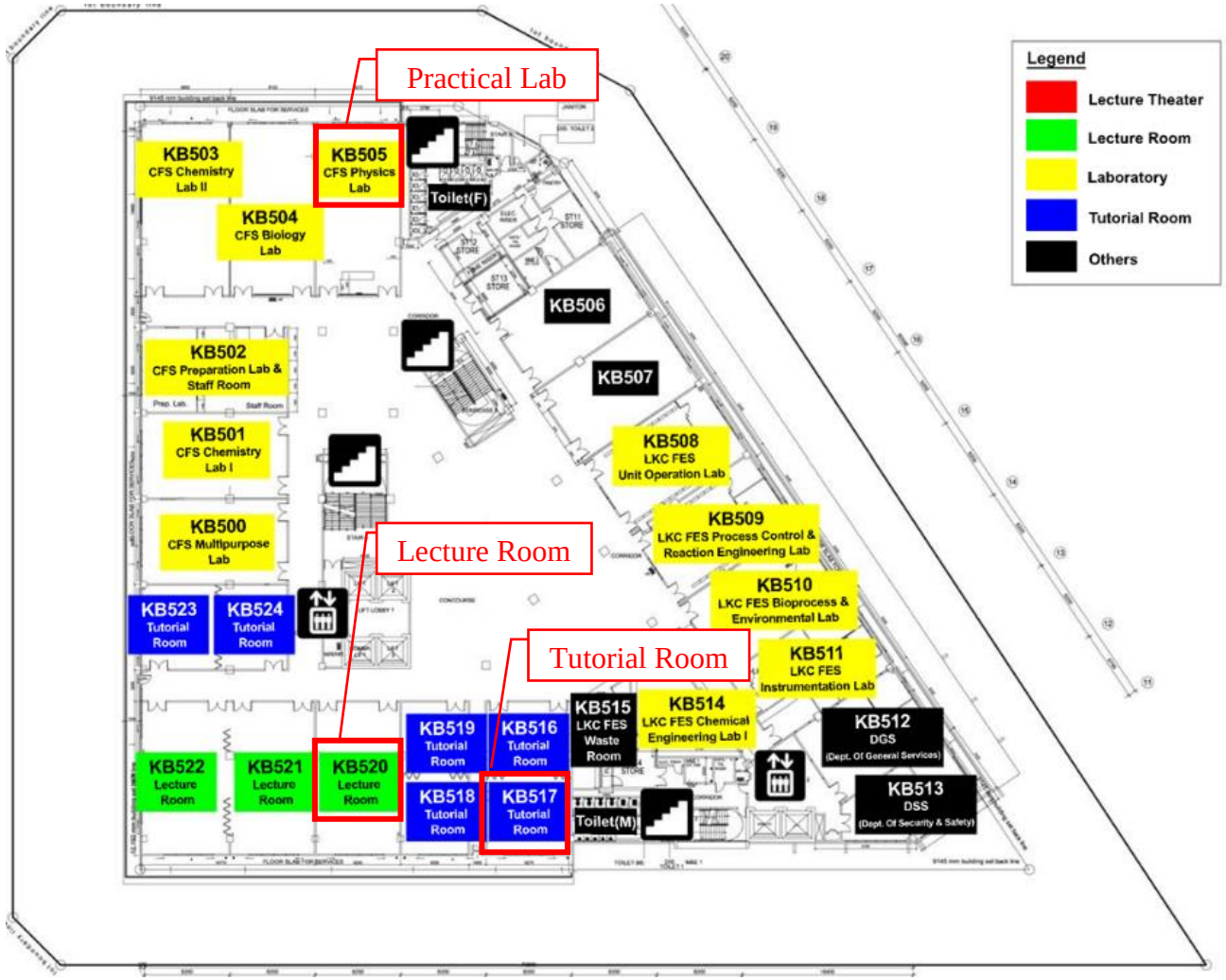


Figure 3.7: Sungai Long KB building floor plan – 5th floor.

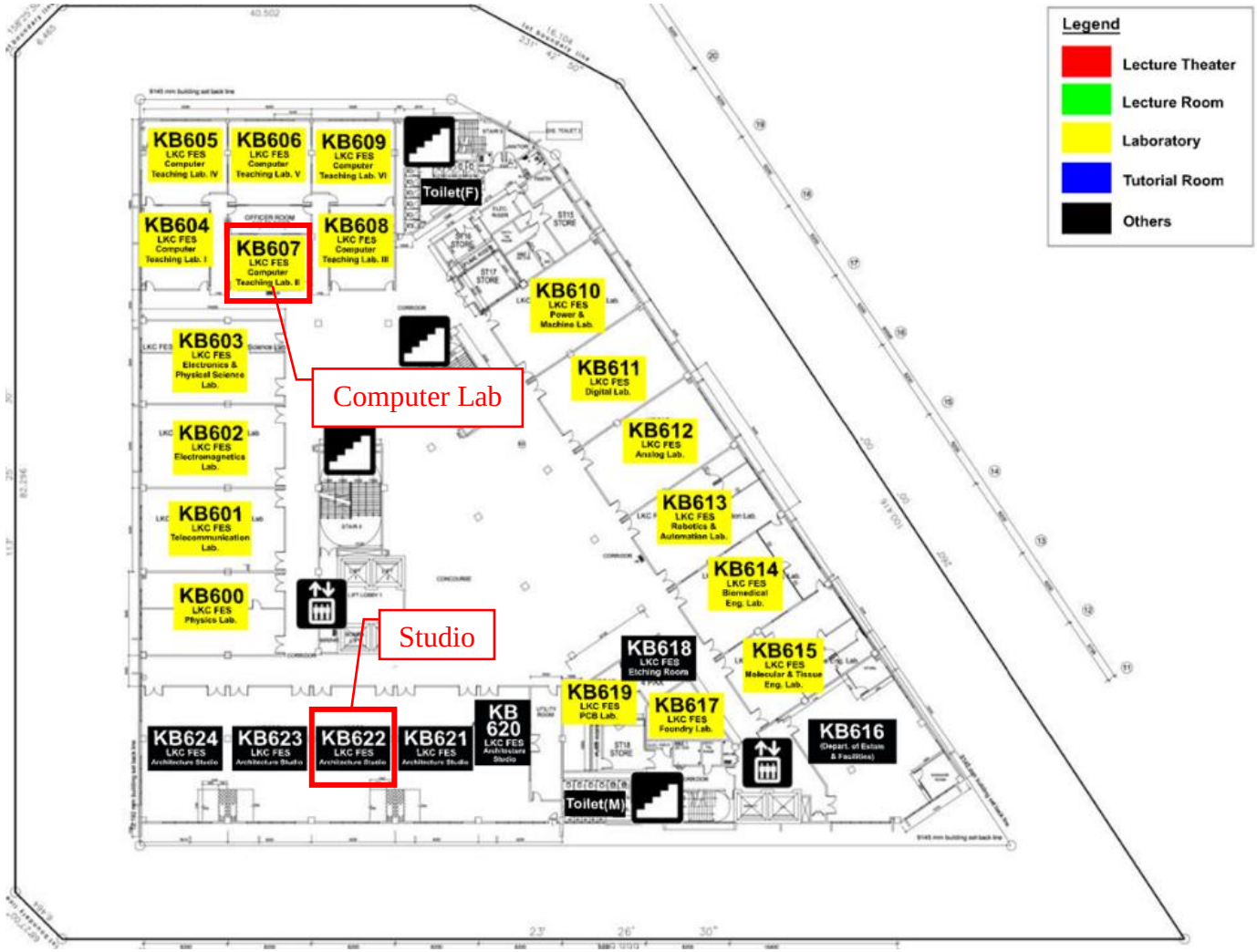


Figure 3.8: Sungai Long KB building floor plan – 6th floor.

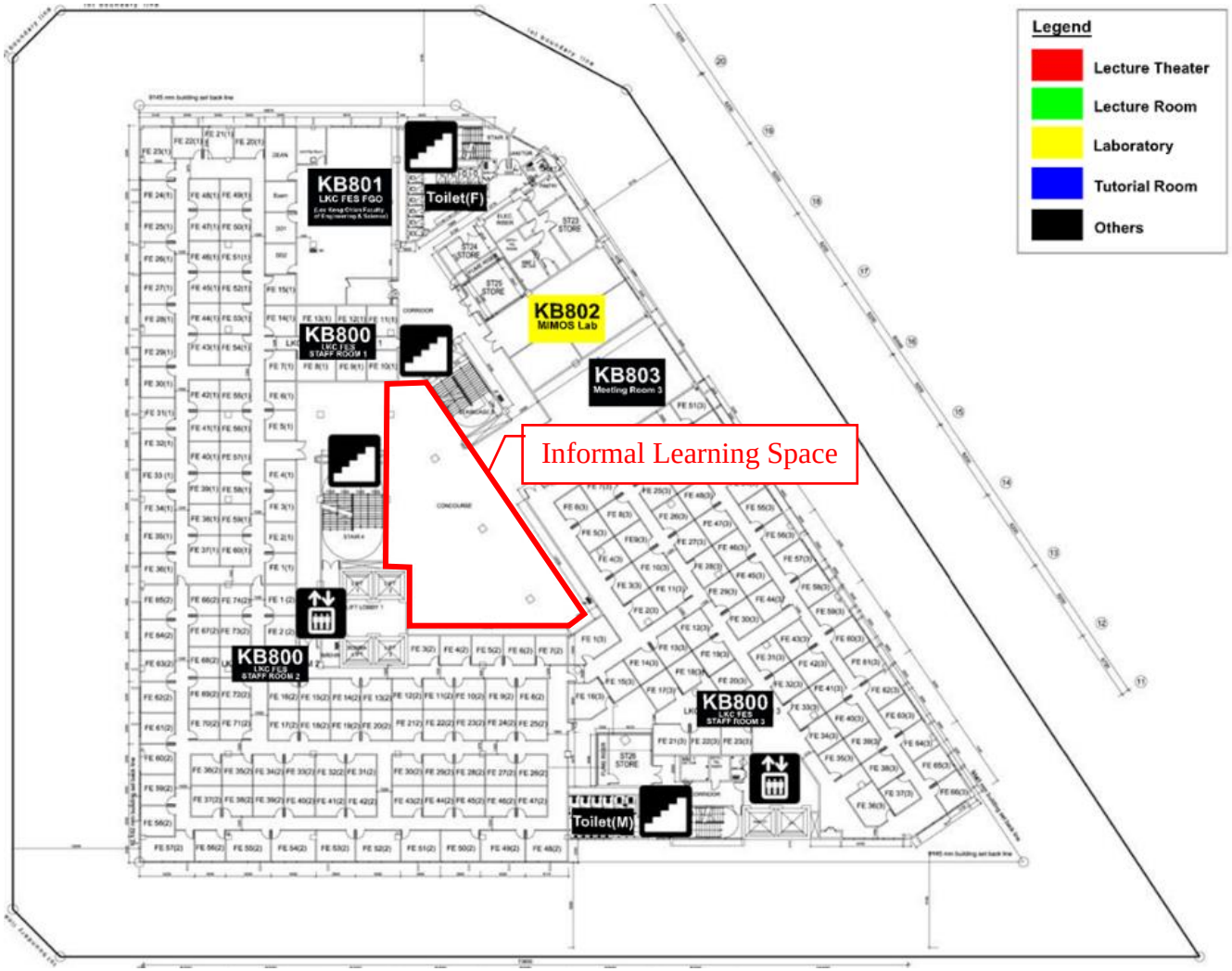


Figure 3.9: Sungai Long KB building floor plan – 8th floor.

3.5 Data Analyses Procedures

As mixed research method was used in this research, the author had to analyse both quantitative and qualitative data collected through survey, interview and walkthrough with experts.

Measure of central tendency was adopted to analyse quantitative data obtained from survey while content analysis was used to interpret qualitative data collected from interview. A picture is worth a thousand words, photos taken during walkthrough were used as evidence of the feedback from experts.

The data interpreted and analysed was to be compared and supported with the secondary data obtained through literature review. The results either supports the theories of literature review or against it. The results were compared with the hypothesis set in the theoretical framework to see whether the hypothesis was fulfilled. New theories may be established through this research.

Furthermore, feedbacks from Department of Estates and Facilities (DEF) and IT Infrastructure and Support Centre (ITISC) staff were obtained to evaluate and support the findings.

3.5.1 Measures of Central Tendency

In this research, data obtained through survey were analysed using one of the central tendency which is mode. Mode represents the most frequently occurring data picked by the respondents. For example, a question asking the “preferred mode of travel by the respondents to floors they commonly work or study on” was provided with options of “lift” and “staircase”, if the highest frequency falls on the option of “lift”, then it could be concluded that the mode was “lift” because it has the highest percentage of respondents indicating that their preferred mode of travel to such floors is lift. Mode was used as it is suitable for ordinal data collected for this research. The distribution of responses could be obtained by calculating the percentages of frequency and to be shown in a charts and tables.

3.5.2 Content Analysis

Content analysis is a method to make valid inferences by interpreting and coding textual material to enables more objective evaluation (Audience Dialogue, 2003). It simply means that the qualitative data is to be categorised and interpreted in a quantitative way (Mayring, 2000). The contents or information drawn from a sample

were to be grouped into a unit, such as a person or a comment, according to their similarity. Contents could be obtained through interview with the experts. Other than that, contents from a report produced by staircase committee in the usage of staircase could be referred. Primary and secondary data collected are used to support the results of content analysis.

Figure 3.10 shows the steps of content analysis. Firstly, the contents were interpreted and grouped into units based on areas of study. For example, the improvement suggested by the respondents during interview and walkthrough on the lift could be categorised into lift grouping; the identification of design inadequacy on staircase was to be categorised into staircase grouping. The revision of grouping was done along the content analysis to see whether there is a better grouping method. The contents of verbatim were supported with primary and secondary data obtained from other feedback and literature review. Lastly, interpretation of results using quantitative steps of analysis could be done. For instance, the numbers or frequency of people suggesting to include an escalator in this building could be recorded. The higher is the occurrence of the suggestion, the more is the respondent emphasizes on the suggestion.

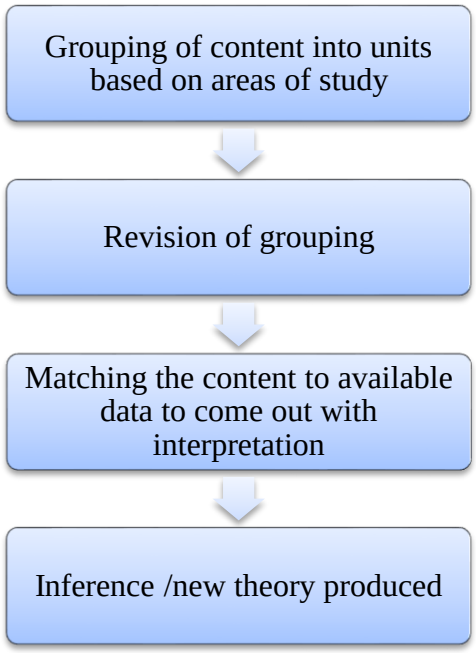


Figure 3.10: Steps of Content Analysis

3.6 Theoretical Framework

Theory is used to explain and predict relationships between variables. Theoretical framework is a collection of interrelated concepts that can hold or support a theory of a research work and guides a research. The framework consists of testable hypotheses which could be retained or rejected and it identifies the variables in this research and shows the relationship between the variables (Mukesh, K., Talib, S. and T, R., 2013). The following shows some theories that are tested in this research.

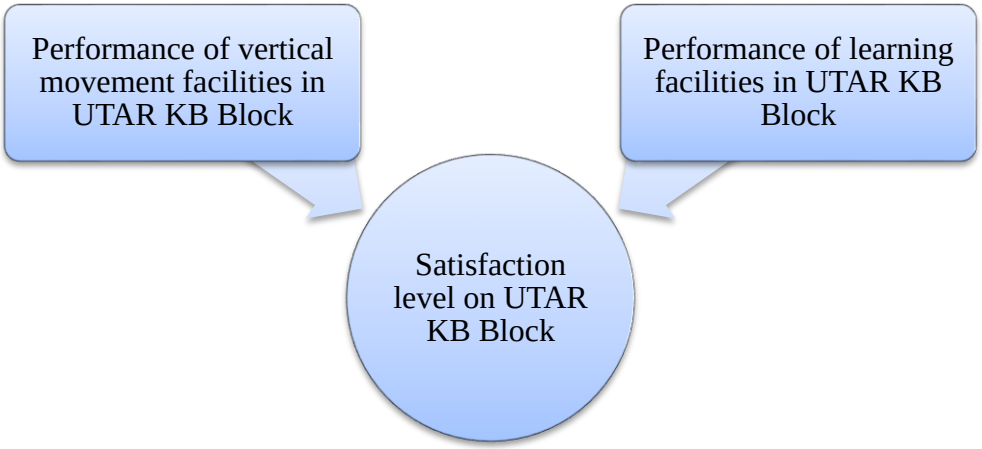


Figure 3.11: The Relationship between Performance of Areas of Study and Occupant's Satisfaction Level.

Figure 3.11 illustrates that there is a relationship between the performance of vertical movement facilities and satisfaction level of occupants towards UTAR KB Block. There is also a relationship between the performance of learning facilities and satisfaction level of occupants towards UTAR KB Block. The following represents some hypothesis for this research.

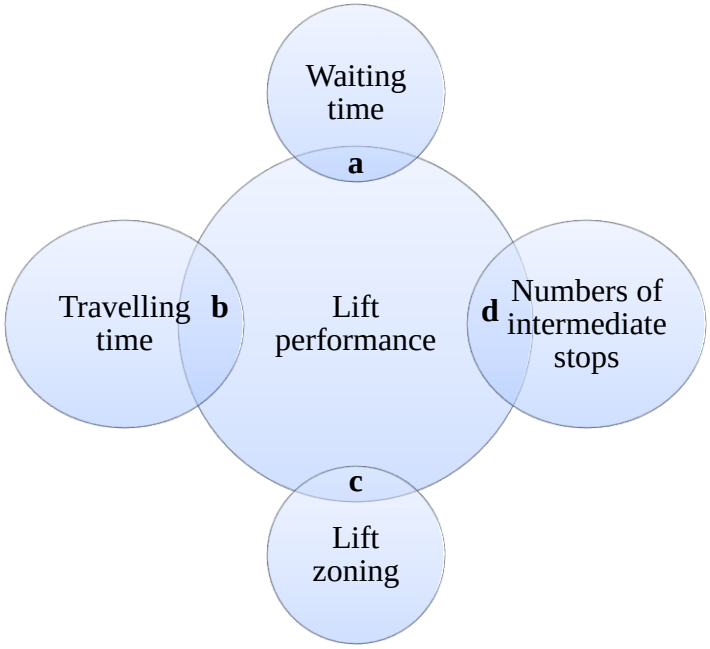


Figure 3.12: The Variables that Affect the Lift Performance.

Vertical movement facilities – Lift

Referring to Figure 3.12,

(i) The shorter is the waiting time of lift, the higher is the satisfaction of occupants.

(ii) The shorter the travelling time of lift, the higher is the satisfaction of occupants.

(iii) The better is the lift zoning design, the higher is the satisfaction of occupants.

(iv) The better is the breakdown of lift, the higher is the satisfaction of occupants.

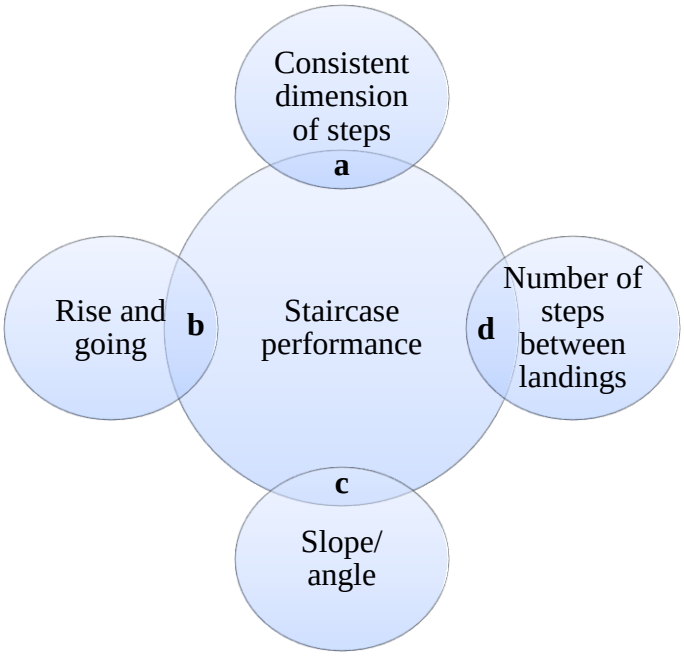


Figure 3.13: The Variables that Affect the Staircase Performance.

Vertical movement facilities – Staircase

Referring to Figure 3.13,

(i) The more consistent is the dimension of steps, the higher is the satisfaction of occupants.

(ii) If the rise and going of staircase are in proper dimension, then the satisfaction of occupants is high.

(iii) The gentler is the slope of the staircase, the higher is the satisfaction of occupants.

(iv) If the number of steps between landings is appropriate, then the satisfaction of occupants is high.

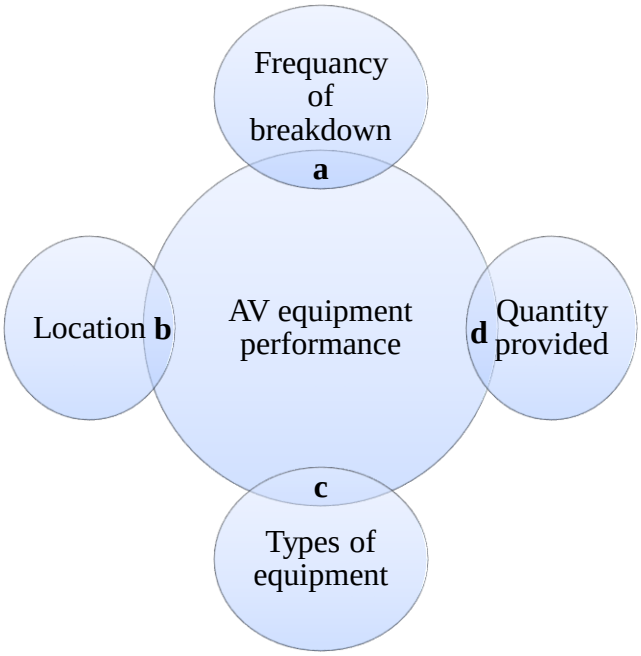


Figure 3.14: The Variables that Affect the AV Equipment Performance.

Learning facilities – AV equipment

Referring to Figure 3.14,

(i) The lesser is the frequency of breakdown, the higher is the satisfaction of occupants.

(ii) If the AV equipment is placed at a proper location and height, then the satisfaction of occupants is high.

(iii) If the proper type of equipment is provided, the then the satisfaction of occupants is high.

(iv) If the quantity of AV equipment is sufficiently provided, then the satisfaction of occupants is high.

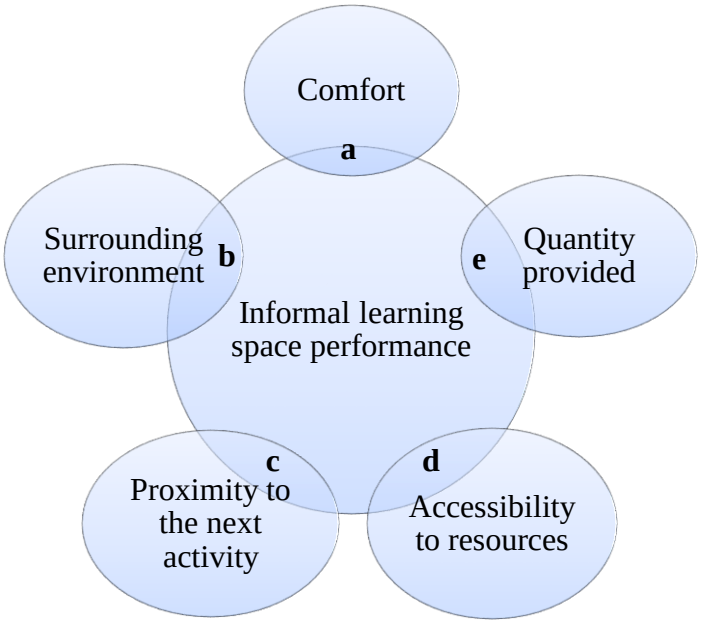


Figure 3.15: The Variables that Affect the Informal Learning Space Performance.

Learning facilities – Informal Learning Spaces

Referring to Figure 3.15,

(i) If the informal learning spaces are comfortable, then the satisfaction of occupants is high.

(ii) There is a relationship between the surrounding environment of informal learning spaces and the satisfaction of occupants.

(iii) The nearer are the informal learning spaces to occupant's activity, the higher is the satisfaction of occupants.

(iv) If the informal learning spaces are accessible to various resources, the then the satisfaction of occupants is high.

(v) If the provision of informal learning spaces is sufficient, then the satisfaction of occupants is high.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter highlighted the results from questionnaire survey, interview and walkthrough done on KB Block. The findings of POE on the areas of study were presented with tables and pie charts structured according to the sections of the designed questionnaire, followed by discussion of the findings. Results of interviews and walkthrough with building surveyor were used to reinforce the findings of survey results and to suggest improvement on the areas of study. Secondary data from literature review were included to support the data analysis. Feedbacks from DEF and ITISC were used to recommend possible improvement to the areas of study. At the end of each section of POE findings, summary tables were prepared to show the results which achieved the research objectives. In the previous CHAPTER 3, the author had summarised the objectives or purposes of collecting the data as per Table 3.4: Questionnaire Development of this Research.

The author received four hundred and thirty five (435) responses for the survey – three hundred and sixty nine (369) from hardcopy questionnaire and sixty six (66) from online questionnaire, from the respondents or the occupants. Some of the survey forms were incomplete, for example there were respondents who did not complete one or two questions. However, it was unnecessary to discard the whole survey because the other questions were answered and were able to provide useful feedback for analysis. Hence, no survey was rejected.

Two registered architects who are lecturing at UTAR had agreed to participate in the interview. The probe was recorded with their permission and transcripts were produced (refer to APPENDIX D and APPENDIX E). They are named interviewee 1 and 2 respectively. For the interview results, the author used content analysis to synthesize the professional feedback provided by interviewees (refer to Table 4.11). The walkthrough findings were summarised in tables (refer to Table 4.12 and Table 4.13) and were being discussed together on each section.

4.2 Results of Questionnaire Survey

4.2.1 Section 1 – Demographic Information

Table 4.1 below summarised the results received from survey on the background of the respondents. The following shows that the data collected for this research were reliable and valid.

The survey respondents were users of KB Block whereby 93 % of the respondents were occupants of KB Block who were from LKCFES, FCI and CFS. They were those who frequently used the facilities of KB Block, thus were able to provide valid and reliable data. The rest of the respondents were from another academic block (KA Block) who used KB Block for their activities but were not considered as occupants of this building. Nevertheless, the author believed that feedbacks from the respondents of other faculties who mainly occupying KA Block such as Faculty of Accountancy and Management (FAM) and Faculty of Medicine and Health Sciences (FMHS) are relevant for this POE. Their feedback was evaluated as they used the services and facilities of KB Block occasionally. Other respondents involved in the questionnaire survey were from Department of Alumni Relations and Placement (DARP), Department of Soft Skills Competency (DSSC) and Division of Finance (DF) who occupied KB Block.

Majority of the respondents (59 %) occupied the block more than one year. They frequently used the facilities of this block, compared to the new comers who were still not familiar with the building thus able to provide accurate feedback; and most of the respondents (51 %) spent at least 4 hours per day in the block. Thus they were more familiar with the facilities and services provided in the block and able to give accurate feedback. Moreover, this research is significant as majority of the respondents spent a long time in the building in which building environment will substantially affect the productivity of occupants (Fisk, 1999).

Table 4.1: Respondent's Demography.

Gender	
Male	53 %
Female	47 %
Faculty/Centre/Division	
LKCFES	52 %
FCI	4 %
CFS	37 %
FAM	3 %
Others	3 %
Duration of occupation	
Less than one month	19 %
One month to one year	21 %
More than one year	59 %
Hours Spent in UTAR KB Block Per Week	
Less than ten hours	13 %
Ten hours to twenty hours	35 %
More than twenty hours	51 %
Height of Respondents	
Less than 1.50 m	1 %
1.50 m to 1.60 m	28 %
1.60 m to 1. 70 m	36 %
More than 1.70 m	34 %
Physical Condition of Respondents	
Asthma	0 %
Handicapped	1 %
Overweight	11 %
Underweight	0 %
Visual impaired	7 %
I don't have any of the above	81 %
Identity of Respondents	
Student	86 %
Lecturer	8 %
Staff	6 %

The respondents were asked where they commonly study or work on in order to find out the areas that would be mainly affected due to design inadequacy or existence of breakdown and where the improvement should be focused. The results are shown in Figure 4.1.

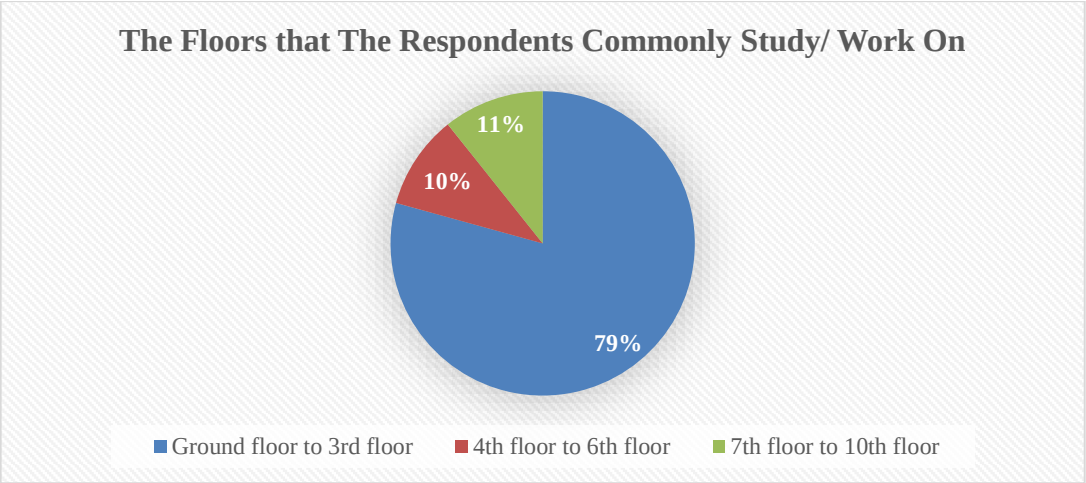


Figure 4.1: The Floors that the Respondents Commonly Study/ Work On.

Based on the survey data collected, majority of respondents used the common study and work places at the ground to the 3rd floor. The result is as expected because these areas are where the lecture halls, most of the classrooms and other learning facilities could be found. The 11 % respondents who used the higher floors as their common study or work areas, i.e. from 7th to 10 floors, were the lecturers and staff who made up 14 % of the total respondents. Since there are lecturers' offices on the 3rd floor and there are staff offices on the ground floor, it is believed the 3 % of the respondents who are lecturers and staff were the ones working on these lower floors i.e. ground floor to 3rd floor. It could be concluded here that the more is the occupants used the common areas on the ground to the 3rd floor, the more traffic movement is expected on these lower floors. Thus, more vertical mechanical transportation system should have been installed to cater for these heavy flow of movement. In addition, it is expected that there should also have more learning spaces and facilities provided at these lower floors as majority of the respondents study or work on these lower floors.

4.2.2 Section 2 – Vertical Movement Facilities

There were two facilities under vertical movement at KB Block: the mechanical system, lift or elevator, and staircase. Respondents were asked to choose either the lift or staircase as their preferred mode of travel to the floors they commonly study or work on. Based on the findings, the respondents preferred to travel to the floors they commonly work or study by taking the lift as illustrated in Figure 4.2. This confirms that occupants in KB Block do prefer to use the vertical mechanical transportation system than climbing the stairs. Overweight and handicapped respondents' preference

was analysed and it was found that all the handicapped respondents and 78 % of the overweight respondents would take the lift to reach their destination. This shows that the lift provide in this building has cater for the special needs persons in line with the government policy or building code. Besides, overweight is not advised to take the staircase to minimise stress on their hearts (Deseret News, 1989).

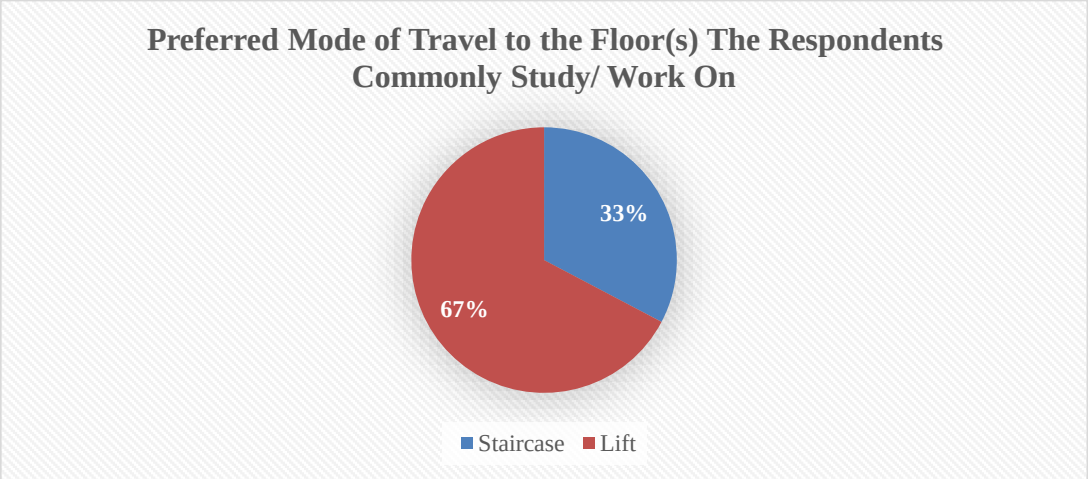


Figure 4.2: Preferred Mode of Travel to the Floor(s) The Respondents Commonly Study/ Work On.

Further analysis made on the data received from the survey shown in Table 4.2 indicated that the respondents would take lift even if they just want to reach at the lower floors. It was perceived that taking the lifts would saves time and energy and majority of the respondents clearly showed that they were not willing to use the staircase but rather wait for the lift. This reflected the heavy traffic of lift at the lower floors.

Table 4.2: Respondents' Preferred Mode of Travel to the Floors that They Commonly Study/ Work On.

Floor Level	Lift as preferred mode of travel (%)	Staircase as preferred mode of travel (%)
Ground floor to 3rd floor	72	92
4th floor to 6th floor	13	7
7th floor to 10th floor	15	1
Grand Total	100	100

The survey found that the reasons of why the respondents chose lift as their preferred mode of travel are shown in Figure 4.4 below.

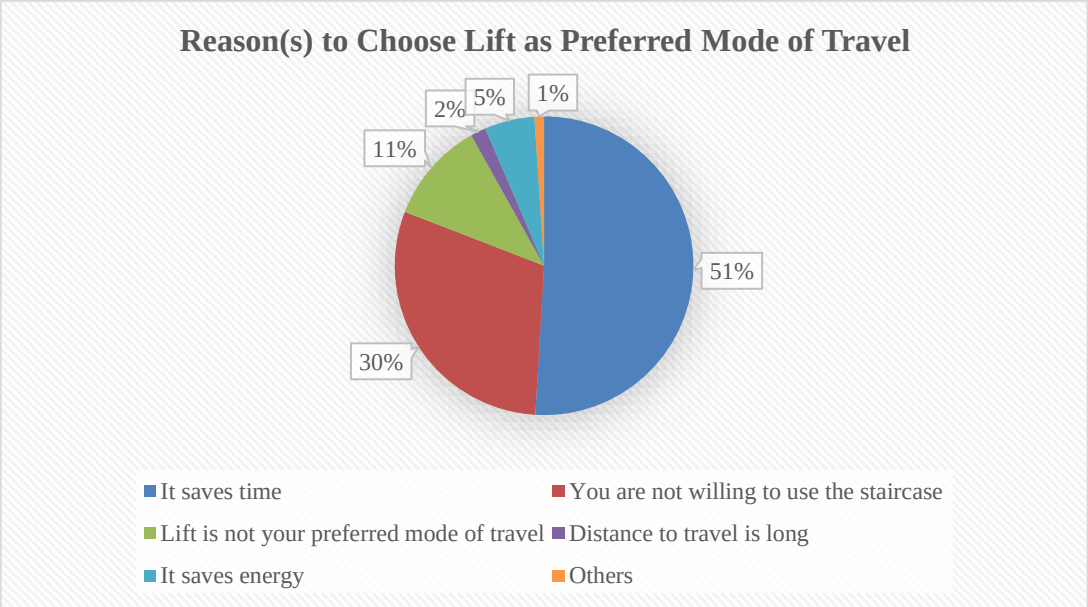


Figure 4.3: Reason(s) of the Respondents to Choose Lift as Preferred Mode of Travel.

Although most of the respondents highlighted their dissatisfaction on the lift, they still claimed that the lift is time-saving to travel up on the floors within the block. Perhaps this is because they perceived that taking the staircase would take longer time compared to taking the lift. Generally, the perception is that taking the lift still save time compared to taking the staircase to the upper floors. Some respondents (30 %) were not willing to use the staircase and this may be related to their dissatisfaction towards the staircase and problems faced while using the staircase (refer to analysis under Figure 4.12 and Figure 4.15). Eleven percent (11 %) of the respondents stated that they did not prefer to take the lift to their destination and this could be related to their dissatisfaction towards the lift and problems faced while taking the lift (refer to analysis under Figure 4.6 and Figure 4.7). There may be several reasons why lift is still the chosen transport method to move up on the building. The staircase at the lower floors, primarily from the ground floor to the 3rd floor were of double volume due to the existence of lecture halls. This means that people who uses the staircase to get to the 1st floor from the ground floor would have climbed 4 flights, which are equivalent to 2 storey. Other reasons include to avoid knee pain and sweating due to climbing the stairs.

Notably from the survey, as shown in Table 4.2 above, the respondents were more likely to climb the stairs if they wish to go to the lower floors. They chose staircase as their preferred mode of travel mainly because of the long waiting time at the lift lobby, which compliments with Figure 4.4 below that showed the claimed made by respondents on their time spent waiting at the lift lobby. This also confirms the problems faced by the respondents as per Figure 4.7 – the lift is insufficient to cater the needs of the huge population in the block. Thus, instead of waiting for the lift, they would climb the stairs instead to reach their destination. As illustrated in Figure 4.4, some respondents (21 %) did not preferred to climb the staircase. They most probably think that there are more pros in taking the lift than climbing the stairs as shown in Figure 4.3 and they might face problem while using the staircase as described in Figure 4.15. Twenty three percent (23 %) of the respondents stated that it was more time-saving to climb the stairs than taking the lift owing to the long queue at the lift lobby[1]. They also might be the ones who only have to travel on lower floors thus climbing the staircase would have saved them time. Other reasons to climb stairs include to exercise, short travel distance, in a rush and to let others who are more in need to take the lift.

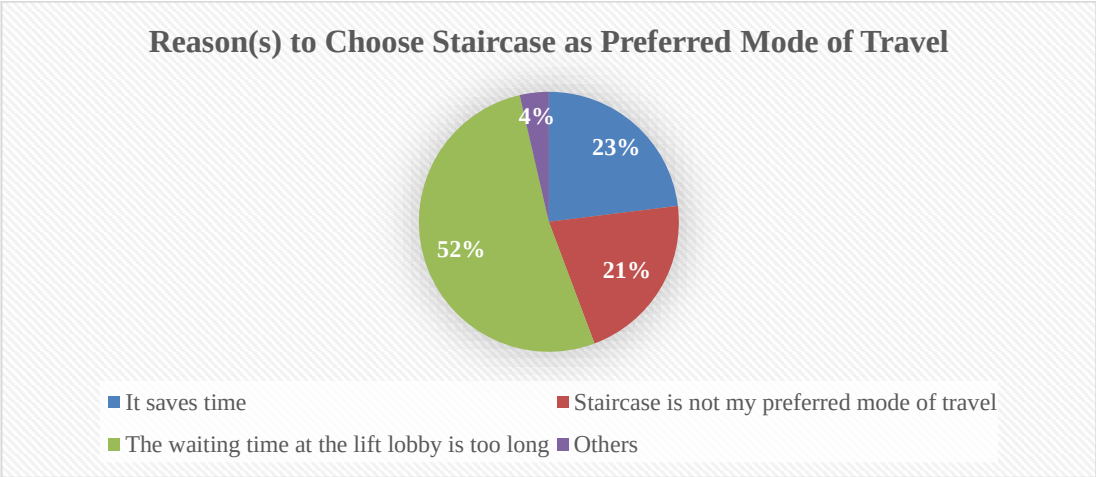


Figure 4.4: Reason(s) to Choose Staircase as Preferred Mode of Travel.

Since lift and staircase both saves time, the author wished to find out which mode of travel saves more time in general. Figure 4.3 and Figure 4.4 were combined and analysed which resulting in the following Figure 4.5 below. 68 % of the respondents claimed that lift is the mode of travel which saves more time compared to

[1] Refer to Figure 5.2.

staircase. This concur the occupants' perception of taking the lift still saves time compared to climbing the stairs to upper floors and the occupants do like to use the mechanical transportation vertically. This also concurs with the findings that the occupants preferred vertical mechanical transportation than manual transportation, staircase. The university should review the provision of vertical mechanical transportation which can cater to the number of students, staffs and lecturers using the blocks.

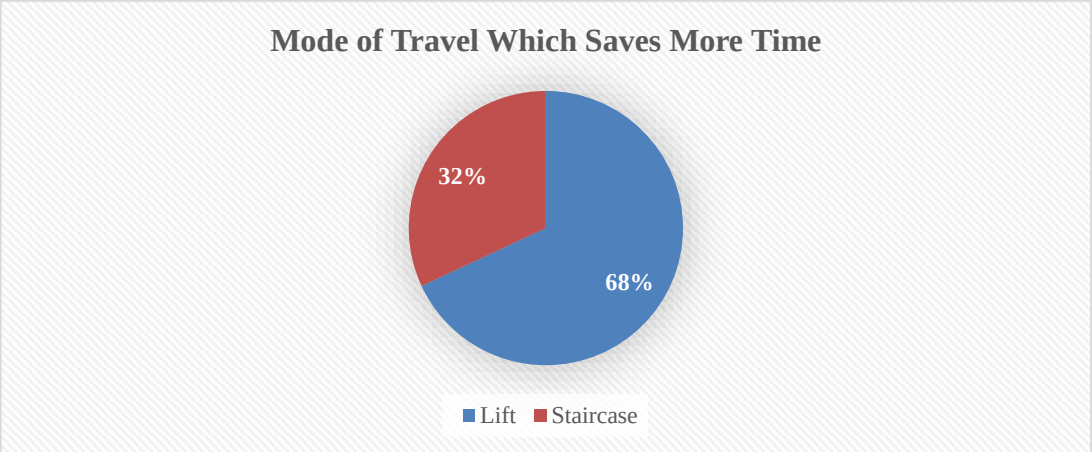


Figure 4.5: Mode of Travel Which Saves More Time.

4.2.3 Section 2A – Lift

To determine the users' perception on the performance of vertical movement facilities in KB Block, respondents' satisfaction towards the performance of lift was collected.

The survey result indicated that more than 60 % of the respondents were not satisfied with the lift as shown in Figure 4.6 below. Further analysis of the survey data showed that the main issue of lift is the waiting of the lift. More than 50 % of the respondents were not satisfied with the waiting time. Detail of the issues faced by the respondents on using the lifts at KB Block are illustrated by Figure 4.7.

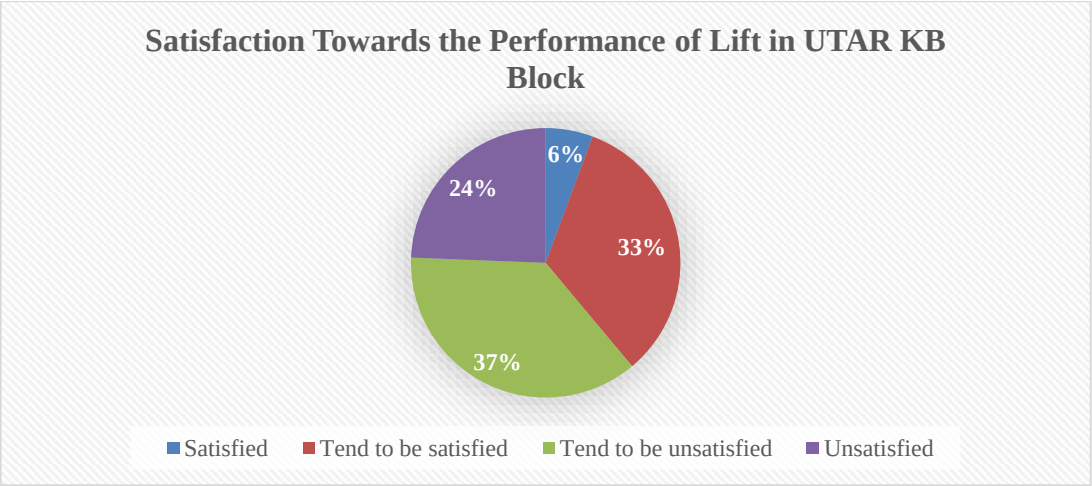


Figure 4.6: Satisfaction Towards the Performance of Lift in UTAR KB Block.

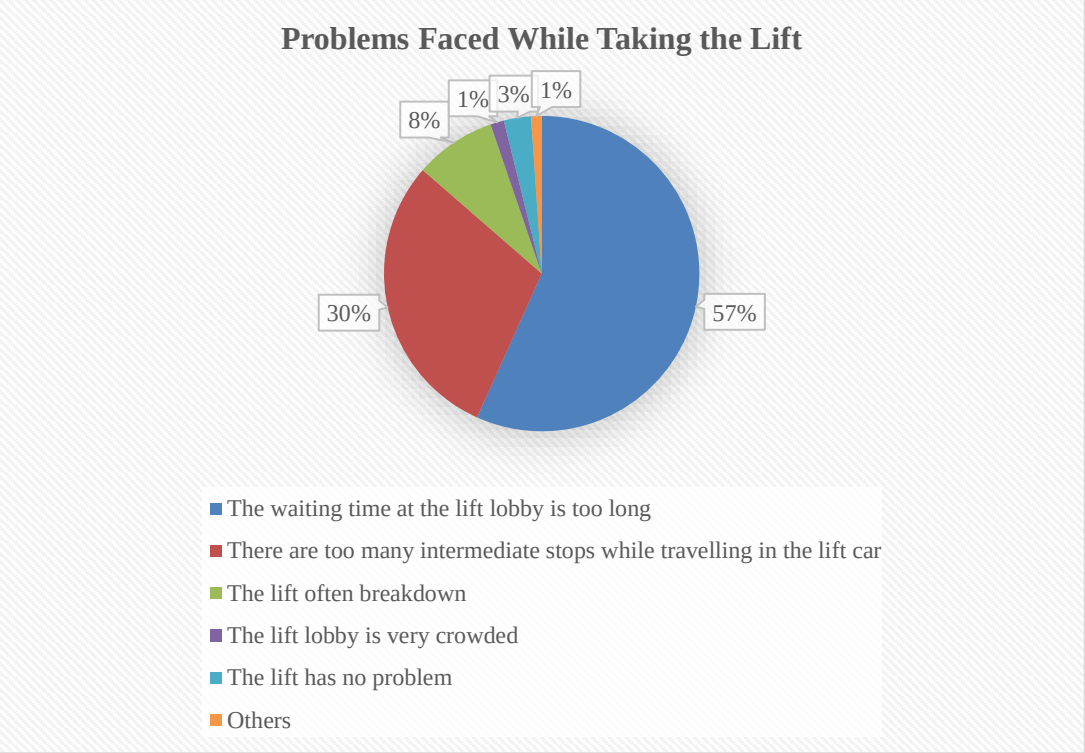


Figure 4.7: Problems Faced by the Respondents While Taking the Lift.

The survey results also highlighted the duration of time that respondents were willing to wait for the lift although the satisfaction level of the lift was towards not satisfactory. According to Al-sharif et al. (2010), lift passenger should have waiting time not more than 30 seconds. The finding found that majority of the respondents were willing to wait for more than 30 seconds to use the lift (Figure 4.8). In the UTAR Staircase Committee Report (2016), it outlined that the waiting time for the lift in the block generally ranged from 50 seconds to 240 seconds. The result of the walkthrough

with the building surveyor found that the waiting time for the lift was more than 180 seconds and both interviewees had indicated their dissatisfaction of the lift. According to Otis (2012), the performance of lift is poor if the lift takes 45 seconds or more to make a round trip, including upward journey time, downward journey time, passenger travelling time and door opening time (Srour, 2014). Generally the interval should be less than 30 seconds (Jochem, n.d.). This concur the unsatisfactory feedback from the respondents and interviews. As such there is a need to review and find solution to minimise the waiting time for lift. Although the waiting time is long, lift is still the most favourite method by the respondents to move up and down in the building. This could be the main reason for the crowded lift.

The following Figure 4.8 highlighted the acceptable waiting time for users of lift at KB Block.

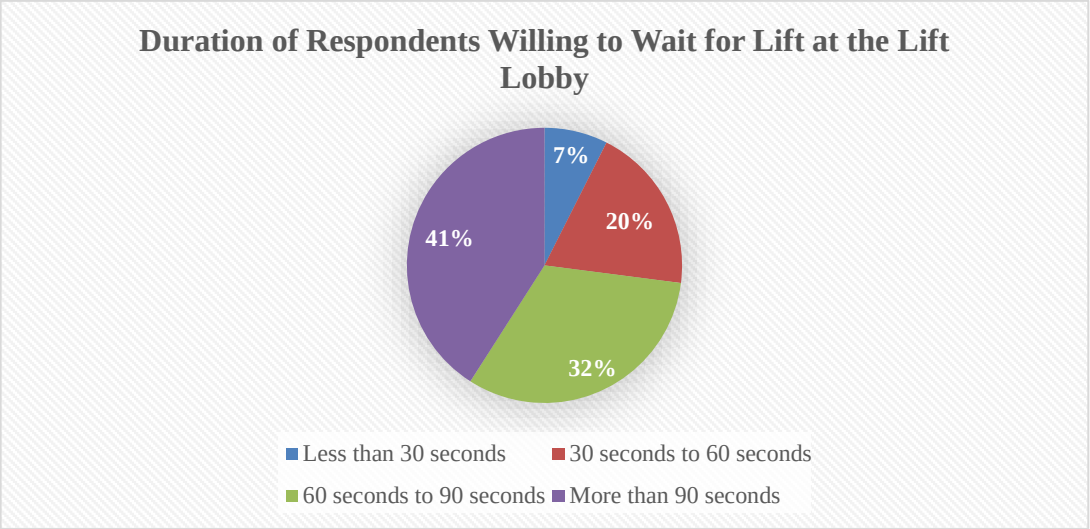


Figure 4.8: Duration of Respondents Willing to Wait for Lift at the Lift Lobby.

Some of the respondents claimed of frequent lift breakdown which could be the contributing factor to the longer waiting time for lift. According to a DEF staff, the root causes of lift breakdown were mostly the failure of components of lift which required replacement, malfunction of weight setting and bug in the lift programming. The lift would be maintained once in a month. It seemed like the maintenance frequency should be increased to minimise the breakdown, although the DEF staff mentioned that lift breakdown seldom happen.

Another problem stated by the respondents when using the lift was the many intermediate stops while travelling in the lift car. Notably from the walkthrough and

the feedback of survey, the more intermediate stops was made by the lifts, the longer was the respondents have to wait inside the lift car before reaching destination. This is another contribution to the longer waiting time for lift. The survey results also highlighted the duration of time that respondents were willing to travel inside the lift although the satisfaction level of the lift was towards not satisfactory. According to Al-sharif et al. (2010), the targeted travelling time within the lift should be within 60 seconds. The finding found that 47 % of the respondents willing to travel more than 60 seconds in the lift car. This represents that the duration of waiting has exceeded the actual current industry standard of 60 seconds.

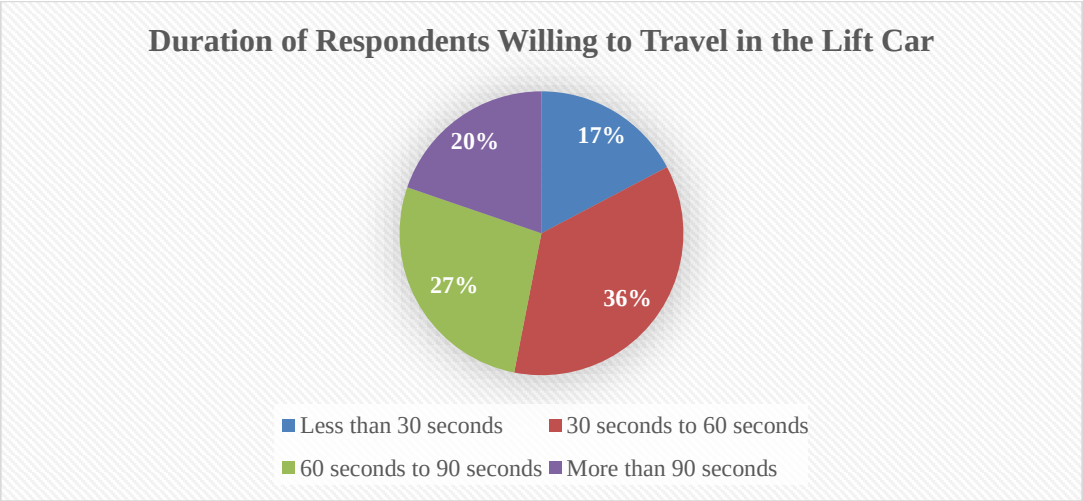


Figure 4.9: Duration of Respondents Willing to Travel in the Lift Car.

From Figure 4.8 and Figure 4.9 above, it could be concluded that the respondents were willing to wait for the lift for a long period of time. If they were not willing to wait, they would have taken the staircase (Figure 4.7). This means that lift is the first choice of moving up and down in KB Block. The respondents also stated that they were less willing to stay longer inside a lift car. Thus, some actions may be necessary be taken to reduce the traveling time of the lift in this block to increase the satisfaction level of the occupants. A method to reduce the intermediate stops should be applied based on the feedbacks received that is illustrated in Figure 4.10. Lift zoning such as lifts which only transport people from and to certain floors (even or odd floors) – the current lift zoning design, is seemed to be more effective than lift which transport people from and to every floor and which can minimise the waiting time. The

respondents seemed to also prefer to have one or few designated lifts to only transport people from and to higher floors, i.e. 5th to 10th floor.

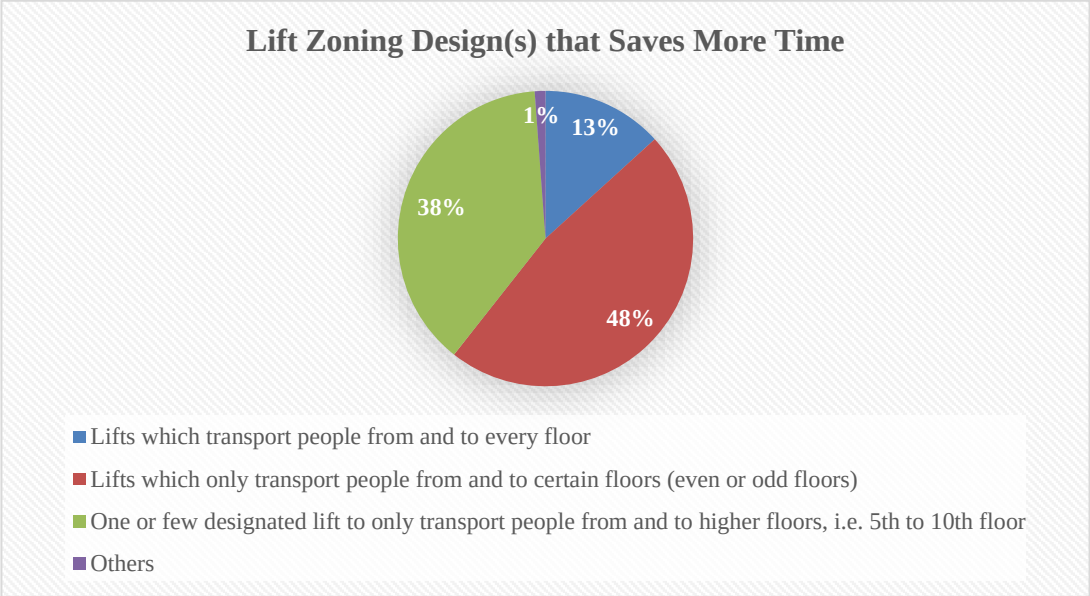


Figure 4.10: Respondents' Feedback on Lift Zoning Design(s) that Saves More Time.

There were other suggestion from the respondents such as:

i) Lift which only transport people from (sub-basement) SB and ground floor to 4th floor and above;
ii) Lift only accessible by lecturers and staff;
iii) One or few designated lift to only transport people from and to lower floors;
iv) Equal numbers of lifts which travel to odd and even floors; and
v) Odd number lift which do not stop by 1st floor.

There are pros and cons for the suggestion above. Lift which only transports people from level SB and/or ground floor to 4th floor and above could save the waiting time of respondents who wishes to travel to higher floors. According to a DEF staff, the population from 1st to 3rd floors was around half of the population in the building. Since most of the respondents were to travel to the lower floors, more lift should be catered for the lower floors instead for the higher floors. If the lifts only transport people to 4th floor and above, most of the occupants would have no choice but to take the staircase. This might lead to hazard in using staircase i.e. falling and knee pain in long term especially for greater age occupants, stated by the DEF staff. According to interviewee 2 in Table 4.11, a designated lift to transport people to the higher floors is

unnecessary as the lower floors should be prioritised. In addition, there must be lift accessible to the lower floors so that the special needs occupants could use the lift to reach their destination.

The advantage of the second suggestion as per item ii) above – lift only accessible by lecturers and staff is shorter waiting time for the lecturers and staff. However, according to the DEF staff, this is not a win-win situation. For example, lecturer could not teach even if they reach the classroom on time, because most of the students are still waiting for the lift. Thus, the DEF staff claimed that it is better to treat everyone on "first come first serve" basis to use the lift. Furthermore, it may be difficult to identify who is the lecturer and staff unless a person such as the building security guard is employed to check and determine who can use the specific lift. Segregation of lift during specified hours may be necessary if there is justification that the waiting time contributed to the late attendance of staff or lecturer to classrooms.

The third suggestion as per item iii) above – One or few designated lift to only transport people from and to lower floors may be applicable as most of the occupants always travel to the lower floors. This method could be applied together with "one or few designated lift to only transport people from and to higher floors", which was supported by 38 % of the respondents in Figure 4.10. As shown in Figure 4.1, 79 % of the respondents usually travelled to the lower floors while the remaining 21 % often travelled to the middle and higher floors. If this suggestion is to be applied for the four lifts near to the entrance (Lobby 1), one lift is for fire lift, two lifts could be used to travel people from and to the lower floors while one lift could be used to travel people from ground floor to 4th and above floor as shown in Table 4.3.

Table 4.3: Lifts which transport people to and from lower floors and higher floors.

Floors which the respondents travelled to	**Proportion of respondents travelled to the floors (%)**	**Number of lifts at Lobby 1**
Lower floors i.e. ground to 4th floors	79	79 % x 3 lifts ≈ 2 lifts
Middle and higher floors i.e. 4th to 10th floors	21	21 % x 3 lifts ≈ 1 lift

As per the 4th suggestion item iv) above, a respondent had suggested to have equal numbers of lifts which travel to odd and even floors, instead of lifts which only

travel to the even floors at Lobby 1. As it is, there are only two lifts available to travel to the odd number floor compared to four lifts travelling to even floors and the position of these lifts were not at Lobby 1. This method was suggested to make those who travel to the odd floor level more convenient especially those having disabilities. There may be little improvement to the overall lift performance as there is no change in the number of intermediate stops since the intermediate stops still the same. Some may feel confused of which lift they should take if the lifts are divided into more than one category in a lift lobby, especially for outsiders or new comers.

Odd number lift which do not stop by first floor would reduce one intermediate stop while travelling in the lift car. However, those with poor physical condition have to be taken into consideration. For example, people in wheelchair could only reach 1st floor by taking the lift.

In short, the current lift zoning design at KB Block could remain as it is. Perhaps other suggestion could be adopted such as two designated lift to only transport people from ground floor to 3rd floor and below, and one lift to only transport people from ground floor to 4th floor and above at Lobby 1. The performance assessment to determine performance of lift should take into account of both classical performance criterion and modern passenger centric performance criterion, which means that both the interval and the waiting time of the lift users should be looked into before deciding on a suitable lift system (Al-sharif et al., 2010; CIBSE Lifts Group, 2011).

Others issues highlighted from the survey and walkthrough included lift users attitude such as those who cut queuing line and making others wait longer. From the observation from the walkthrough it was found that existing ventilation provided for the lift is not sufficient during peak hours when the lift was fully packed. The DEF staff stated that in order to improve ventilation within the lift, another exhaust fan has to be installed and this requires a lot of work such as to have another electrical control unit (ECU) and modification of the lift system. Since the ventilation problem was not serious, in his opinion, an additional exhaust fan is not required. In addition, the building surveyor had mentioned that on several occasions the lift produced noises while travelling; the lift car door jammed and needed to be manually opened or closed; and sometimes the landing of the lift car was not properly placed, i.e. jerking at the time of starting and stopping.

The interviewees believed that the main reason leading to the unsatisfactory responses of the lift could be due to the insufficient number of lifts in the block which

was the main cause of congestion to existing lifts. Interviewee 1 stated that the university only provided limited number of lifts perhaps due to the lift is very expensive and it requires additional spaces; if the lift is insufficient, the occupants are encouraged to climb the stairs. Most of the respondents also reported that the number of lifts provided is insufficient as described in Figure 4.11 below. Thus, it could be concluded that the insufficient number of lift is a major issue in this block for vertical movement facilities. This issue may be critical as the number of occupants or users in KB block increases over time. One of the respondents and both interviewees claimed that the lifts were over capacity and thus modifying the lift zoning design might has little improvement on the efficiency of the lift.

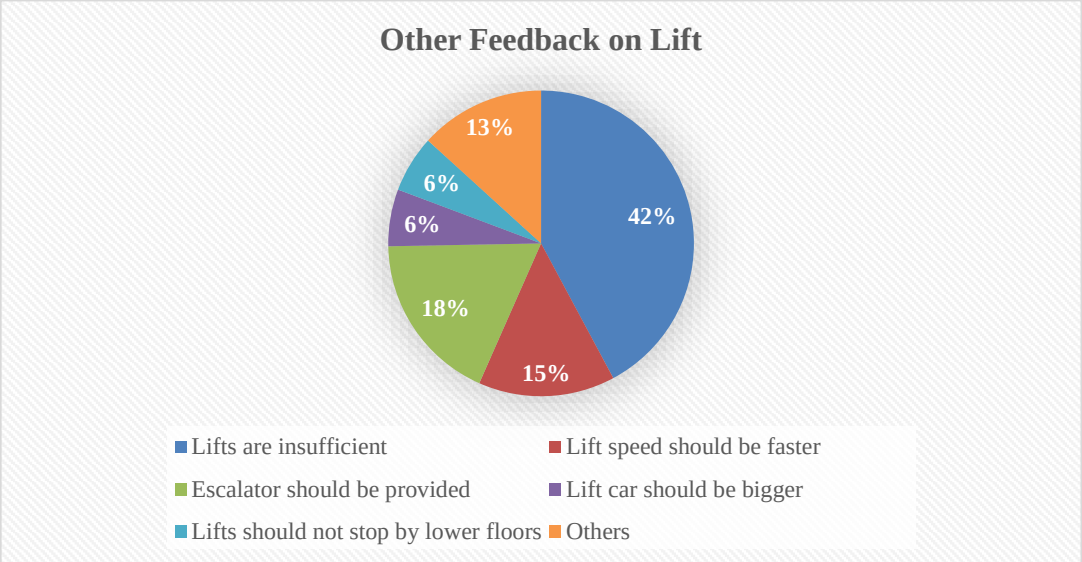


Figure 4.11: Other Feedback on Lift.

Eighty three respondents provided extra feedback regarding the lift in KB Block. Some respondents (15 %) suggested that to increase the lifts movement so as to reduce the traveling time and the waiting time at the lift lobby. 6 % of the respondents suggested that having a bigger lift to transport more people from floors would reduce the number of people waiting for the lifts. The suggestions given by these respondents who were common users of lifts in the block may only be adopted with the university's top management approval to change the lifts capacity to higher efficiency. Some of these respondents (6 %) claimed that the lift should not have stopped at lower floors. However, since majority of the respondents usually travel at these lower floors, eliminating lift stops at these lower floors would lead to non-

compliance to provide vertical movement facilities to occupants who are not able to use staircase due to their physical condition. There is no data or review provided whether having lifts to higher floors only would reduce the waiting time for the lift nor would any study to confirm that lift that does not stop by at the lower floors lead to longer waiting time at the lift lobby.

Another suggestion given by 18 % of the respondents is to have provision of escalators in the building. Interviewee 2 suggested to have escalator from ground floor to 4th floor since most of the crowd were in these floors and to overcome the lift congestion issue. An escalator would be more efficient than the lift especially during peak hours, said by the interviewee 1 and as such the design and construction of this block should have taken into consideration of the installation of escalators for the movements of crowd around these lower floors, i.e. ground to 3rd floor, similar to most commercial buildings. This conclusion somewhat reinforced the suggestions given by the respondents that there should be another provision of mechanical transportation besides lift such as escalator. Interviewee 1 claimed that high initial cost, high maintenance cost and the danger associated in using escalator were some of the reasons why the escalators were not provided in in the construction of this block. This suggestion to have escalators in KB Block was reported to a DEF staff. The staff accepted this suggestion and may plan to execute this suggestion in the future because this could distribute the flow of movement from the lift. The structure of the building has to be taken into consideration before this suggestion is implemented, according to the staff.

Other suggestions by the respondents which may be taken into consideration include:

i) The ventilation within the lift car should be improved;
ii) Maintenance should be done regularly;
iii) Occupants should be encouraged to take the staircase if their travel distance is short; and
iv) The lift users should stand orderly inside the lift to optimise the spaces in the lift, so that more people could be transported in a lift car.

There were a few suggestions from the interviewees on the above issues when asked during the interviews. Interviewee 2 suggested to add at least two more lifts at Lobby 1. In total, the block requires ten lifts in three groups of lift. Such additional lifts would not take a lot of spaces. Currently the block consists of two lift group with

four lifts while another lift group with two lifts which notably not sufficient based on feedbacks received.

Moreover, interviewee 2 also suggested the university to submit and install additional lifts as temporary structure that would use part of the space of setback of the building. This means to have an extension for the building for lifts. Besides, Class VI lift, the service lift which mainly used to transport goods and are generally accompanied by persons should be provided, so that the goods in huge size could be transported separately without disturbing the occupants in using the Class II lifts which is mainly used to transport persons (ISO, 2010).

The suggestions above require extra cost and time to demolish some areas, to install new lift, to pay for extra maintenance, to obtain authorities' permission and to engage professionals which will inconvenienced existing users and may have financial implication to the university. These have to be considered carefully before any action is taken. Interviewee 1 mentioned that the current quantity of lifts available would only be sufficient if the occupancy rate drops by 30 % to 40 %. For example, any move of classrooms or offices to a new block would decrease the occupancy of KB Block and as such automatically drops the number of users for the lifts. In addition, interviewee 2 suggested that the space allocation of the block should be corrected – managing spaces for lecture halls and library where most of the occupants usually visited – there should be more learning facilities at the ground floor.

The results for the POE done to lift is summarised in Table 4.4 below.

Table 4.4: Summary of Results on Lift.

Objectives Achieved	Results from Survey, Interview and Walkthrough
1 – To determine the users' perception on the performance of lift	➢ Majority of the respondents were not satisfied with the performance of lift mainly due to long waiting time at the lift lobby and many intermediate stops while travelling in the lift car.

Table 4.4 (Continued)

Objectives Achieved	Results from Survey, Interview and Walkthrough
2 – To investigate whether there is existence of design inadequacy and the root cause of breakdown (if any) to the lift	➢ Breakdown due to failure of lift components, malfunction of weight setting and bug in the lift programming ➢ There are many intermediate stops while travelling in lift ➢ Poor ventilation within the lift car especially during peak hour when the lift was fully packed ➢ Lift occasionally produced noises while travelling ➢ Lift car door jammed ➢ Experience of jerking at the time of starting and stopping ➢ Insufficient provision of lift ➢ Lift speed is slow ➢ Lift car size is small ➢ Landing of lift was not properly placed
3 – To establish possible improvement to the inadequacies of lift based on users' perception	➢ To increase lift maintenance frequency to minimise breakdown that could lead to longer waiting time ➢ To have 2 lifts to transport people from and to lower floors and 1 lift to transport people from ground floor to 4th floor and above at Lobby 1 ➢ To improve the ventilation within the lift car (may not be required according to a DEF staff) ➢ To increase the lift movement so as to reduce the waiting and traveling time ➢ To have a bigger lift to transport more people from floors to floors ➢ To provide escalator i.e. from ground floor to 4th floor ➢ To encourage occupants to take the staircase if their travel distance is short

Table 4.4 (Continued)

Objectives Achieved	Results from Survey, Interview and Walkthrough
	➢ To have the lift users to stand orderly inside the lift car to optimise spaces in the lift, so that more people could be transported every time ➢ To have at least 2 more lifts for the lift group near to the entrance or to have 10 lifts in 3 groups of lift ➢ To submit and install additional lifts as temporary structure that would use part of the space of setback To install service lift to transport goods

4.2.4 Section 2B – Staircase

Data received on respondent's perception of the performance of staircase were highlighted in Figure 4.12. 67 % of the respondents or users of the staircase in KB Block were quite satisfied with the staircase provided. According to Protopapadaki et al. (2007), a taller person could climb the staircase with lesser effort and use it more comfortably. Thus, the author would like to determine whether there is any relationship between height of respondents and their comfort level in using the staircase.

Further analysis made on the data received from the survey shows that more than 62 % of the male respondents and more than 41 % of the female respondents having height exceeding the average height of male and female in the country (1.66 m and 1.55 respectively) as shown in Figure 4.13 (Onion, 2016). The relevant of this information determines whether satisfaction level of these respondents to the staircase design and/or provision as height do affect comfort level of a person using the staircase.

Refer to Figure 4.14 below, it could be noticed that male respondents were more satisfied (73 %) towards the staircase compared to female respondents (61 %). This concur data above that a taller person could climb the staircase more comfortable with lesser effort as majority of the male respondents are taller than female respondents.

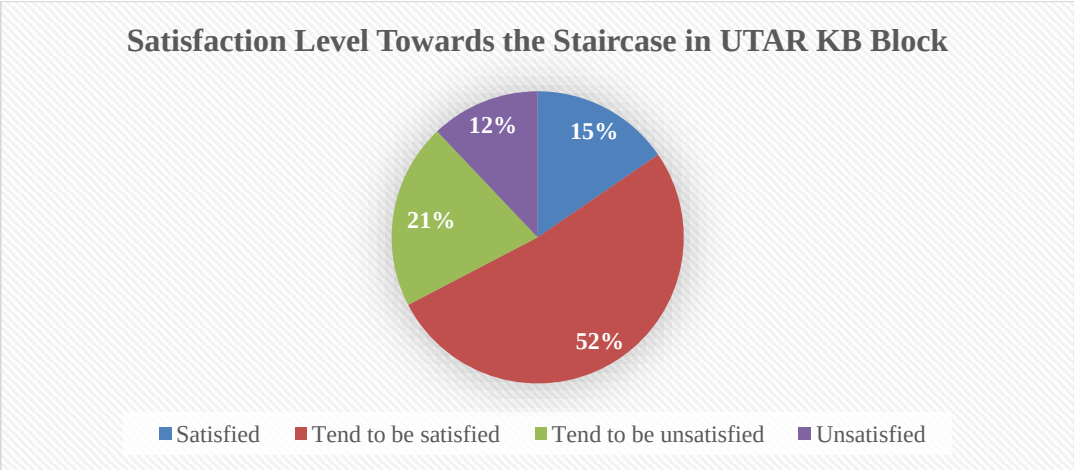


Figure 4.12: Satisfaction Level Towards the Staircase in UTAR KB Block.

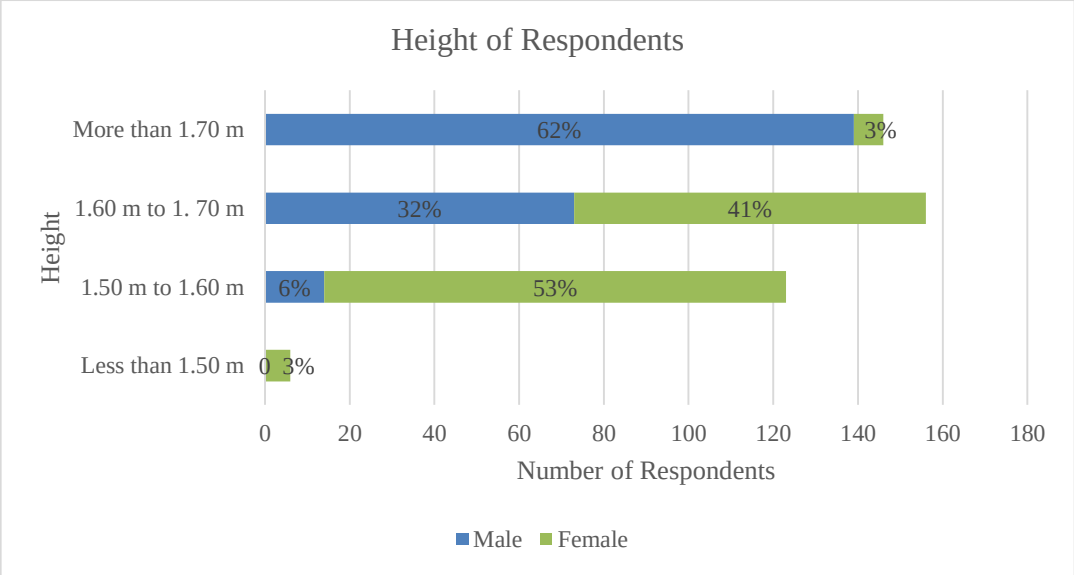


Figure 4.13: Height of Respondents According to Gender.

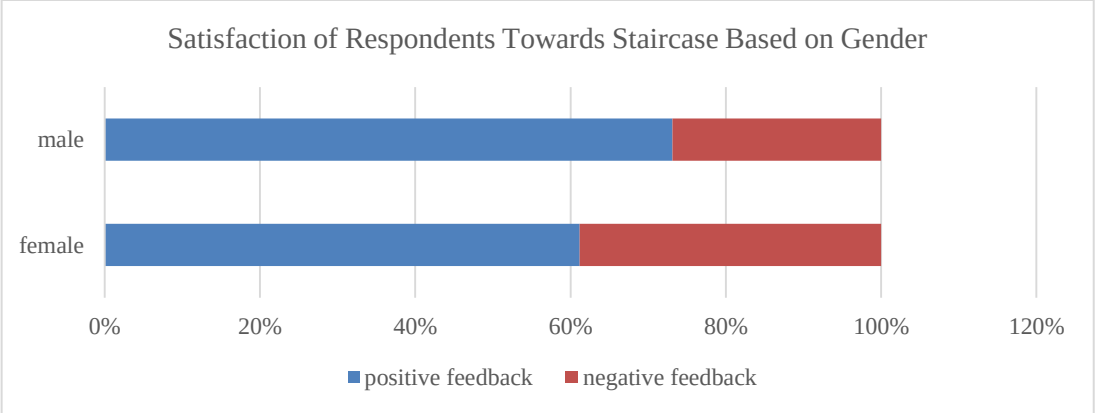


Figure 4.14: Satisfaction of Respondents Towards Staircase Based on Gender.

In order to investigate further whether there is any design inadequacy of the staircase built, respondents were asked on problems faced by them while climbing the staircase. The following (Figure 4.15) were perceived as the problems for the respondents when using the facilities.

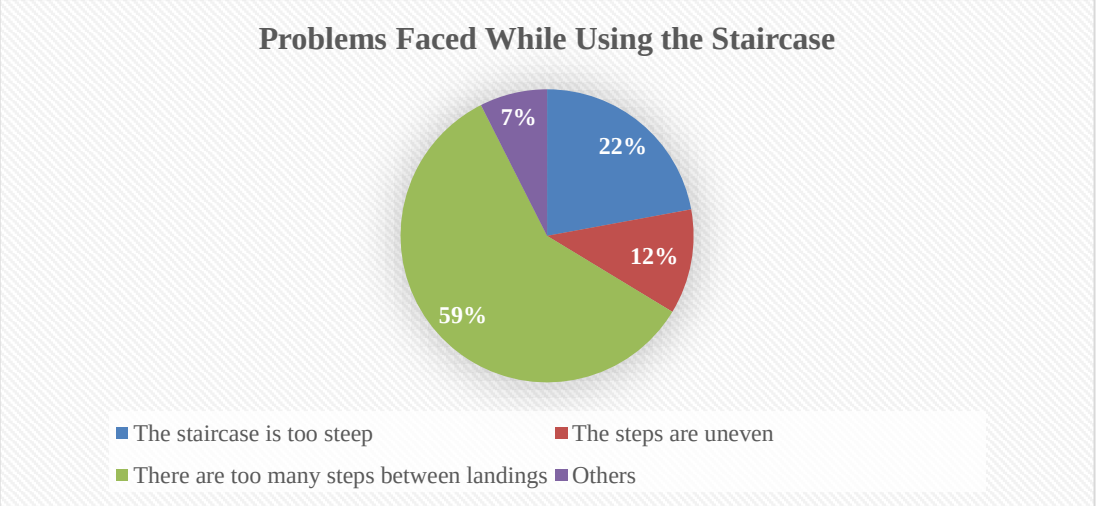


Figure 4.15: Problems Faced While Using the Staircase.

Figure 4.15 illustrated that more than half of the respondents (59 %) claimed that there were excessive steps between landings when they used the staircase. According to Jane, Donna and Nancy (n.d.), the chance of fall and fatigue increases if there are ten or more steps without landing. Referring to Held *et al.* (2008), there should be maximum twelve steps between landing if the going is less than 350 mm to enable the user to rest and recover physically.

Based on the walkthrough results, all the going is less than 350 mm, thus there should be a maximum of twelve steps per flight. During the walkthrough it was found that there were a few flights with more steps than the recommended numbers by the above article, this is especially so on the ground and first floor where occupants often climb. The double volume of floor level on these floors could have been the primary reason which was confirmed by the walkthrough. There is no possibility to reduce the steps on these lower floors but future design should consider more landing between floors that have double volumes to minimise fatigue and discomfort level of staircase users.

There were 22 % of the respondents claimed that the staircase is very steep. In other words, the angle of the staircase is uncomfortable. Interviewee 1 reported that

the angle of staircase was uncomfortable and tiring. From the results of walkthrough, the angle of staircase from ground to third floor ranged from 33.27° to 37.15°. This is not an ergonomic staircase which has been concluded previously in Table 2.5, the recommended angle of a staircase should be less than 30° in overall. Although there is no provision or regulation in the UBBL of Malaysia on the angle of staircase, the design should take into consideration of comfort level of the staircase users. This is because the rate of falls, misstepping and injured increases as the angle of staircase increases (Protopapadaki et al., 2007; Tseng and Liu, 2011). However, the building surveyor and probably most of the respondents who were satisfied with the staircase could use the staircase comfortably. This may depend on one's physical condition but in overall, the staircase should have been considered those with special needs or poor physical condition.

Some respondents (12 %) reflected that the steps of staircase were uneven. This complimented by the results from the walkthrough as in Table 4.5 – the dimensions of rise and going were inconsistent. The dimensions of steps should be even or uniform to prevent tripping and falling (Matthews, n.d.). If the rise of a step is relatively higher than another step, people may trip during stair ascent or their foot may have a harder impact on the next step during stair decent which may cause injury to the foot (The Mercury News, 2012; Inspectapedia, n.d.). According to International Building Code for Stair Treads and Risers (2014), Luckado (2012), Stairs4u (n.d.), Logan (n.d.), Haring (n.d.) and Inspectapedia (n.d.), the maximum variance of rise and tread of steps is 9.525 mm. Interviewee 1 stated it is acceptable if the dimension of steps in a flight is different from another flight as long as the steps within a flight has consistent dimension. By referring to Table 4.15, the rise of flight number 1 of ground floor ranged from 150 mm to 175mm. The variance of rise of that flight is more than 9.525 mm. From these results, we can conclude that the staircase in this block did not fulfil this requirement. From this findings it could be said that the likelihood for the occupants of this block to trip and fall may be high while using the staircase.

The survey also indicated other problems (7 %) faced by the respondents while using the staircases provided in this block:

i) There are many flight per floor due to double volume of floor;
ii) Direction of going up and down the staircase is not stated clearly;
iii) Poor ventilation inside the staircase;
iv) The staircase area is small;

v) The staircase is dusty, frequent cleaning required;

vi) Occurrence of knee pain while climbing the stairs; and

vii) Lack of decoration i.e. plant inside the staircase.

Twenty eight (28) respondents provided some feedback on the staircase as illustrated in Figure 4.16. 25 % of these respondents claimed that there was lack of ventilation inside the staircase as there were no natural ventilation such as windows provided to some staircase areas. Based on the walkthrough observation, most of the staircase areas has poor ventilation. Diffusers should be provided for the staircase to deliver ventilating air and evenly distribute the flow of air (Staircase Planning, 2015). Although from the walkthrough results, one diffuser of pressurisation system on each floor was observed (Table 4.15), there is possibility that the system is not working, or more diffusers are required to ventilate the spaces within the stairwell. Maintainability of the system should be of major concerned with areas without natural ventilation or window openings.

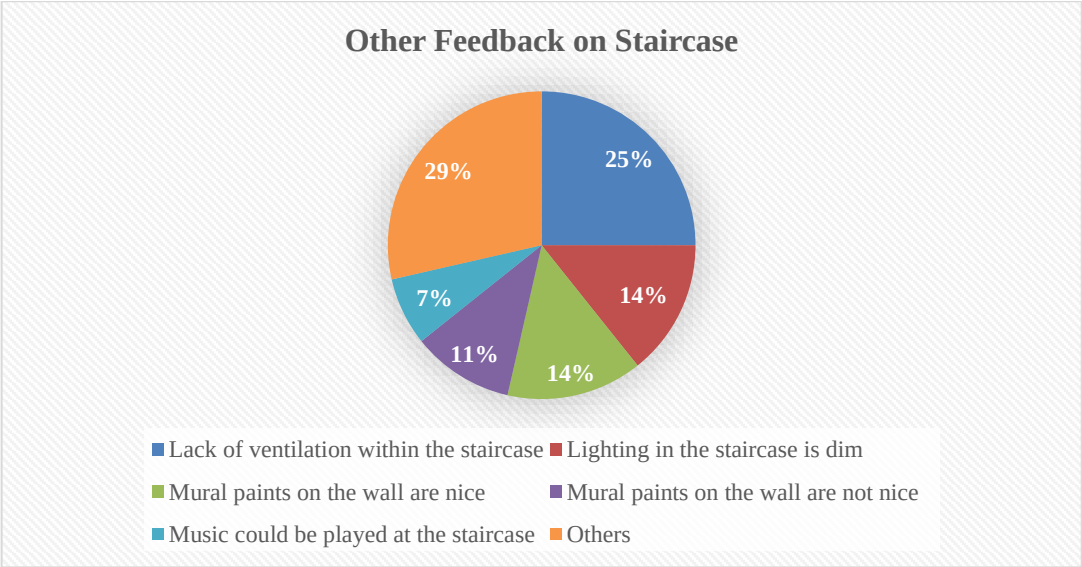


Figure 4.16: Other Feedback on Staircase.

In addition, 14 % of the respondents thought that the lighting in the staircase was too dim. Lighting should be bright enough so that the occupants will not have danger of tripping while climbing as they may misjudge the location of each steps without proper illumination at the staircase (The Staircase Experts, n.d.). There were some respondents who mentioned that the existing mural paints on the wall of staircase were nice (14 %) to look at while some (11 %) stated they were not nice to view at.

The respondents who provided negative feedback felt that the mural paints looked like kindergarten drawings and paintings which demotivated them to use the staircase. The mural painting is one of the motivation for occupants to climb the staircase as shown in Figure 4.16. Two of the respondents suggested that music to be played at staircase area to create an environment which may encourage more occupants to climb the staircase.

Other feedback from the respondents on the staircase at KB Block include:

i) Closed-circuit television (CCTV) should be provided due to the quietness and darkness in some staircase area;
ii) Free drinks could be provided at the landings as checkpoint;
iii) Mirrors at landing could be provided for occupants to tidy up themselves after climbing the stairs;
iv) Incentive to climb staircase is given i.e. an app to record number of steps climbed;
v) Plant to be provided at the staircase; and
vi) The staircase is dusty and slippery.

Interviewee 1 informed that the staircase was built in the block just to fulfil the fire escape requirement of the building. He also claimed that the angle of staircase was uncomfortable and it was tiring to use the staircase. Furthermore, interviewee 1 mentioned that the fundamental of Feng Shui was not observed as some of the flights have 14 steps. He claimed that in Feng Shui, "four" is not a nice number. The occupants may not feel pleasant to stay in this block. He suggested to have 13 or 15 steps in the future and to avoid 14 steps in a flight. Interviewee 2 reported that the staircase is very dark and most likely less occupants would like to use it.

Furthermore, the staircase of this block did not considered as an ergonomic staircase as described in Table 2.5 – the recommended maximum rise of staircase should be ranged from 150 mm to 180 mm and the recommended minimum going should be ranged from 255 mm to 350 mm in overall. Based on the recorded measurement during walkthrough, the average rise of staircase from ground to 3rd floor generally fell between the suitable ranges. However, the average going of staircase on the ground floor was 240 mm – less than the minimum of 255 mm. In addition, the handrail of the staircase was not sturdy. In general, the staircase provided at KB Block did not considered any ergonomic and it could be concluded not healthy or safe for users in the long run.

In this POE, the motivation of respondents to use staircase were identified so that action could be taken to encourage the occupants to climb the staircase. Figure 4.17 portrays the percentage of respondents who claimed benefits of using staircase where more than 50 % claimed that they climbed the stairs to improve their physical health because climbing staircase can burn calories. Stairs climbing offers the users a lot of health benefits such as reduces cardio risk by at least 30 %, helps to build muscle and control weight, cuts carbon and et cetera (Step Jockey, n.d.). Ten percent (10 %) of the respondents stated that they were motivated by the posters around the staircase. The posters encourage the occupants to climb the stairs instead of taking the lift by displaying the benefits of stairs climbing. It could be concluded that the Stair Climbing Campaign had successfully raised awareness of some of the occupants in the block to climb the staircase. The stairs climbing campaign organised a series of events such as stairs climbing poster competition and stair climbing competition to encourage occupants to climb the stairs. Other than cash rewards, the participants could claim for soft skills points by participating in the campaign. Moreover, an Android application had been developed for the participants to record their calories burnt while climbing the stairs.

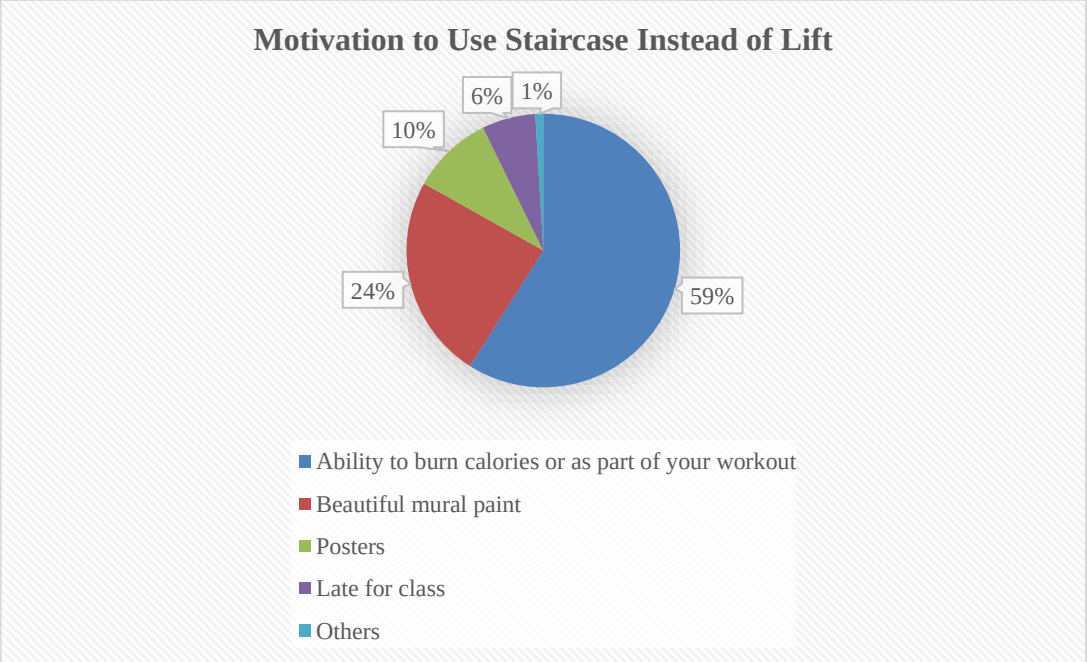


Figure 4.17: Motivation of Respondents to Use Staircase Instead of Lift.

Furthermore, 24 % of the respondents stated that the beautiful mural paint on the wall of staircase was one of their motivation to take the stairs. This means that the "UTAR beautification project – design competition" organised successfully increased student's participation in stairs climbing. The event encouraged various societies to participate in mural painting around the staircase of the building. The participants would be awarded with soft skills points.

It could be concluded that to increase the number of occupants using staircase, more promotion or more campaign should be made to publicise the importance of taking staircase for health purposes or as part of trending lifestyles which may attract the youngsters or students to use the staircase.

Some respondents (6 %) only used the staircase when they were late for class. This was due to the long waiting time at the lift lobby especially during peak hours when occupants were heading to class located from first floor onwards.

In short, the past efforts such as mural paints, stair climbing campaign, posters displayed to increase respondents' use of staircase were quite successful. The works could be continued to encourage the occupants to climb the staircase more often.

Although the stair climbing campaign did create awareness of occupants to take the staircase, interviewee 1 was of the opinion that occupants of older age could not afford to use the staircase as they might suffer while climbing due to the double volume. Stairs climbing is suitable for the youngsters such as students, young lecturers and staff. Interviewee 2 suggested that in order to magnify the importance of climbing stairs, the top management should become the role model of the occupants to start the climbing.

Some respondents claimed that there is good ventilation within the staircase. It could be concluded that poor ventilation occurred on part of the staircase probably where there is no natural ventilation but not the whole staircase in the block. Thus, the technical staff should check whether the diffuser is working in the staircase. A respondent stated that he or she climb the staircase due to the encouragement from his or her friends. If stair climbing awareness are high among the occupants, there may be more and more occupants willing to take the staircase.

Table 4.5 below shows the summary of POE on staircase in KB Block.

Table 4.5: Summary of Results on Staircase.

Objectives Achieved	Results from Survey, Interview and Walkthrough
1 – To determine the users' perception on the staircase	➢ Majority of the respondents were satisfied with the performance of staircase although there are some design inadequacies on the staircase. This is because most of the respondents are tall.
2 – To investigate whether there is existence of design inadequacy to the staircase	➢ There are excessive steps between landings ➢ The staircase is very steep ➢ The steps of staircase are uneven ➢ There are many flight per floor due to double volume of floor ➢ Direction of going up and down the staircase is not stated clearly ➢ Poor ventilation inside the staircase ➢ The staircase area is small ➢ The staircase is dusty and slippery ➢ Lack of decoration i.e. plant inside the staircase. ➢ Lighting in the staircase was dim ➢ Mural paints on the wall of staircase are not nice ➢ Fundamental of Feng Shui was not observed ➢ The going of staircase does not exceed the minimum recommended dimension ➢ Handrail of the staircase was not sturdy
3 – To establish possible improvement to the inadequacies of staircase based on users' perception	➢ Future design of staircase should not have more than 12 steps in a flight if the going is less than 350 mm to reduce the chance of fall and fatigue ➢ Future design of staircase should not have angle more than 30° to reduce the rate of falls, misstepping and injured. ➢ Future design of staircase should have uniform and even steps to prevent tripping and falling

Table 4.5 (Continued)

Objectives Achieved	Results from Survey, Interview and Walkthrough
	➢ Stair Climbing Campaign to be continued to encourage the occupants to climb stairs to improve occupants physical health by burning calories ➢ Direction of going up and down the staircase should be pasted around the staircase i.e. left go up, right do down ➢ Frequent checking on the diffuser in the staircase to ensure good ventilation within staircase ➢ Frequent cleaning on staircase is required ➢ Plants to be provided at the staircase ➢ Lighting at staircase should be bright enough to minimise danger of tripping ➢ To beautify the staircase by drawing mural paints to motivate the users ➢ To play music at the staircase area to create an positive environment to climb stairs ➢ CCTV to be installed due to the quietness and darkness in some areas of staircase ➢ Free drinks to be provided at the landings as checkpoint ➢ Mirrors at landing could be provided for occupants to tidy up themselves after climbing the stairs ➢ Top management should become the role model of the occupants to start the climbing. ➢ To include fundamental of Feng Shui while design for the staircase in future

4.2.5 Section 3A – Microphone

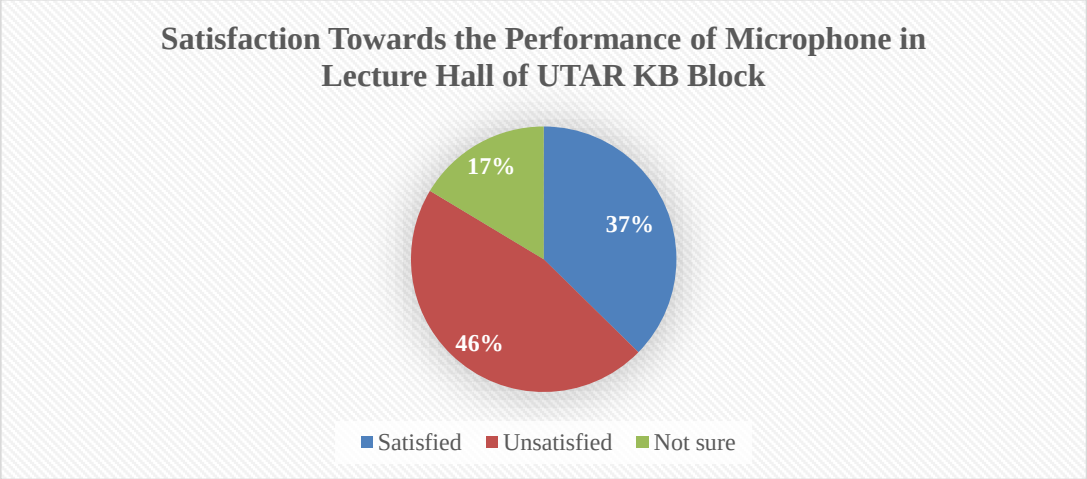


Figure 4.18: Satisfaction Towards the Performance of Microphone in Lecture Hall of UTAR KB Block.

Figure 4.18 illustrates the findings on the performance of microphone provided in lecture halls where there were more respondents who felt unsatisfied (46 %) than those who were satisfied (37 %) towards the performance of microphone provided in the lecture hall. It was noted that there were frequent breakdown of microphone in the lecture hall as shown in Figure 4.19 below. The interviewees expressed their dissatisfaction towards the performance of microphone due to frequent breakdown and its poor quality. Other reasons for dissatisfaction are listed in Figure 4.26. The interviewees were unsatisfied with the performance of microphone due to frequent breakdown and of its poor quality.

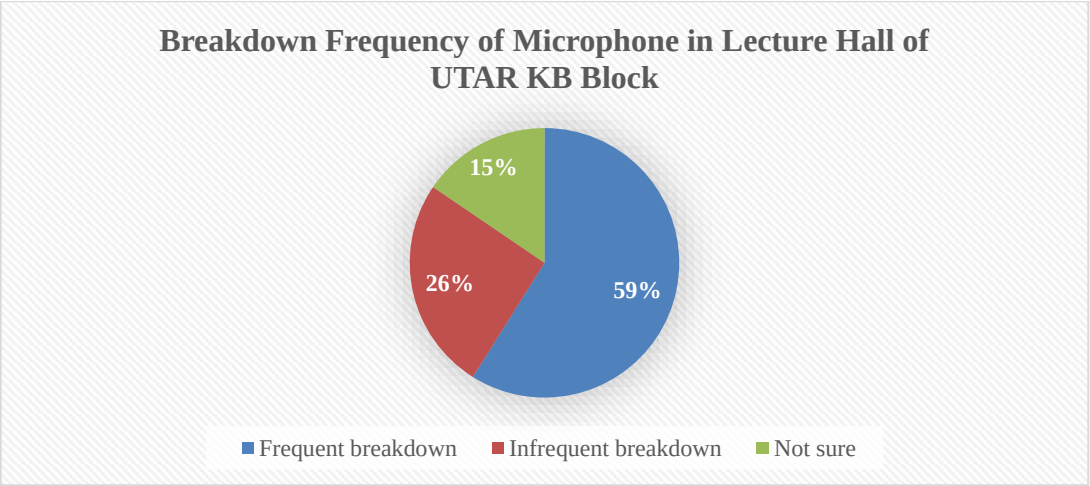


Figure 4.19: Breakdown Frequency of Microphone in Lecture Hall of UTAR KB Block.

Most of the respondents (59 %) claimed that the microphone in the lecture hall frequently broke down. This issue should be taken seriously as the breakdown of microphone could most likely affect the learning and teaching process. By using the microphone, lecturers could deliver lesson more effectively to the whole class as this device will amplify their voice message clearly which can increase student's concentration and provide motivation for students to learn (Ashaver and Igyuve, 2013). The microphone should not experience breakdown as this is a big disruption to both the lecturer and the students, especially the auditory learners (Ericksen, K., 2016). Since lectures are often delivered through verbal communication delivered from a distance, words spoken have to be delivered clearly in order to achieve effective learning and teaching process.

Suggestion was given by the respondents and to have frequent check by authorised staff as portrayed in Figure 4.26. Interviewee 2 claimed that the authorised staff should take initiative to do frequent checking on the equipment. According to a DEF staff, there is no frequent maintenance of microphone by DEF staff due to shortage of manpower. The DEF staff mentioned that they have to focus on other more important tasks such as event set up and breakdown of toilets. They would only fix the microphone if there is report or complaint on the microphone in the lecture hall. Most of the time the root cause of breakdown of microphone is due to loose cable connection. In case there is breakdown of microphone during teaching process, they will bring another wired microphone to the classroom to replace the malfunctioned one. If the cause of breakdown is not due to loose connection of microphone cable and further

trouble shooting is required, portable sound enhancement system would be used to replace the malfunctioned microphone temporarily. This infrequent maintenance of microphone might be one of the main cause of frequent microphone breakdown.

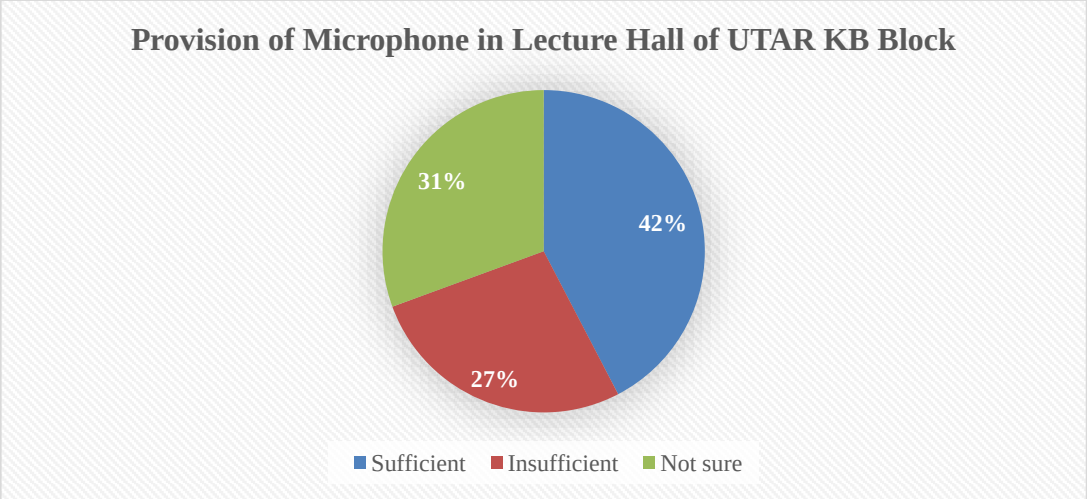


Figure 4.20: Provision of Microphone in Lecture Hall of UTAR KB Block.

Majority of the respondents (42 %) informed that the provision of microphone in lecture hall was sufficient as illustrated in Figure 4.20. From the observation of walkthrough, there was one microphone in the lecture hall (KB208) and lecture room (KB520). During walkthrough, it could be observed that only the lecturer used the microphone. Twenty seven percent (27 %) of the respondents claimed that there should have more microphones. A microphone should be provided for the students at lecture hall, stated by the building surveyor. The extra microphone might be used by the students to voice up their ideas during the learning process. In addition, the extra microphone could be used as a spare microphone in case there is breakdown of microphone.

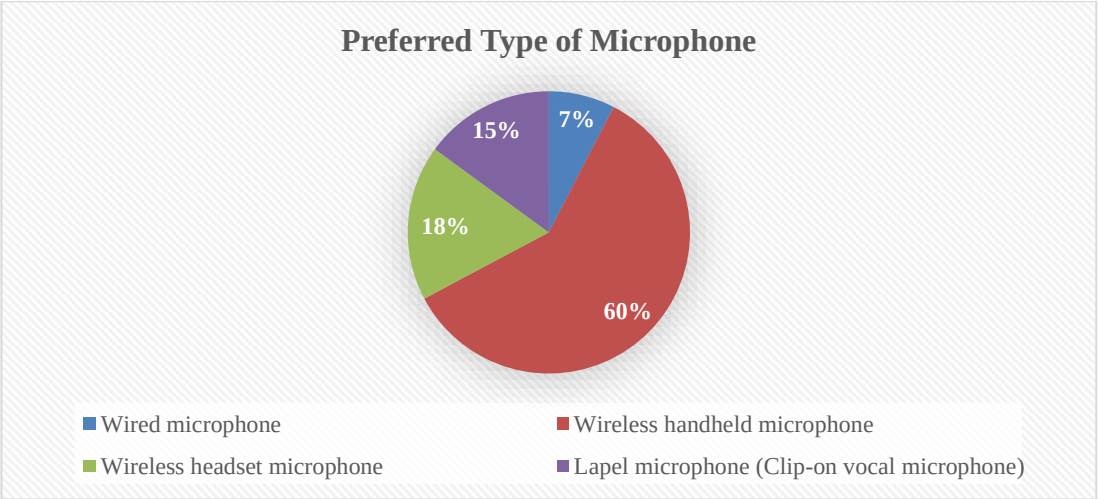


Figure 4.21: Preferred Type of Microphone by the Respondents.

In overall, most of the respondents (93 %) preferred wireless microphone, specifically wireless handheld microphone than other types of microphone as shown in Figure 4.21. Figure 4.22, Figure 4.23 and Figure 4.24 illustrates the preferred type of microphone by the respondents according to their identity.

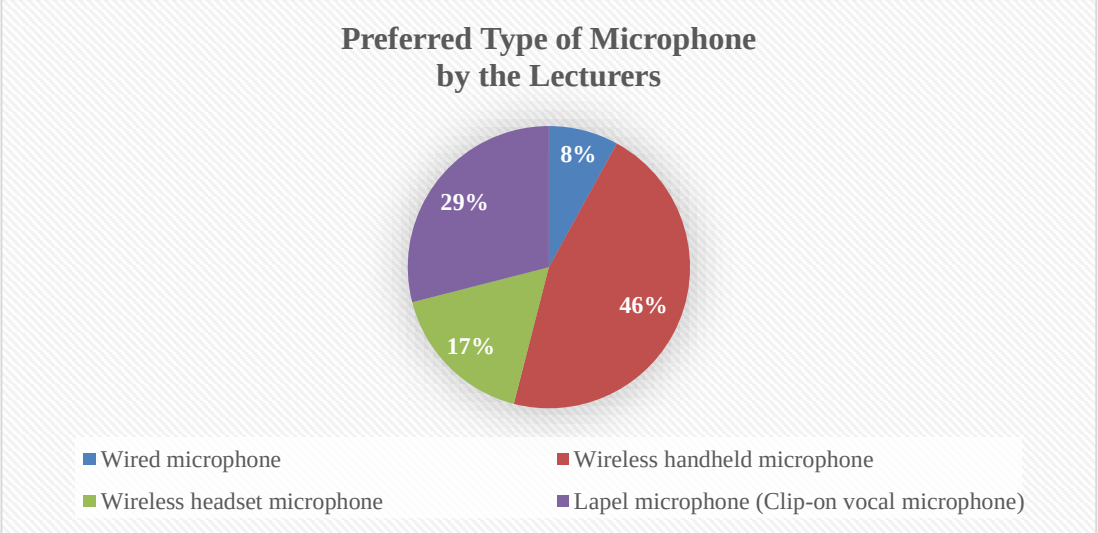


Figure 4.22: Preferred Type of Microphone by the Lecturers.

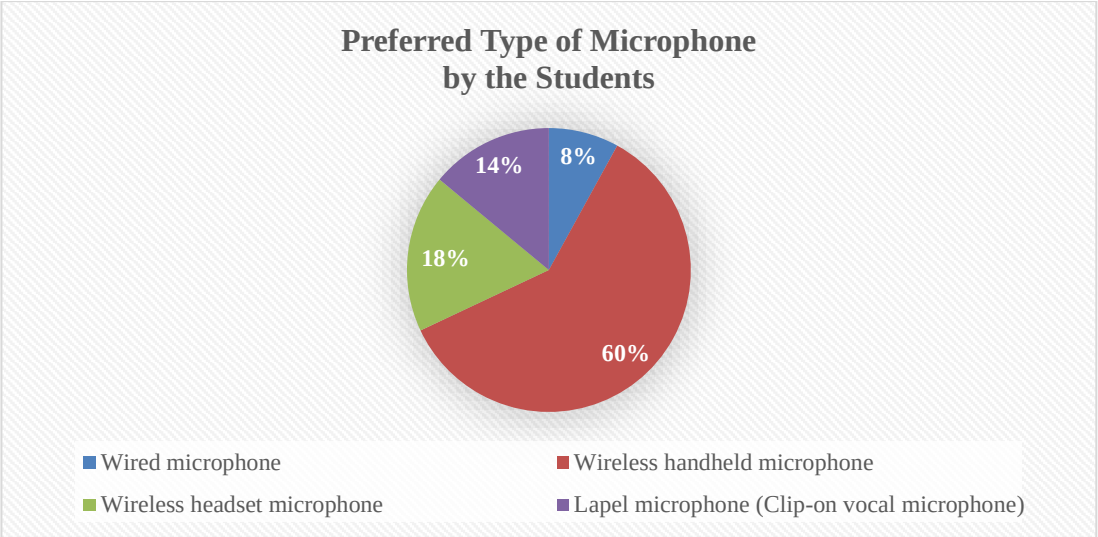


Figure 4.23: Preferred Type of Microphone by the Students.

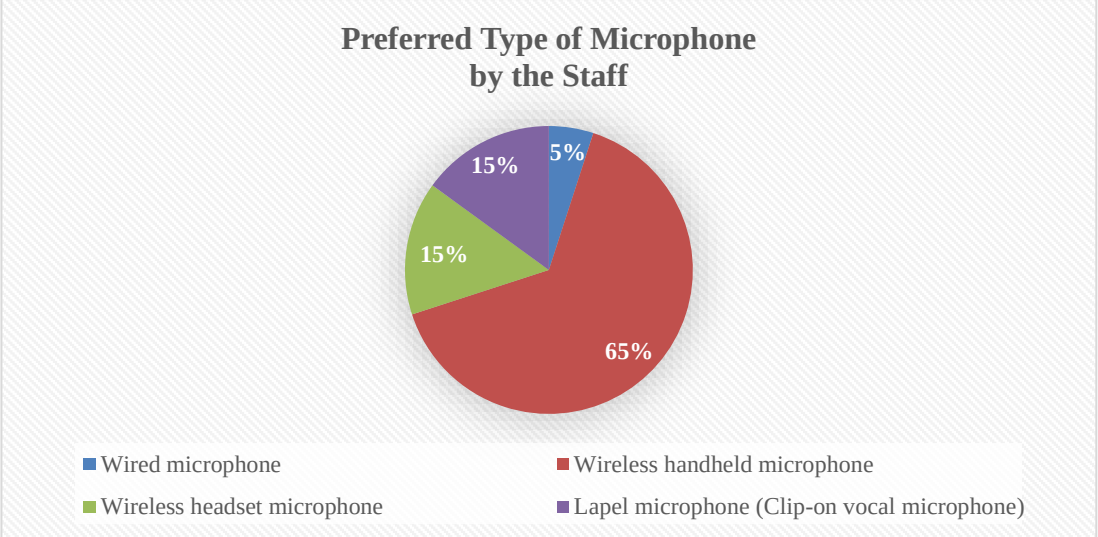


Figure 4.24: Preferred Type of Microphone by the Staff.

As can be seen from the figures above, regardless of the respondent's identity, they preferred the wireless microphone. Wireless handheld microphone was the most popular choice among the wireless microphones. Wireless microphone has several advantages as shown in Table 2.7: Types of Microphone. One of the advantage is able to avoid cable-caused problem, which often leads to breakdown of microphone. In addition, wireless microphone is convenient to use when the lecturer needs to walk around the classroom or to reach for the whiteboard. One of the respondents claimed that sometimes the whiteboard was too far away at place where the wired microphone was unable to reach, thus the lecturer's sound could not be amplified while draw or

write on whiteboard. Students who sit far away from the lecturer might not able to hear the knowledge delivered without the aid of microphone. Another respondent stated that wired microphone is inconvenient for the lecturer because lecturer who has to carry an answer script, a marker pen and a wired microphone at the same time is difficult to give a good learning experience for students. In this case, headset or lapel microphone would be a better choice.

However, the disadvantages have to be taken into consideration before choosing a microphone. A DEF staff mentioned that frequency interference always occur if multiple radio frequency wireless system are used in the university. In this case, a wireless FM system with switchable frequencies could be provided for users to select interference-free channels (AudioLinks, 2016). However, such coordination would become a complex problem for a large university. Thus, infrared wireless handheld microphone could be adopted as it would solve the radio frequency problem and it provides a low cost signal security feature (Liles, 2012). Another DEF staff mentioned that there is microphone set with around twenty frequencies in the market. It could be adopted without frequency interference. The staff also suggested to have a speaker portable wireless microphone (refer to Figure 4.25) to replace the existing wired microphone. According to the staff, the speaker portable wireless microphone could eliminate frequency interference and it integrated with a portable speaker.

Figure 4.25: Speaker Portable Wireless Microphone.

[Source: Bang Good, n.d.].

Interviewee 1 mentioned that if good quality equipment is to be provided, stealing of such equipment may be one of the issue. The DEF staff raised a question of how to monitor and manage the wireless microphones to minimise misplacement of wireless microphone. The author suggested to have a room at the lower floors where the lecture hall located i.e. 1st to 3rd floor to store the wireless microphones. A few designated staff would be allocated there and they are responsible to monitor the quantity of wireless microphone and to frequently maintain the wireless microphone. Before the class starts, lecturer have to borrow a wireless microphone from the authorised staff with proper records. After the class, the lecturer is responsible to return the wireless microphone back to the room. Proper records of who borrows how many microphones could minimise misplacement of wireless microphone. Moreover, due to such centralisation system of wireless microphones, the wireless microphones could be maintained frequently by the authorised staff, such as recharging the batteries and to check for any damage of the wireless microphone. In case there is any breakdown of wireless microphone during lecture, the authorised staff could easily reach to the classroom to do trouble shooting, since they are located at the lower floors. The DEF expressed his agreement on this suggestion.

In order to coordinate microphones and other AV equipment, an AV asset management could be adopted to centralise AV system and to monitor and manage the equipment. DEF staff would receive alerts immediately when microphone goes offline or breakdown. Thus, this minimise time-wasting to look for the authorised staff for help (Harman, 2015).

Twenty two (22) respondents provided other feedback on the microphone in KB Block. From Figure 4.26 below it is clear that majority of the respondents (54 %) suggested to have frequent maintenance on the microphone by the authorised staff to minimise breakdown of microphone during the learning and teaching process. One of the respondents suggested to have some staff to check through all the microphone (and other audio equipment) in the morning before the class starts. The staff may need to update the driver of microphone when necessary (Steam, n.d.).

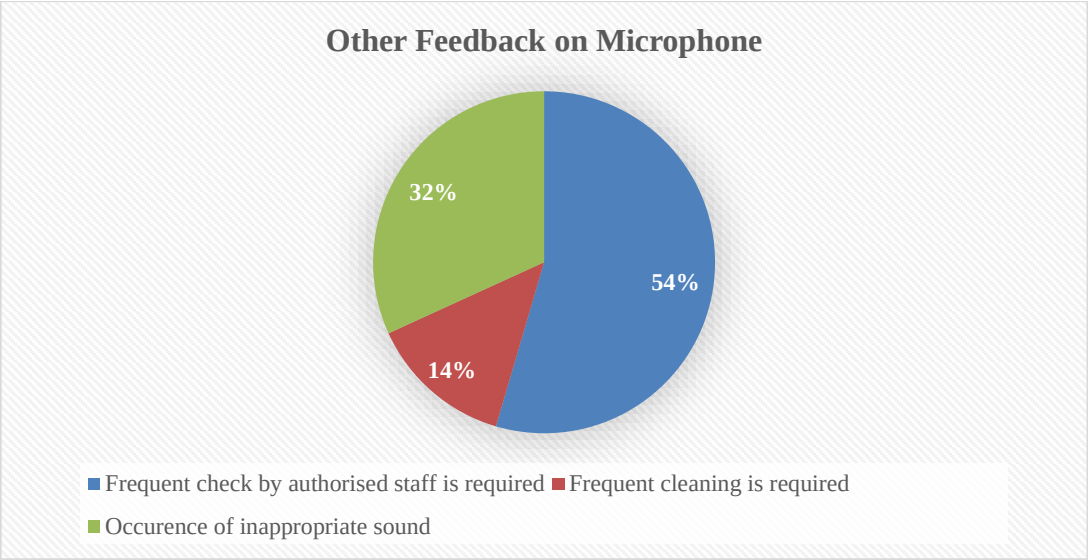


Figure 4.26: Other Feedback on Microphone.

Moreover, 32 % of the respondents reported that sometimes the microphone created inappropriate sound such as buzzing or humming which disturbed the teaching and learning process and might lead to ear pain. One of the causes is due to bad connection between the microphone and the speaker. Thus, an authorised staff should conduct frequent check on the connection (Steam, n.d.). If wireless microphone is used, the problem could be minimised. Another cause is the bad conduct of the microphone user such as placing their mouth too near to the microphone, tapping or blowing into a microphone. A chart showing the precautions while using the microphone should be provided in each room so that the users know how to take care of the microphone. In addition, some respondents claimed that there was background noise or acoustic feedback while the microphone was being used. In this block, as a unidirectional microphone is used, directionality of microphone would not be the cause of acoustic feedback (refer to Figure 4.27). The microphone should be used as far away as possible from the loudspeakers to prevent amplifying the sound from loudspeakers (Errede, n.d). There may have other factors affecting the performance of microphone, DEF staff should initiate the checking on microphone to minimise problem occurred in the future.

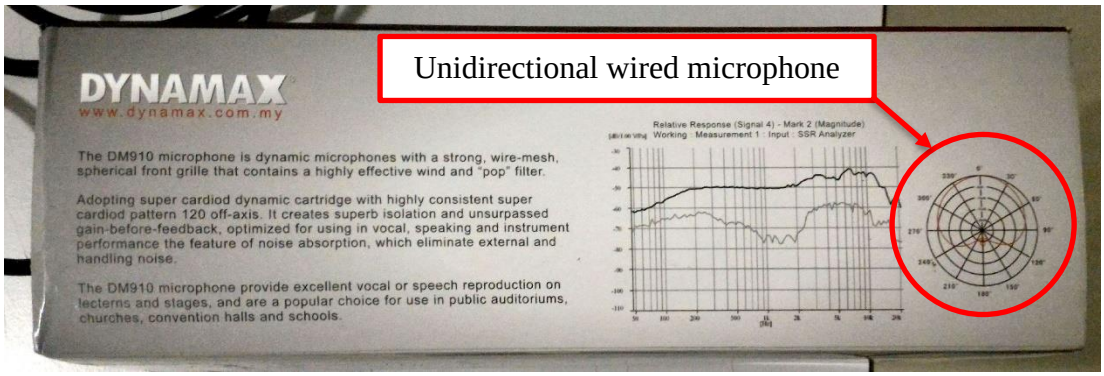


Figure 4.27: Directionality of Microphone of Wired Microphone in UTAR KB Block.

Fourteen percent (14 %) of the respondents reported that frequent cleaning on the smelly microphones is required because the microphones are shared among the lecturers. The respondents suggested to put a cover on top of the microphone i.e. tissue paper with rubber band fixing its position to ensure hygiene and to prevent spread of bacteria from one to another.

Table 4.6 below summarised the results for the POE done to microphone.

Table 4.6: Summary of Results on Microphone.

Objectives Achieved	Results from Survey, Interview and Walkthrough
1 – To determine the users' perception on the performance of microphone	➢ Majority of the respondents were not satisfied with the performance of microphone in lecture hall mainly due the frequent breakdown of microphone in lecture hall
2 – To investigate whether there is existence of design inadequacy and the root cause of breakdown (if any) to the microphone	➢ Frequent breakdown of microphone in lecture hall mostly due to loose cable connection ➢ Wireless handheld microphone is more preferred by most of the respondents than wired microphone ➢ Inappropriate conduct of the microphone user such as placing their mouth too near to the microphone, tapping or blowing into a microphone ➢ There was background noise or acoustic feedback while the microphone was being used ➢ The microphone is unhygienic and smelly

Table 4.6 (Continued)

Objectives Achieved	➢ Results from Survey, Interview and Walkthrough
3 – To establish possible improvement to the inadequacies of microphone based on users' perception	➢ To have frequent check on microphone i.e. connection by the authorised staff ➢ Authorised staff to update the driver of microphone when necessary ➢ Extra microphone to be provided in the lecture hall for student's use. It can be used as a spare microphone if breakdown happens ➢ Wireless microphone should be provided ➢ To have a coordination room to manage the wireless microphone (if provided) ➢ AV asset management could be adopted to centralise AV system ➢ A chart showing the precautions while using the microphone should be provided in each room ➢ The microphone should be used as far away as possible from the loudspeakers to avoid acoustic feedback ➢ Frequent cleaning on the microphone is required ➢ A cover on top of the microphone i.e. tissue paper with rubber band fixing its position to ensure hygiene and to prevent spread of bacteria from one to another

4.2.6 Section 3A – Loudspeaker

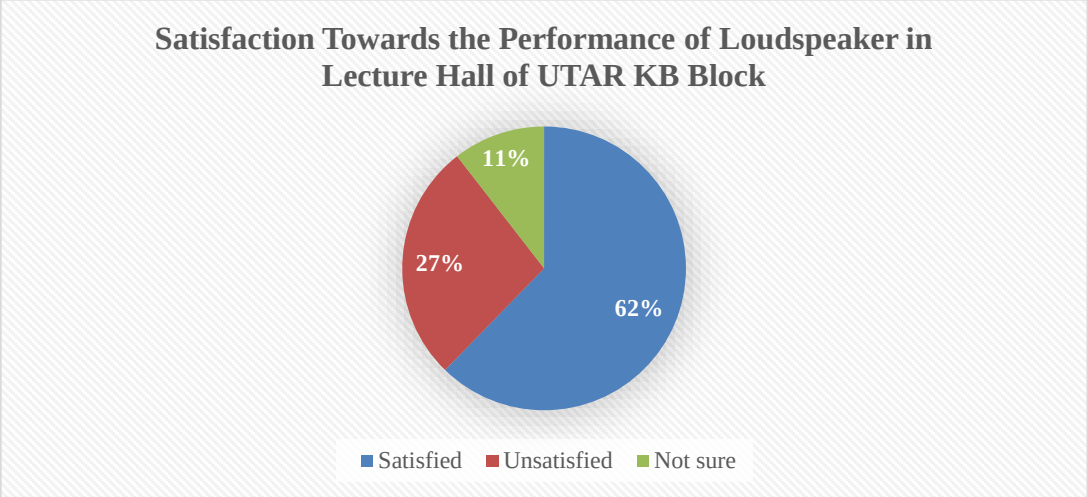


Figure 4.28: Satisfaction Towards the Performance of Loudspeaker in Lecture Hall of UTAR KB Block.

It can be seen from Figure 4.28 that most of the respondents (62 %) felt satisfied towards the performance of loudspeaker in lecture hall. This might be due to infrequent breakdown and sufficient provision of loudspeaker in lecture hall as shown in Figure 4.29.

Some respondents were unsatisfied towards the performance of loudspeaker in lecture hall. This might due to the occurrence of inappropriate sound as illustrated in Figure 4.31.

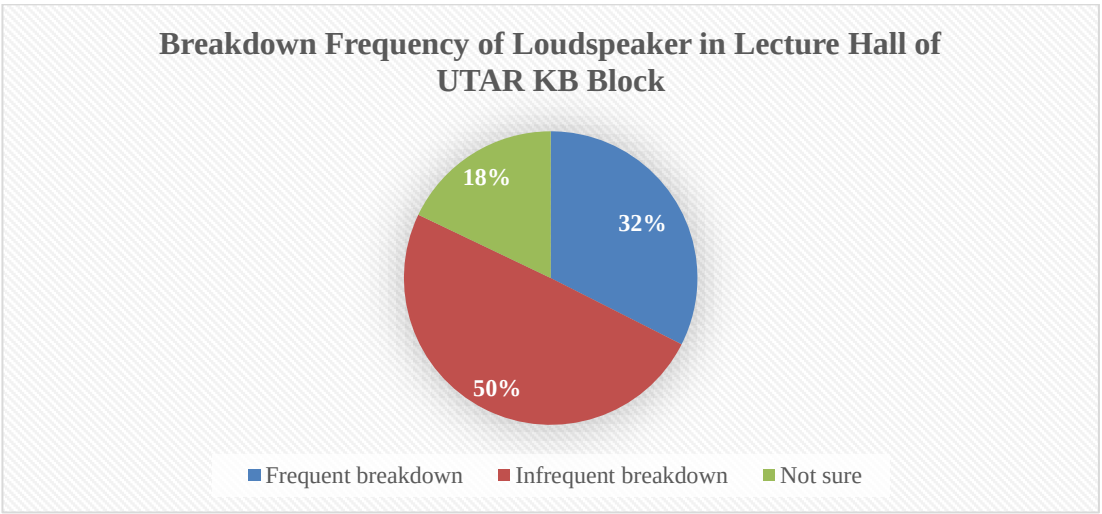


Figure 4.29: Breakdown Frequency of Loudspeaker in Lecture Hall of UTAR KB Block.

As can be seen from Figure 4.29, 50 % of the respondents claimed that there was infrequent breakdown of loudspeaker in the lecture hall. 32 % of the respondents reported that there was frequent breakdown of loudspeaker in the lecture hall. With the aid of loudspeaker, student participation, comprehension, and attractiveness could be improved (PC Werth, 2014). Lecturers may suffer vocal fatigue when they use their voices intensively for a long period of time, so loudspeaker is a necessity especially in a big lecture hall (PC Werth, 2014). Hence, the staff should do regular maintenance on the loudspeaker in the lecture hall to minimise breakdown which if happens would have negative effect on the teaching and learning process as shown in Figure 4.32. However, a DEF staff stated that they are lacked of manpower to do frequent maintenance for the audio equipment in the block. Thus it is expected that more DEF staff should be employed in the future to perform the necessary maintenance.

One of the respondents stated that the breakdown did not happen frequently but when it did, it would take months to replace or repair. Furthermore, it was time-consuming to borrow a portable speaker to continue teaching while the loudspeaker malfunctioned. Due to the breakdown, one respondent reported that he or she had to shout to deliver lecture in lecture hall for almost 2 hours until he or she lost his or her voice. Another respondent reported that the breakdown affects his or her presentation performance. Thus, notably from the survey that although most of the respondents claimed that there was infrequent breakdown of loudspeaker, the loudspeaker still has to be checked frequently because if breakdown happens, it would bring a lot of trouble to the users.

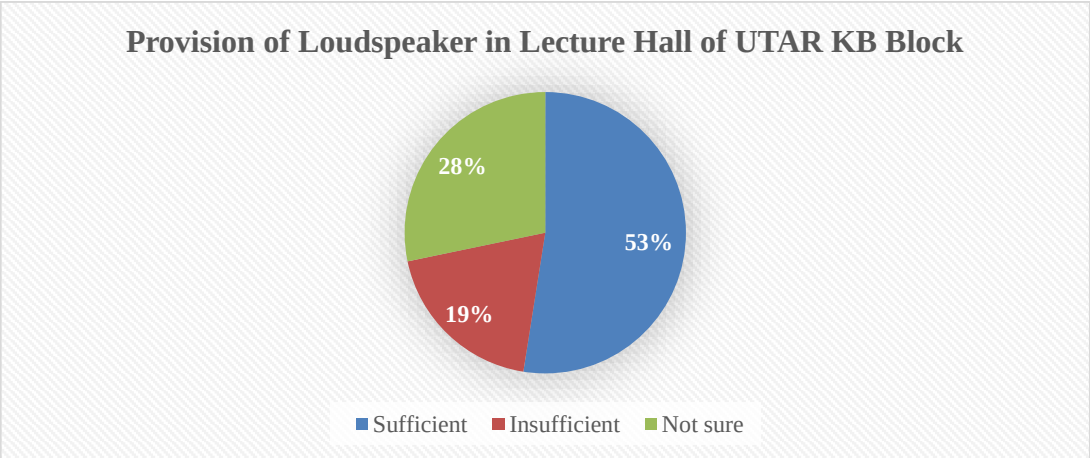


Figure 4.30: Provision of Loudspeaker in Lecture Hall of UTAR KB Block.

As is illustrated by Figure 4.30, more than half of the respondents (53 %) stated that there was sufficient loudspeaker provided in the lecture hall. From the observation of walkthrough, the lecture hall was equipped with two wall loudspeakers at left and right side of the room. During walkthrough, the sound of the lecturer was properly amplified.

Nineteen percent (19 %) of the respondents claimed that there should have more loudspeakers. It is believed that this was due to the loud background noise which disturbed the learning process. The students who sit far behind the lecture hall might not clearly receive the spoken messages from the lecturer if the background noise is loud. Adults with normal hearing would require at least +6 dB to hear spoken message clearly. For example, for students to hear at least 65 dB voice from the lecturer (which is a standard decibel required for speech delivery 1 m away from the lecturer), the maximum background noise should not more than 59 dB (65 dB – 6dB = 59 dB). Students may not able to hear the voice of lecturer if the background noise exceeds the allowed decibel (Audio Enhancement, 2009). Thus more loudspeaker might be required if the background noise is loud. Another method is to provide column loudspeakers in front of the hall which could project sound to a longer distance than using wall loudspeakers as shown in Figure 2.6 and Figure 2.7 (Audio Visual System Solutions for Education, 2015; The Institute of Sound and Communications Engineers, n.d.).

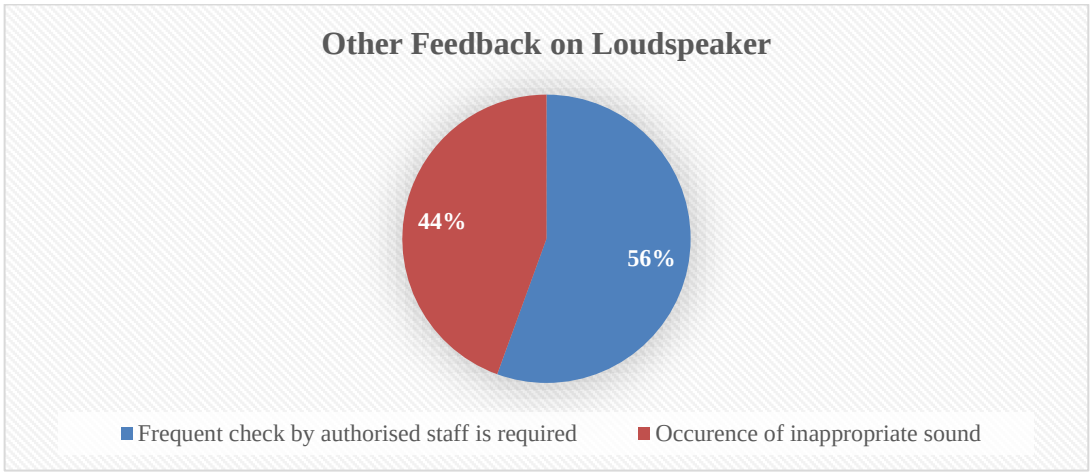


Figure 4.31: Other Feedback on Loudspeaker.

Nine (9) respondents provided feedback on loudspeaker. 56 % of them request frequent checking on the loudspeaker in lecture hall. As mentioned under Figure 4.26,

staff should check through all the sound enhancement equipment in the morning before the class starts. This is the responsibility of the authorised staff to ensure the teaching and learning process would not be interrupted by the breakdown of the system.

Responses shown that there were occurrence of inappropriate sound such as buzzing and humming from the loudspeaker or the speaker intersected sound of user and microphone. This could be prevented with few precautions. For example, the loudspeaker's cable should not run alongside with microphone's cable for more than 1 m which might lead to acoustic feedback or occurrence of inappropriate sound. The sound enhancement system should be designed properly so that the sound from both the performer and the loudspeaker should hear like they are originated from the performer, but not from the loudspeakers (Guide et al., n.d.).

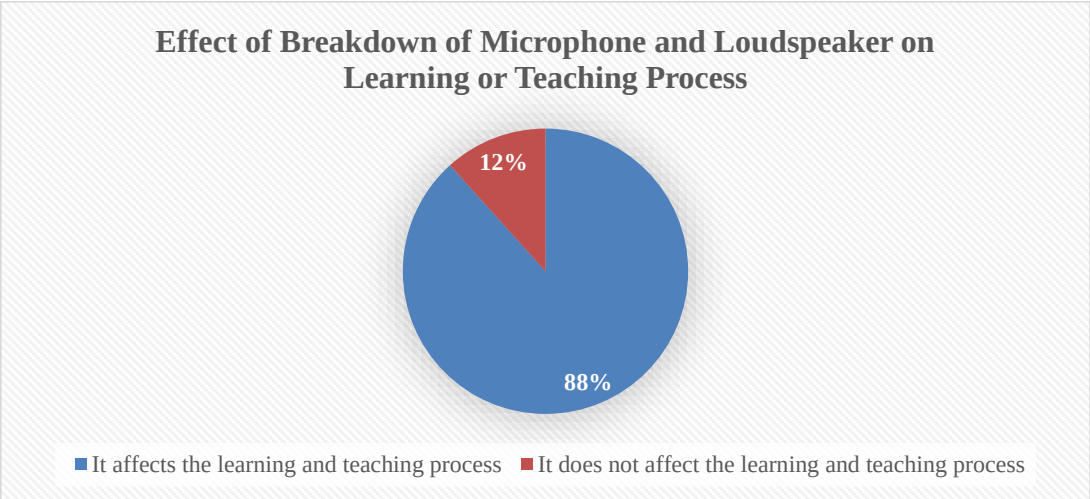


Figure 4.32: Effect of Breakdown of Microphone and Loudspeaker on Learning or Teaching Process.

Figure 4.32 indicates that majority of the respondents (88 %) agreed that the breakdown of the sound enhancement system would affects their learning and teaching process. This shows the significance of the sound enhancement system in the university. This confirms that students and lecturers agreed that audio visual aids provide great assistance for them in the learning and teaching process (Rasul, Bukhsh and Batool, 2011). These audio aids are significant in the learning process because they can help to increase student's concentration and provide motivation for students to learn (Ashaver and Igyuve, 2013). Such breakdown would significantly affects auditory learners who prefer things to be explained to them verbally and through

communication (Ericksen, K., 2016). It could be concluded that the microphone and loudspeaker are the essential components that should be provided to the occupants in university for better teaching and learning experience.

Table 4.7 summarised the POE done on loudspeaker in KB Block.

Table 4.7: Summary of Results on Loudspeaker.

Objectives Achieved	Results from Survey, Interview and Walkthrough
1 – To determine the users' perception on the performance of loudspeaker	➢ Most of the respondents were satisfied with the performance of loudspeaker in the lecture hall which might due to infrequent breakdown and sufficient provision of microphone in the lecture hall
2 – To investigate whether there is existence of design inadequacy and the root cause of breakdown (if any) to the loudspeaker	➢ Breakdown occasionally occurred in lecture hall ➢ Insufficient loudspeakers in lecture hall ➢ Occurrence of inappropriate sound from loudspeakers
3 – To establish possible improvement to the inadequacies of loudspeaker based on users' perception	➢ To have regular and frequent check on loudspeaker by the authorised staff ➢ More loudspeakers to be provided in lecture hall ➢ the loudspeaker's cable should not run alongside with microphone's cable for more than 1 m which might lead to inappropriate sound

4.2.7 Section 3B – Whiteboard

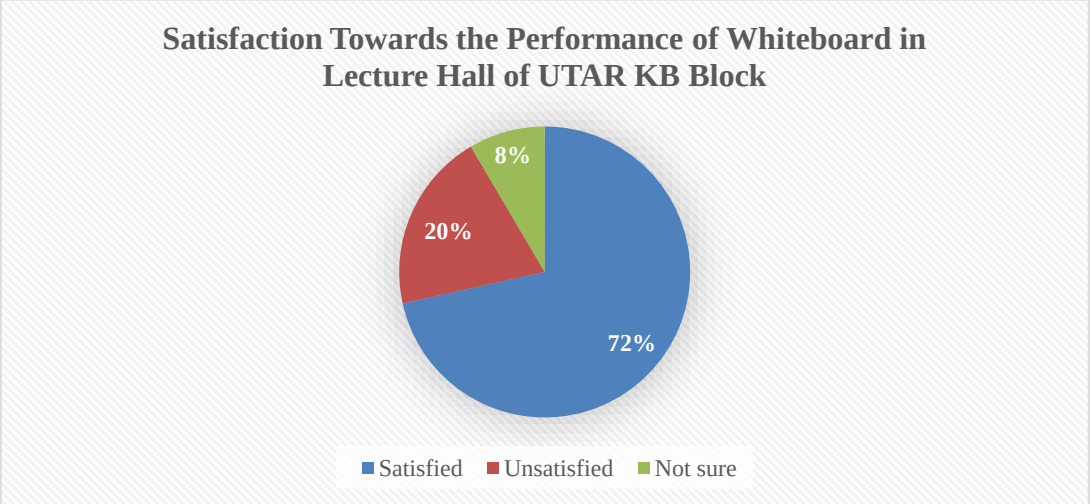


Figure 4.33: Satisfaction Towards the Performance of Whiteboard in Lecture Hall of UTAR KB Block.

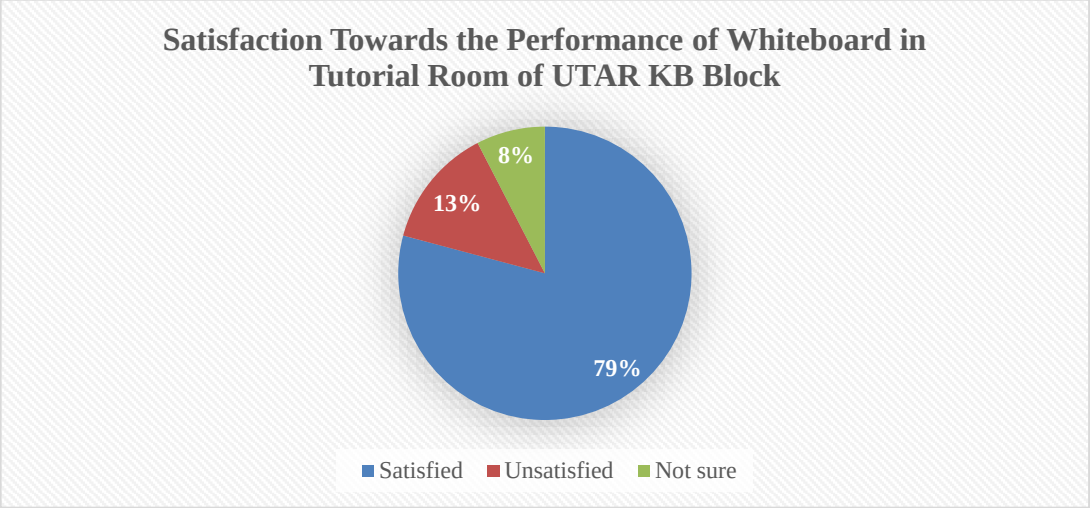


Figure 4.34: Satisfaction Towards the Performance of Whiteboard in Tutorial Room of UTAR KB Block.

As is illustrated in Figure 4.33 and Figure 4.34, 72 % and 79 % of the respondents were satisfied towards the performance of whiteboard in lecture hall and tutorial room respectively. This might be due to the sufficient provision and comfortable location and height of whiteboard in lecture hall and tutorial room as illustrated from Figure 4.35 to Figure 4.38.

Some respondents were unsatisfied towards the performance of whiteboard in lecture hall and tutorial room. The reasons of dissatisfaction were shown in Figure 4.43.

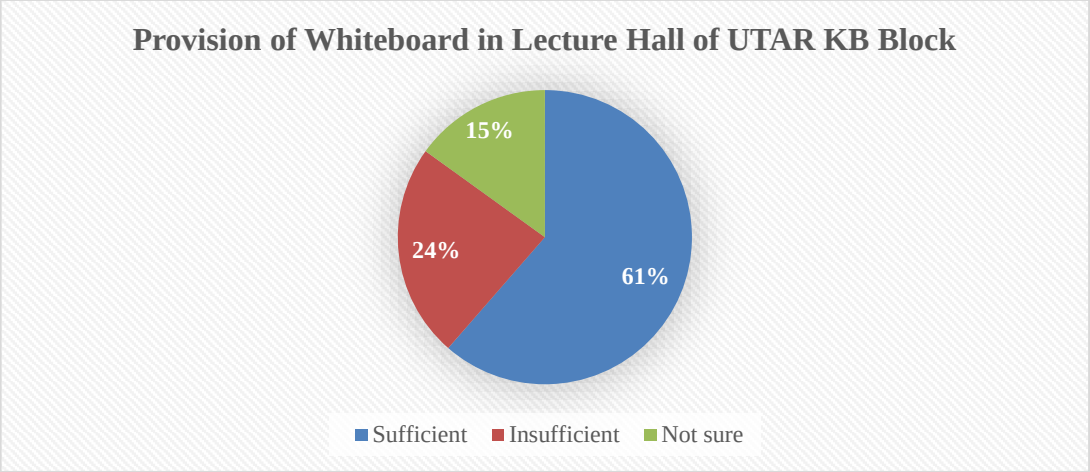


Figure 4.35: Provision of Whiteboard in Lecture Hall of UTAR KB Block.

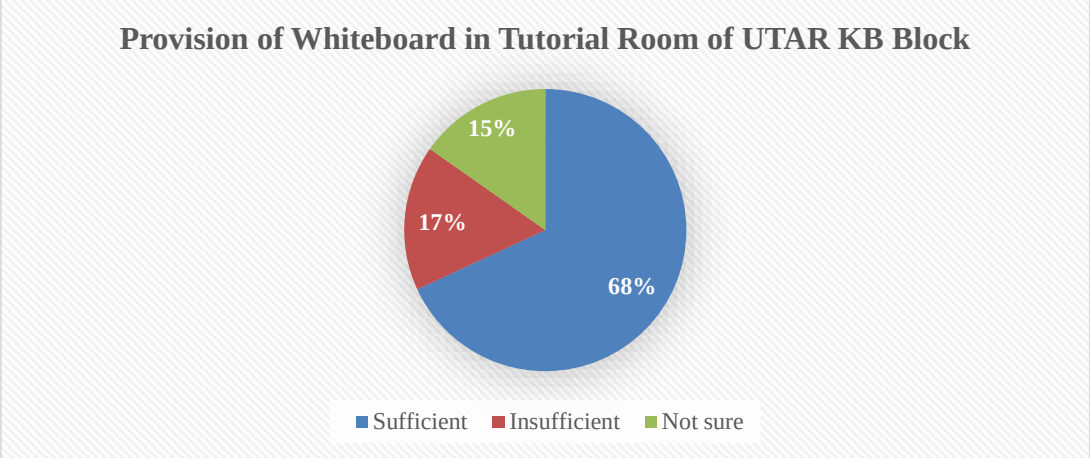


Figure 4.36: Provision of Whiteboard in Tutorial Room of UTAR KB Block.

Figure 4.35 and Figure 4.36 illustrate the findings on the performance of whiteboard provided in lecture hall and tutorial room where there were more than 60 % of the respondents claimed that there was sufficient provision of whiteboard in these venues. Based on the observation during walkthrough, the lecture hall has three fixed whiteboards, the lecture room has two while the tutorial room has only one. Some of the lecture room and tutorial room has portable whiteboard. From the figures above it is clear that the provision of whiteboard in tutorial room was more sufficient (68 %)

than in the lecture hall (61 %). It is believed that because the size of the lecture hall is bigger, thus more whiteboard should be provided.

There were 24 % and 17 % of the respondents felt that the provision of whiteboard in the lecture hall and tutorial room respectively was insufficient. This is supported by the results in Figure 4.43 that the respondents suggested to have more whiteboards especially in the tutorial room.

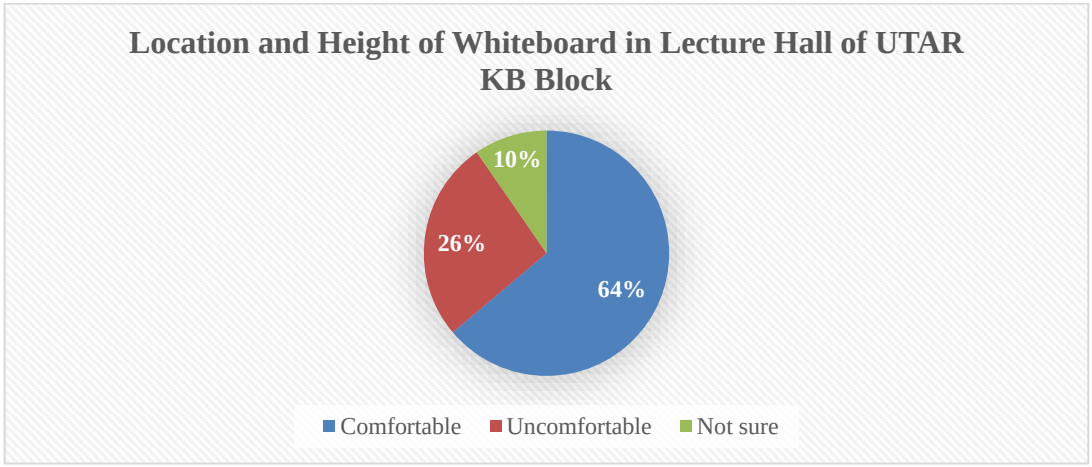


Figure 4.37: Location and Height of Whiteboard in Lecture Hall of UTAR KB Block.

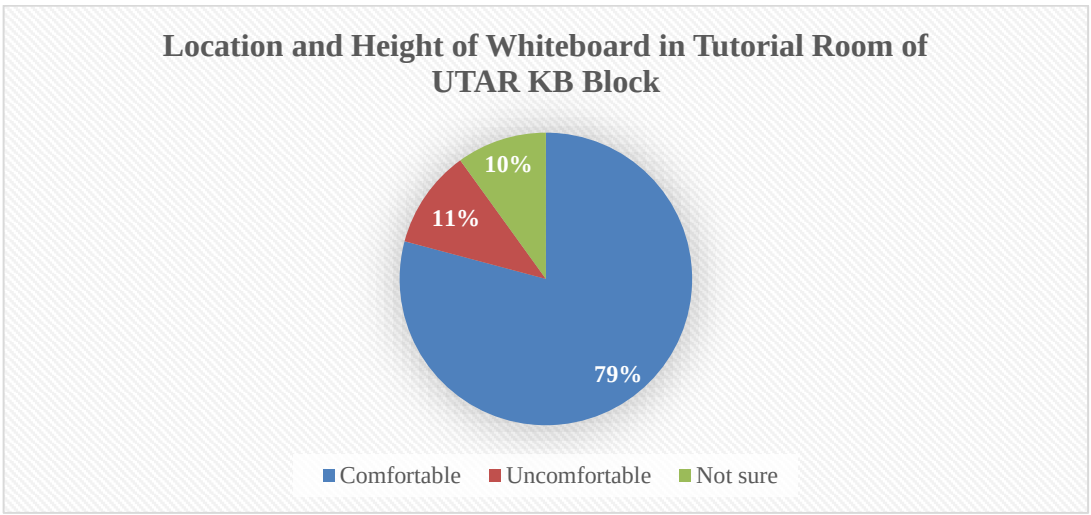


Figure 4.38: Location and Height of Whiteboard in Tutorial Room of UTAR KB Block.

Figure 4.37 and Figure 4.38 indicate that more than 60 % of the respondents were comfortable with the location and height of whiteboard in lecture hall and tutorial

room. From the figures it is clear that more respondents (26 %) were uncomfortable with the location and height of whiteboard in lecture hall than in the tutorial room (11 %). This might be due to the bigger size of lecture hall. One of the respondents claimed that those who sit at one side of the lecture hall i.e. left side could not read the words written on the whiteboard located at the other side of the lecture hall i.e. right side. On the other hand, tutorial room is smaller thus it is less likely that the respondents felt uncomfortable with the location and height of whiteboard.

According to U.S. Department of Defense (2012), if whiteboard is mounted in a low position, those sitting far behind the room may face difficulty in reading the words on the whiteboard while tall people have to bend their body to write on the board. Based on the observation during walkthrough, the whiteboard in KB517 is mounted at a height of 915 mm above floor level while the top of the whiteboard is around 2100 mm from the floor level[2]. This complied with the U.S. Department of Defense (2012) that the whiteboard should be mounted 915 mm above floor level and the top of the whiteboard is maximum 2100 mm from the floor level, for user's height ranged above 1.60 m. This concur the satisfaction of most of the respondents towards the height and location of the whiteboard.

The respondents were asked which type of writing board they would prefer. In overall, most of the respondents (53 %) preferred interactive board than whiteboard (45 %) and chalkboard (2 %) as shown in Figure 4.39. Figure 4.40, Figure 4.41 and Figure 4.42 show the preferred type of writing board according to respondent's identity.

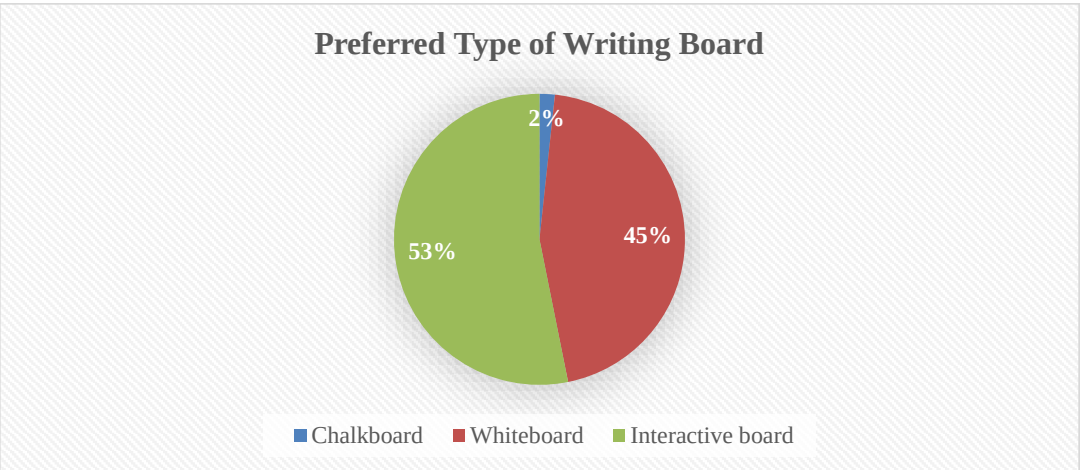


Figure 4.39: Preferred Type of Writing Board by the Respondents.

[2] Refer to Figure 5.22.

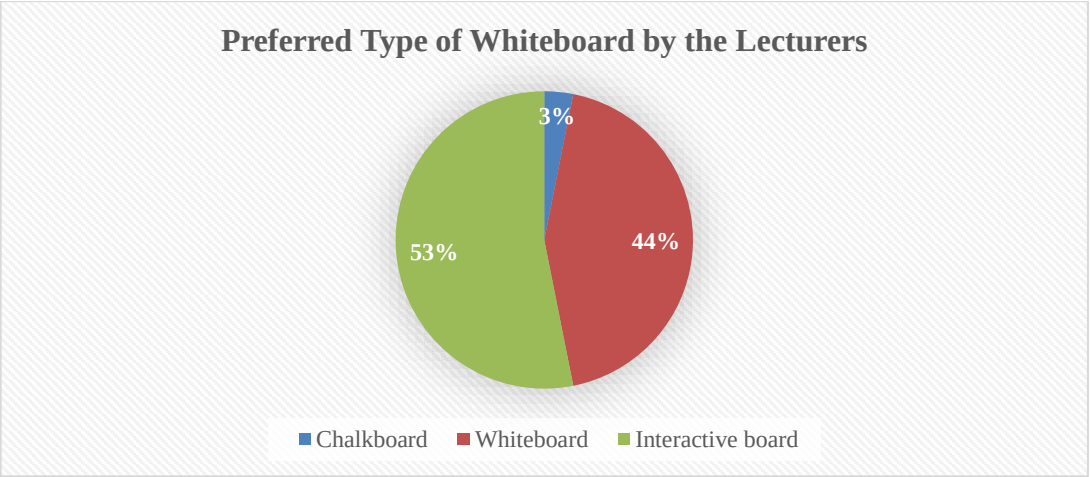


Figure 4.40: Preferred Type of Writing Board by the Lecturers.

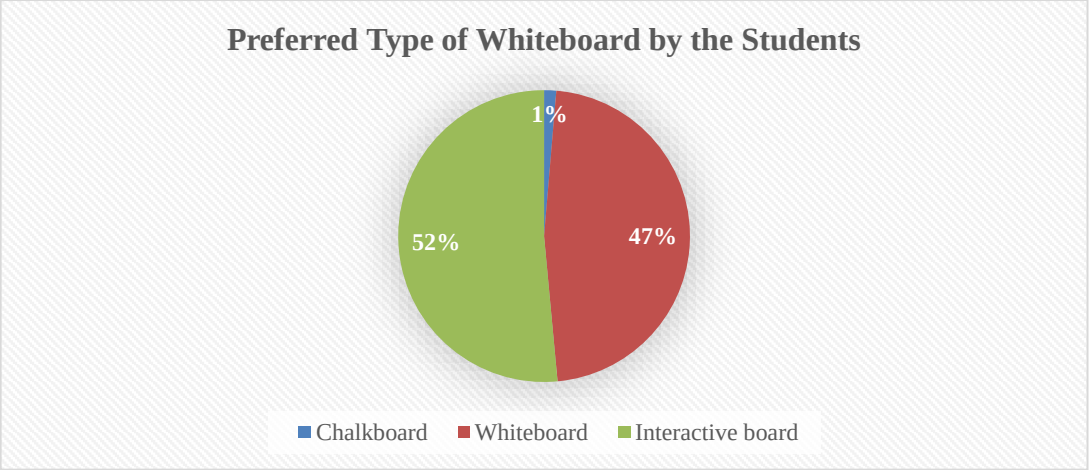


Figure 4.41: Preferred Type of Writing Board by the Students.

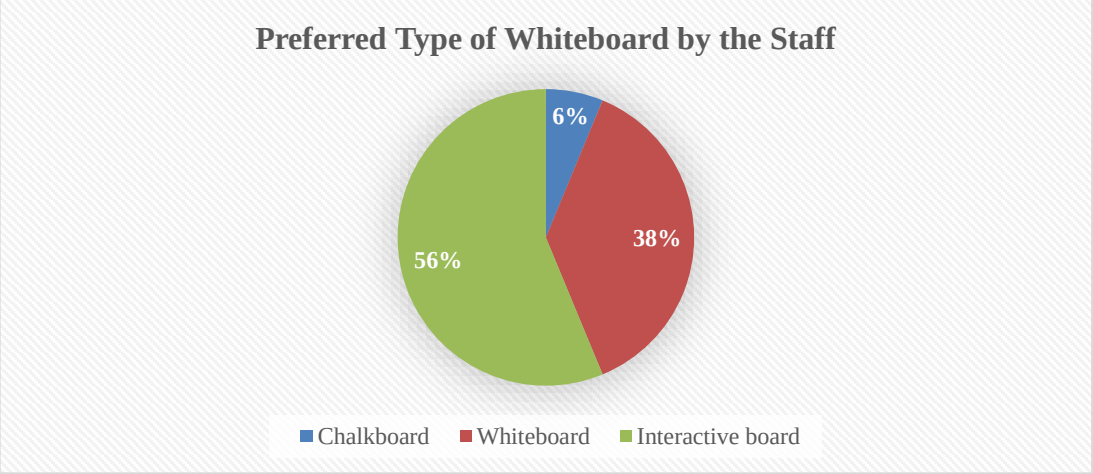


Figure 4.42: Preferred Type of Writing Board by the Staff.

As can be seen from the figures above, regardless of the respondent's identity, interactive board is the most popular choice. Chalkboard is unpopular due to its disadvantages shown in Table 2.9. Interviewee 2 claimed that chalkboard is dusty thus he preferred to use whiteboard. Interactive board has several advantages as shown in Table 2.9: Types of Writing Board Available as Visual Aids in Teaching and Learning. Interactive board has a touch screen, it could be wirelessly connect with other devices, it could promote effective communication among students by improving student engagement, it saves inks of marker pen and chalks and et cetera (ScreenBeam Touch 90 - Miracast interactive whiteboard, 2016). User can scroll, zoom, copy, write, drag and click on the whiteboard, like using a touch screen computer (En.cybernetyx.com, n.d.).

However, the disadvantages of interactive board i.e. its high initial and maintenance cost have to be taken into consideration. One has to weight the pros and cons of each choice and if the cons are acceptable, the choice could be adopted and vice versa.

Nevertheless, 38 % of the respondents' preferred type of board is whiteboard due to its advantages in Table 2.9. All of the boards provided in the block is whiteboard.

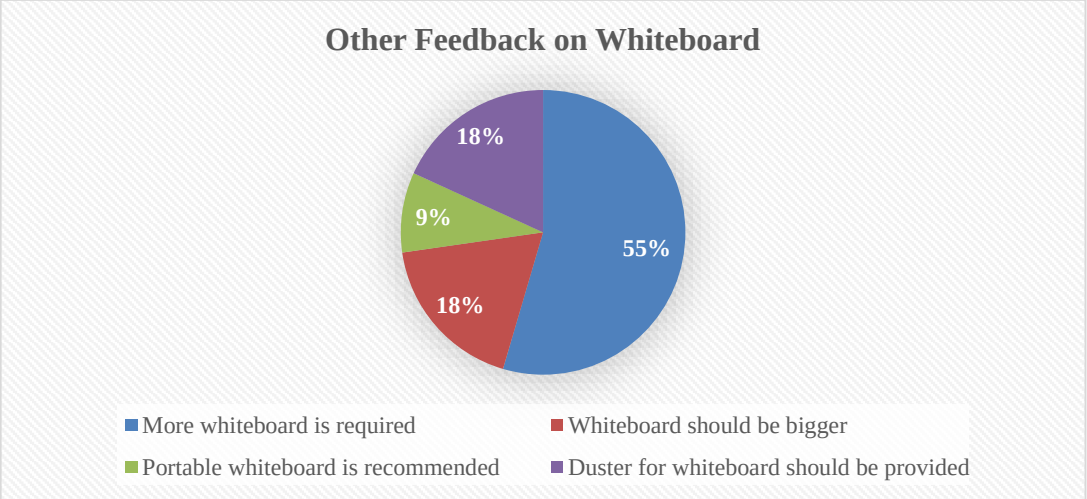


Figure 4.43: Other Feedback on Whiteboard.

A total of eleven (11) respondents provided extra feedback on whiteboard in this block. As is shown in Figure 4.43, more than half of the respondents (55 %) claimed that more whiteboard is required, especially in the tutorial room. It was suggested to have at least two whiteboards in each tutorial room. The respondent also

claimed that some rooms are without whiteboard. Two of the respondents (18 %) reported that the whiteboard should be bigger. Besides, portable whiteboard could be provided instead of the fix type. This is because the portable whiteboard could be moved around and it could be adjusted and located at a place that ease the students to read the written words on the whiteboard. For example, students who sit at left side of the room could read the whiteboard if the whiteboard is tilted to a certain degree facing more to the left side of the room. Lastly, duster to erase the marker ink on whiteboard should be provided to ease the occupants in using the whiteboard. Interviewee 2 reported that the whiteboard on the wall was blocked by the projection screen if the screen was pulled down to function. This would affect the teaching process. Thus, future design of classroom should take into consideration the location and height of whiteboard.

Figure 4.8 below summarised the POE on whiteboard in KB Block.

Table 4.8: Summary of Results on Whiteboard.

Objectives Achieved	Results from Survey, Interview and Walkthrough
1 – To determine the users' perception on the performance of whiteboard	➢ Majority of the respondents were satisfied with the whiteboard in lecture hall and tutorial room which might be due to sufficient provision and comfortable location and height of whiteboard in the lecture hall and tutorial room
2 – To investigate whether there is existence of design inadequacy to the whiteboard	➢ Inadequate provision of whiteboard especially in tutorial room ➢ Inappropriate location and height of whiteboard i.e. occupants who sit on one side of a lecture hall was unable to read the words on the whiteboard located on another side of the lecture hall ➢ Interactive board is more preferred by most of the respondents than whiteboard ➢ Whiteboard should be bigger ➢ Non-provision of duster for the users

Table 4.8 (Continued)

Objectives Achieved	Results from Survey, Interview and Walkthrough
	➢ The whiteboard was blocked by the projection screen if the screen was pulled down to function
3 – To establish possible improvement to the inadequacies of whiteboard based on users' perception	➢ To have at least 2 whiteboards in the tutorial room ➢ Bigger whiteboard to be provided ➢ Portable whiteboard could be provided ➢ Duster of whiteboard should be provided ➢ Future design of classroom should take into consideration the location and height of whiteboard

4.2.8 Section 3B – Projector and Projection Screen

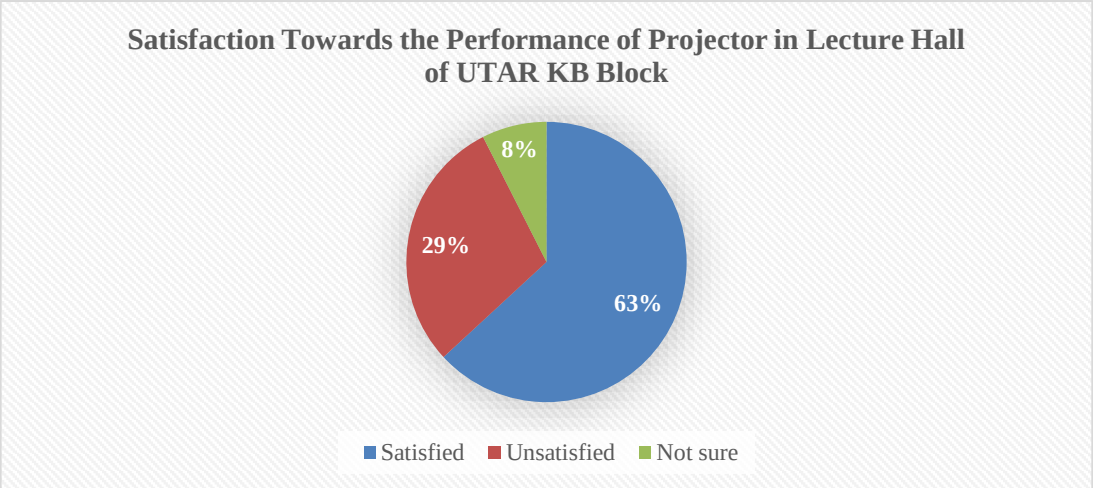


Figure 4.44: Satisfaction Towards the Performance of Projector in Lecture Hall of UTAR KB Block.

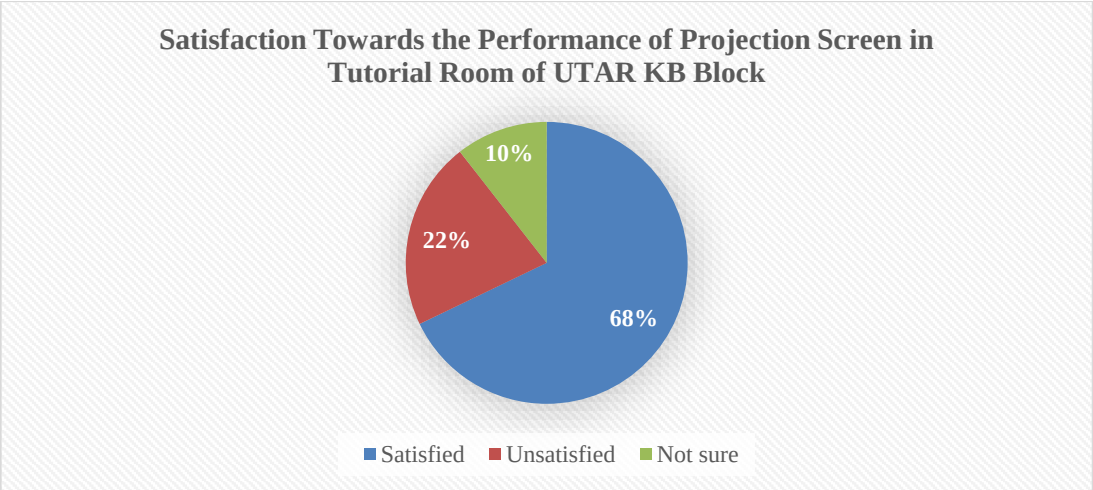


Figure 4.45: Satisfaction Towards the Performance of Projector and Projection Screen in Tutorial Room of UTAR KB Block.

Figure 4.44 and Figure 4.45 illustrates that more than 60 % of the respondents were satisfied towards the performance of projector and projection screen in lecture hall and tutorial room. This might be due to the infrequent breakdown, sufficient provision, comfortable location and height of the projector and projection screen in lecture hall and tutorial room as shown from Figure 4.46 to Figure 4.51.

More than 20 % of the respondents were unsatisfied towards the performance of projector and projection screen in lecture hall and tutorial room. Interviewee 2 informed that the projector provided in the university is of poor quality and outdated. The reasons of dissatisfaction by the respondents were shown in Figure 4.52.

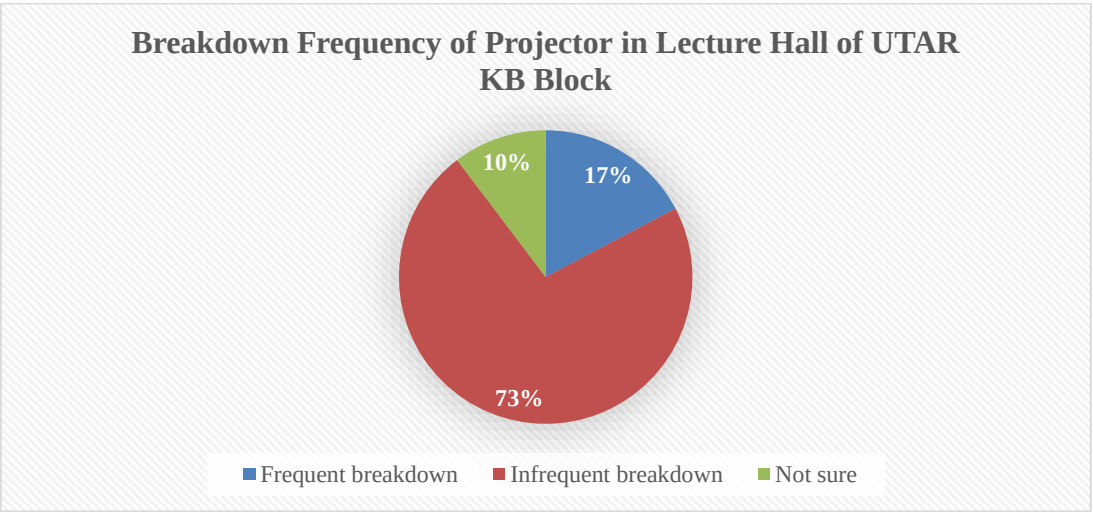


Figure 4.46: Breakdown Frequency of Projector in Lecture Hall of UTAR KB Block.

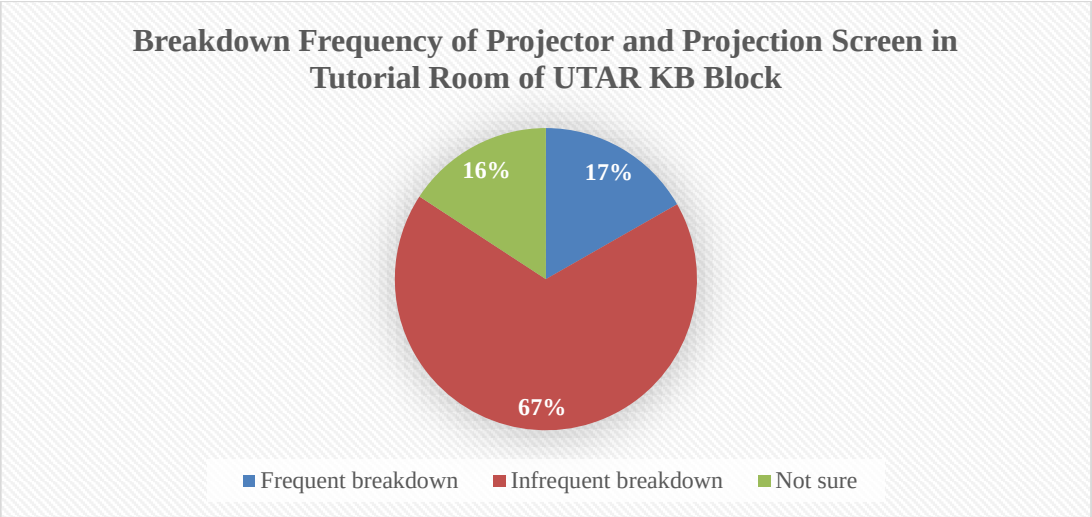


Figure 4.47: Breakdown Frequency of Projector and Projection Screen in Tutorial Room of UTAR KB Block.

From Figure 4.46 and Figure 4.47 it is clear that 73 % and 67 % of the respondents claimed that there was infrequent breakdown of projector and projection screen in lecture hall and tutorial room respectively. Breakdown of projector and projection screen might interfered students' learning process especially for visual learners who like to get exposed to pictures, charts or graphic as the (Ericksen, K., 2016).

However, there was still 10 % and 16 % of the respondents reported that there was frequent breakdown of projector and projection screen in lecture hall and tutorial room respectively. There was more breakdown in the tutorial room than in the lecture hall. As shown in Figure 4.52, the authorised staff should do frequent checking and maintenance on projector and projection screen to minimise breakdown.

A staff from ITISC in UTAR stated that preventive maintenance would be done once every two weeks. Common checking on the projector settings i.e. brightness, saturation, sharpness and et cetera, brightness of the projector bulb and cleaning on the inner components of projector are some of the checklist during maintenance. Compared to audio equipment, projector and projection screen have more frequent maintenance. Thus, the percentage of respondents to report frequent breakdown of projector and projection screen was lesser compared to microphone and loudspeaker (refer to Figure 4.19 and Figure 4.29). According to another ITISC staff, one of the common problems of the projector is the breakdown of inner components of projector. In addition, the bulb of projector may lose power over time and affect the brightness

of the projected image. According to Think Outside The Slide (n.d.), bulb of projector should be replaced once the brightness rating of the projector drops below 800 lumens. The ITISC staff stated that there is infrequent breakdown of projector and projection screen, which concur the result obtained from the survey.

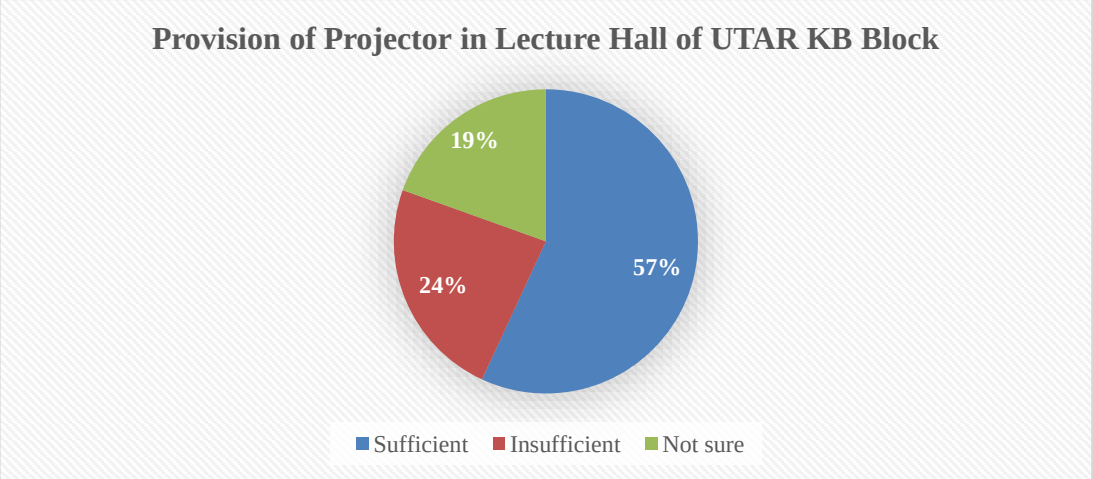


Figure 4.48: Provision of Projector in Lecture Hall of UTAR KB Block.

It can be seen from Figure 4.48 that most of the respondents (57 %) claimed that the provision of projector in lecture hall was sufficient. Based on the observation during walkthrough, the lecture hall consisted of one projector which projects image on the upper centre of front white wall and the building surveyor mentioned that one projector is sufficient. However, according to University Committee of Instructional Facilities (2007), a minimum of two projectors or projection screens should be installed in a lecture hall. This is to increase readability as the students would have to rotate their neck to see the projected image in the middle of the room if only one projector and/or projection screen is provided. They may face severe neck stress once their necks turn more than 35°. Thus, to achieve ergonomics, two projector should be installed in the lecture hall. Besides, the lecture hall is not provided with projection screen as shown in Figure 4.52 below.

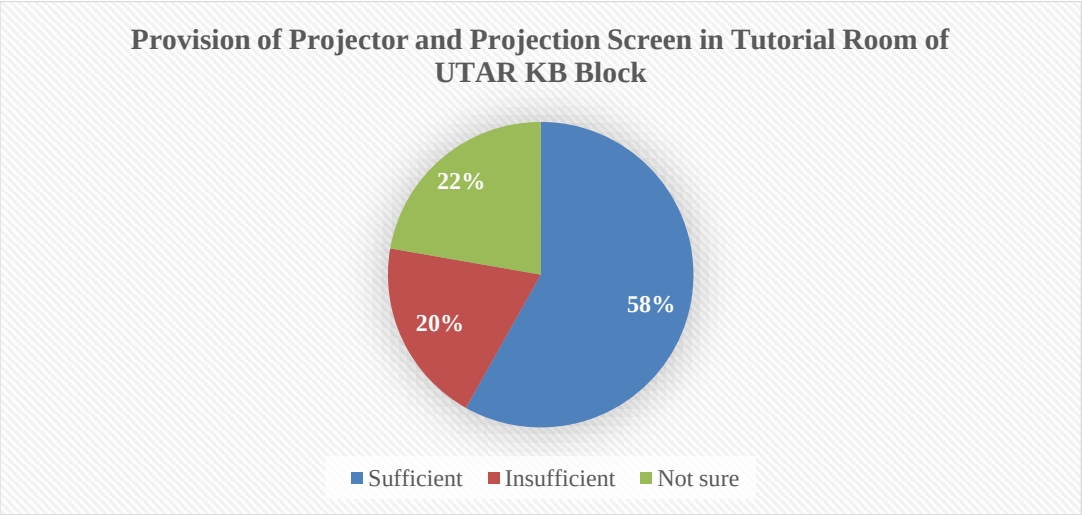


Figure 4.49: Provision of Projector and Projection Screen in Tutorial Room of UTAR KB Block.

The result of Figure 4.49 indicates that majority of the respondents (58 %) reported that the projector and projection screen provided in the tutorial was sufficient. Based on the observation during walkthrough, each tutorial room consists of one projector and projection screen. 20 % of the respondents claimed that there was insufficient projector and projection screen in the tutorial room. This might due to the unsuitable location of projector and projection screen in the tutorial room. Based on the observation during walkthrough, one of the tutorial room, KB517 was provided with a projector and projection screen. However, the projection screen was located at the left side of the room. Thus, students who sit at the right side of the room, especially in the front row may not able to see the projected image clearly. In this case, two projector and projection screen should be provided. However, the room left no space to install another projection screen, according to the building surveyor. Hence, the design of a room should take into consideration of the location of visual equipment to be installed in the future.

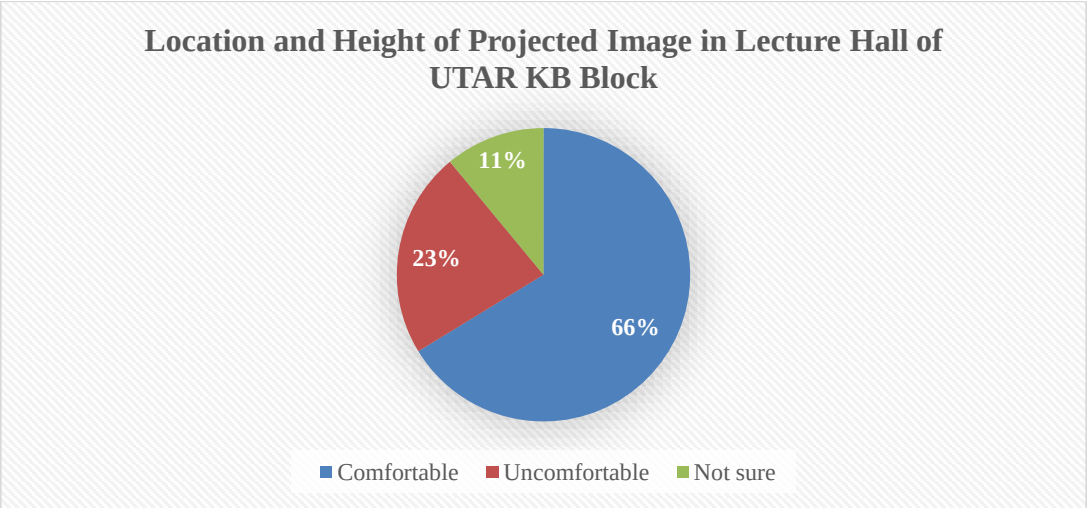


Figure 4.50: Location and Height of Projected Image in Lecture Hall of UTAR KB Block.

As can be seen from Figure 4.50, majority of the respondents (66 %) were comfortable with the location and height of projected image in lecture room. This means that majority of the seating in lecture hall is covered by the viewing cone as shown in Figure 2.12 and the vertical angle for student sitting in front to the top of projected image is within 25° from the horizontal floor level at student viewing height as portrayed in Figure 2.13. Based on the observation during walkthrough, the image would be projected in the lecture hall was located in the upper centre of the front wall.

Twenty three (23 %) of the respondents were uncomfortable with the location and height of the projected image in lecture hall. As mentioned above, there was only one projector in the hall thus for students who sit in the front row near to the left and right wall in the lecture hall, rotating their eyes are not sufficient but they have to rotate their neck in order to read the content of the projected image which was located in the middle. Hence, they may face neck stress during or after the class. In addition, the image projected from the projector partly fell onto the whiteboard instead of the white wall, especially at lecture hall at the 1st floor, a respondents reported. This caused distortion on the projected image. Thus the location of projector should be adjusted to allow the projected image to fall on white wall. Furthermore, a respondent claimed that the projected image sometimes was blocked by the portable whiteboard. The portable whiteboard should be located at a place without blocking the projected image from the projector.

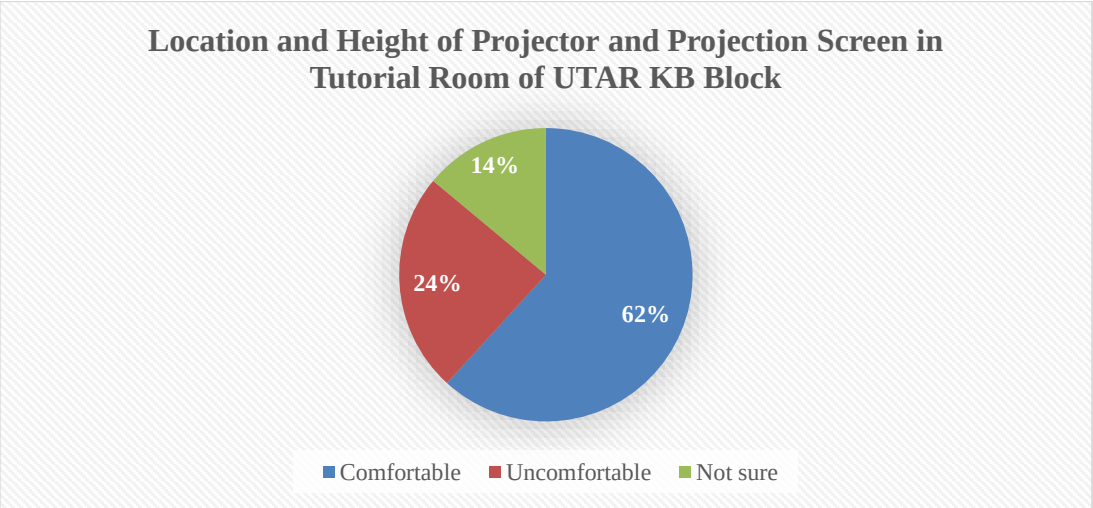


Figure 4.51: Location and Height of Projection Screen in Tutorial Room of UTAR KB Block.

Figure 4.51 has similar result as compared to Figure 4.50, most of the respondents (62 %) were comfortable with the location and height of projection screen in tutorial room.

Some respondents (24 %) were uncomfortable with the location and height of projection screen in tutorial room. Based on the observation during walkthrough, the projection screen in a tutorial room, KB517 was located at the top left corner of a wall as shown in Figure 5.19 at appendix. From the building surveyor point of view, this is not a good location for the projection screen because the students who sit in at the right side of the room especially those sitting at front row could hardly read the content shown at the projection screen. One of the suggestion from a respondent was to locate the screen in the middle of the class. Besides, one of the respondents reported that the screen in the tutorial room is too high, it should be placed at a height where the students would not require to look up to the screen with an angle exceeding 25° from the horizontal floor level at student viewing height as shown in Figure 2.13 and Figure 2.14 (Gardiner, 2015; TU Delft, 2014).

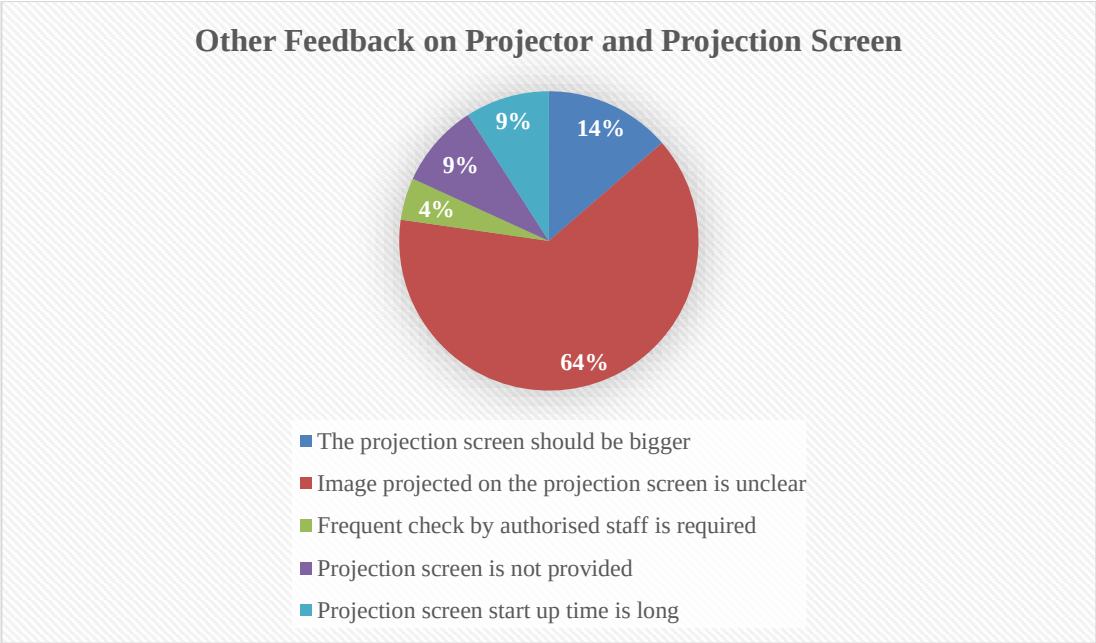


Figure 4.52: Other Feedback on Projector and Projection Screen.

Twenty two (22) respondents provided some feedback on the projector and projection screen in KB Block. One of the feedbacks is the image projected on the projection screen is unclear. This might be due to the low brightness of the projector bulb. The bulb of the projector gradually lose power over time, causing the brightness to decreases as time goes by. The projected image would become unclear, dim and hard to see (Think Outside The Slide, n.d.). The authorised staff should check how many hours the bulb was been used and if it is over half of the rated lift, most likely the problem would be on the projector (Think Outside The Slide, n.d.). Replacement of bulb or projector would have to be done.

Fourteen percent (14 %) of the respondents suggested to have a bigger projection screen. This is because a bigger projection screen could provide a larger viewing cone to cover more seating in the room, so that the students could read the projected material easily.

Some of the respondents (9 %) claimed that projection screen was not provided in lecture hall. Based on the observation from walkthrough and a reminder from the ITISC staff, there is no provision of projection screen in the lecture hall. The image is projected from the projector directly onto the white wall. This could save the cost of projection screen. However, projection screen has optical coatings that enhance the properties of the image such as the highlight, contrast and colour saturation. Besides,

the black frame around the sides of the screen could boost the visual quality of the image (Powell, 2003). Thus, projection screen should be provided in the lecture hall.

Table 4.9 shows the summary of POE on projector and projection screen in KB Block.

Table 4.9: Summary of Results on Projector and Projection Screen.

Objectives Achieved	Results from Survey, Interview and Walkthrough
1 – To determine the users' perception on the performance of projector and projection screen	➢ Most of the respondents were satisfied with the performance of projector and/or projection screen in the lecture hall and tutorial room which might due to infrequent breakdown, sufficient provision and comfortable location and height of projection screen in the lecture hall and tutorial room
2 – To investigate whether there is existence of design inadequacy and the root cause of breakdown (if any) to the projector and projection screen	➢ The projector is of poor quality and outdated ➢ Breakdown of projector and projection screen especially in tutorial room i.e. breakdown of components of projector ➢ Insufficient projector and projection screen in lecture hall ➢ Inappropriate location of projection screen in some tutorial rooms ➢ Image projected from the projector fell onto the white wall instead of the screen in lecture hall ➢ Projected image sometimes were blocked by the portable whiteboard ➢ Image projected on the projection screen is unclear due to decrease in brightness of projector due to power loss of bulb in projector ➢ Projection screen is small ➢ Non-provision of projection screen in lecture hall

Table 4.9 (Continued)

Objectives Achieved	Results from Survey, Interview and Walkthrough
3 – To establish possible improvement to the inadequacies of projector and projection screen based on users' perception	➢ Better quality of projector to be provided ➢ To have frequent check on projection screen by the authorised staff ➢ To have at least 2 projector and projection screen in the lecture hall ➢ The design of a room should take into consideration of the location of visual equipment to be installed ➢ Change the location of screen or fix the angle of projector in lecture hall so that the image projected on the white wall ➢ The portable whiteboard should be located at a place without blocking the projected image from the projector ➢ To replace projector with low brightness or replace the bulb of the projector. The authorised staff should check the lift span of the bulb of projector occasionally ➢ Bigger projection screen should be provided ➢ Projection screen to be provided in the lecture hall.

4.2.9 Section 3C – Informal Learning Spaces

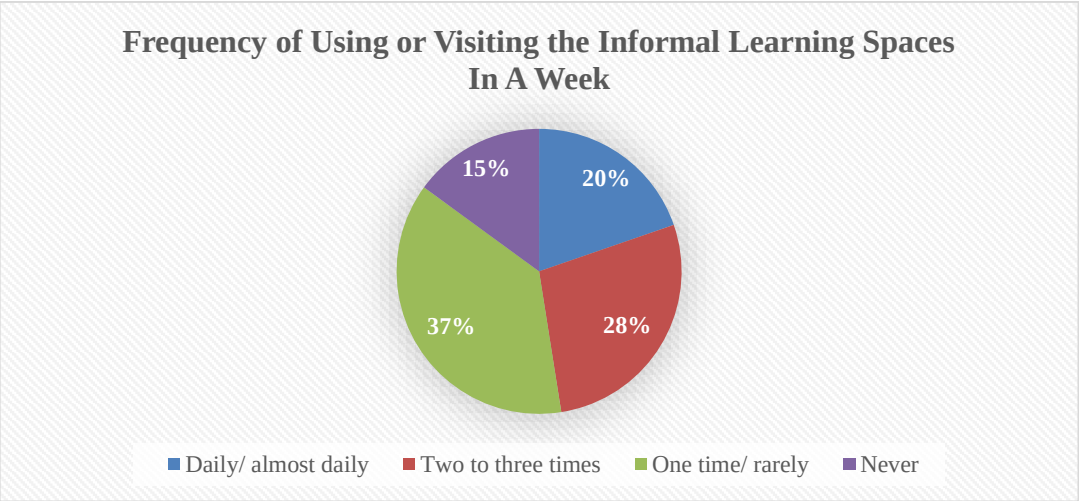


Figure 4.53: Frequency of Using or Visiting the Informal Learning Spaces

Figure 4.53 shows that most of the respondents (85 %) would use or visit the ILS in the block at least once in a week. Around half of the respondents frequently visit the ILS. They visit the ILS because most of them (90 %) claimed that ILS is very important in their learning process as shown in Figure 4.54. This shows that ILS is significant in learning process.

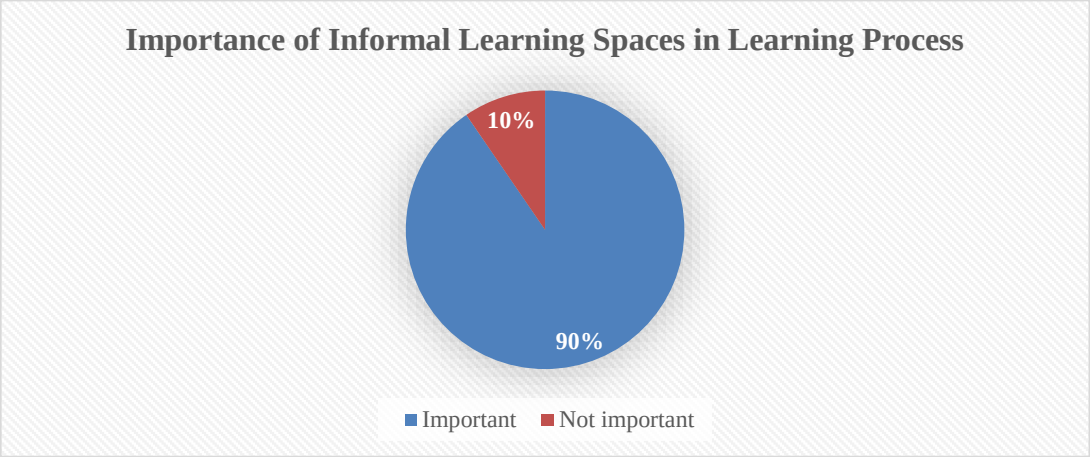


Figure 4.54: Importance of Importance of Informal Learning Spaces in Learning Process.

The respondents were asked why ILS is or is not important to them in their learning process to determine the significance of ILS in their learning process. The reasons were illustrated in Figure 4.55. A total of 296 respondents provided their feedback and majority of them (43 %) claimed that ILS is important because it allowed group discussion and activities i.e. discussing or teaching one another. Students reinforce and master their knowledge when they try to teach others (Briggs, 2013). The respondents stated that library did not allow group discussion and activities, hence they chose the ILS instead. Sometimes consultation with lecturer directly after class could be done at ILS outside the classroom. For example, ILS is a suitable place if ten to twenty students wish to meet a lecturer at a time, stated by a respondent. Besides, ILS provided opportunity to meet new friends and extra knowledge could be gained through group discussion and activities.

Furthermore, 28 % of the respondents claimed that they could focus study at ILS. The respondents claimed that the environment in the ILS encourages them to explore knowledge out of the scope of their learning materials, provides motivation for them to study as ILS are more interesting than formal learning spaces. Some of the

ILS also offers privacy and quietness for self-revision. One of the respondents claimed that he or she preferred to study at ILS than in his or her hostel because there was many disturbance in the hostel caused by his or her housemates.

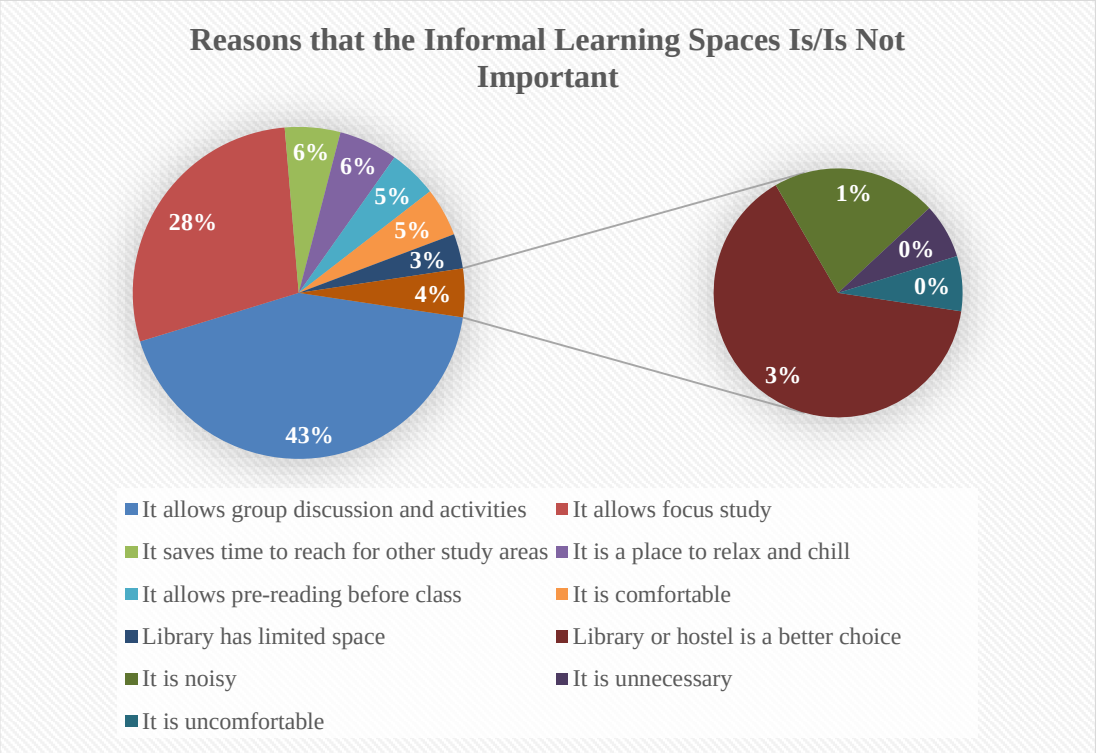


Figure 4.55: Reasons that the Informal Learning Spaces Is/Is Not Important.

As can be seen from the figure above, more group activities (43 %) and discussion would be conducted than focus study (28 %). In ILS, if there is group activities and discussion, the noise produced might not be suitable for occupants to focus on their study. Thus, the ILS should be designed to allow more group activities and discussion. On the other hand, library provided a space for the occupants who wish to focus their study in a quiet environment.

Other respondents reported that it saves time to reach for other study areas. Staying at ILS is more convenient than going to the library. Moreover, some respondents (5 %) felt that the ILS is comfortable, thus they were willing to stay there. The ILS provided a quiet atmosphere with complete facilities, the temperature is more comfortable than in the library and it is more convenient to stay at ILS instead of library as library did not allowed bags to be brought inside, supported by the respondents. Moreover, the respondents claimed that ILS provides a place to relax and

chill (6 %) and allows pre-reading before class (5 %). Some respondents (3 %) reported that that library has limited space, so they stay at ILS instead.

The reasons of importance or unimportance above provided a guideline to design the ILS. For example, more group seating arrangement could be provided as ILS mostly used for group discussion and activities. ILS should be near to the classroom to allow pre-reading before class and time-saving to reach for study areas. ILS should be comfortable for the occupants to stay, relax and chill. Provision of ILS should be sufficient as library has limited space.

Three percent (3 %) of the respondents claimed that library or hostel is a better choice than the ILS, this might be due to the ILS is uncomfortable to stay. Some respondents (1 %) claimed that ILS is not important because the ILS is noisy. This confirms that the noise produced during group discussion and activities would affects the occupants who wish to study in a quiet environment.

There are few factors affecting satisfaction of user towards the ILS in a university such as quantity of ILS provided, proximity, comfort, accessibility to resources and purpose of ILS (Riddle and Souter, 2012; Harrop and Turpin, 2013; Scannell et al., 2016). Further analysis indicated that most of the respondents (67 %) were quite satisfied towards the ILS in the block. This might be due to the ILS is near to respondents' next activity and it provides a suitable environment for group discussion and activities as illustrated in Figure 4.57 and Figure 4.58.

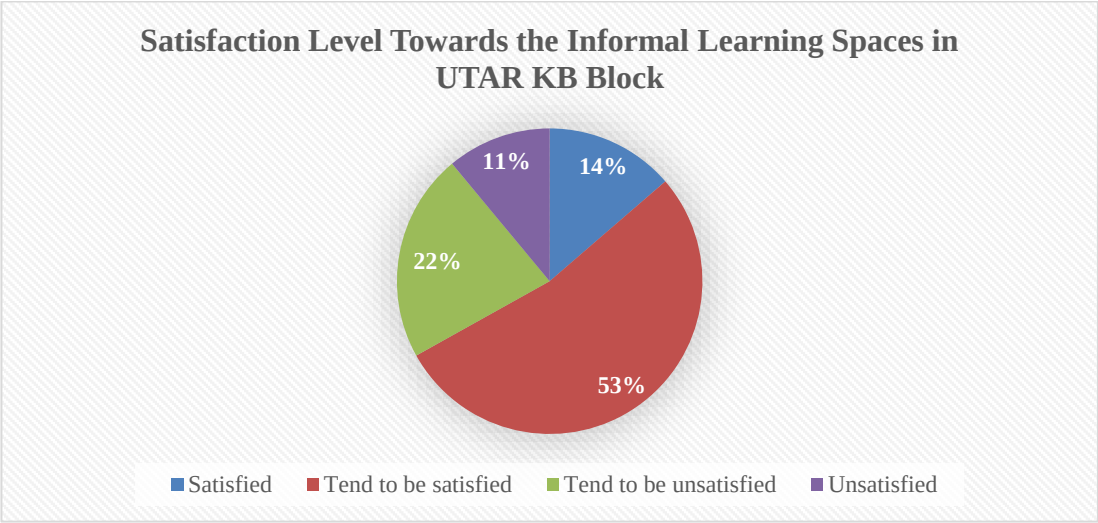


Figure 4.56: Satisfaction Level Towards the Informal Learning Spaces in UTAR KB Block.

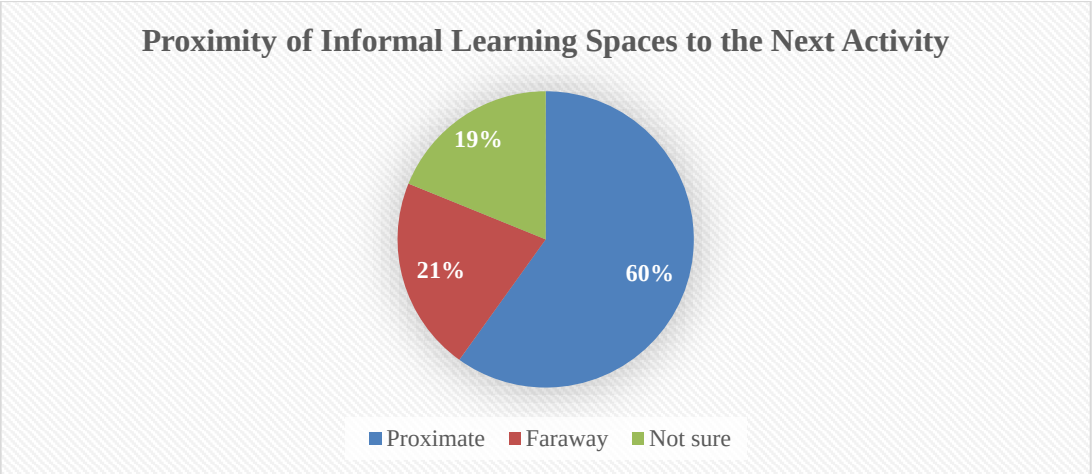


Figure 4.57: Proximity of Informal Learning Spaces to the Next Activity.

From the figure above it is clear that majority of the respondents (60 %) felt that the ILS is proximate to their next activity i.e. classroom. This was supported by the previous results that the proximate ILS provided saves time for the occupants to reach for other study areas and it allows pre-reading before class. It is convenient because occupants can use it between class interchange. Quick tasks such as completing tutorials and checking emails could be done within the interval (Harrop and Turpin, 2013). Besides, based on the walkthrough results, ILS located at 4th floor is proximate to the library and computer lab.

However, according to a staff from DEF, some occupants complained that people made noise at ILS which is near to classroom i.e. lecture hall and tutorial room. This could be supported by Figure 4.58 below where most of the ILS is noisy and open. This disturbed the teaching process inside the classroom. Hence, this is one of the reasons the tables and chairs seldom provided by the DEF at areas near to the classroom. However, this did not stop the occupants to move the chairs and tables to places near to the classroom i.e. at 2nd and 3rd floor.

To solve this problem, a warning chart requesting the ILS users to stay quiet may be pasted at the wall around ILS proximate to the classroom. One of the ways to create this awareness is to inform the new comers during orientation programme. Besides, emails could be sent to the occupants to use the ILS in a good manner, without disturbing the others in the classroom.

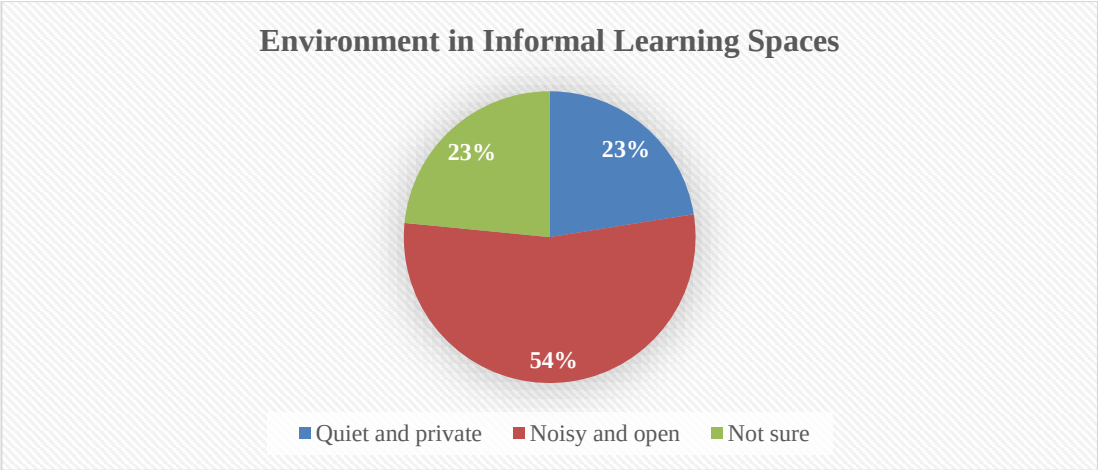


Figure 4.58: Environment in Informal Learning Spaces.

Figure 4.58 illustrated that 54 % of the respondents claimed that the ILS is noisy and open. This confirms that most of the ILS are more suitable to be used for group discussion and activity than focus study. As the spaces in library is limited and group discussion and activities are not allowed in library, another choice for the occupants is ILS. Thus, majority the ILS should have group seating arrangement i.e. a bigger table with four or more chairs to allow group discussion and activity. 23 % of the respondents stated that ILS is quiet and private. Based on observation during walkthrough, ILS at 8th floor with mostly individual seating arrangement was quiet, as the occupants usually used that area for focus study. At 5th floor, the ILS was provided with partitions thus occupants would feel private at that area.

There is room to improve ILS since one out of three persons provided negative feedback towards the ILS. Further analysis showed that respondents were unsatisfied on the provision of ILS, comfort of ILS and accessibility of ILS to resources as illustrated from Figure 4.59 to Figure 4.63.

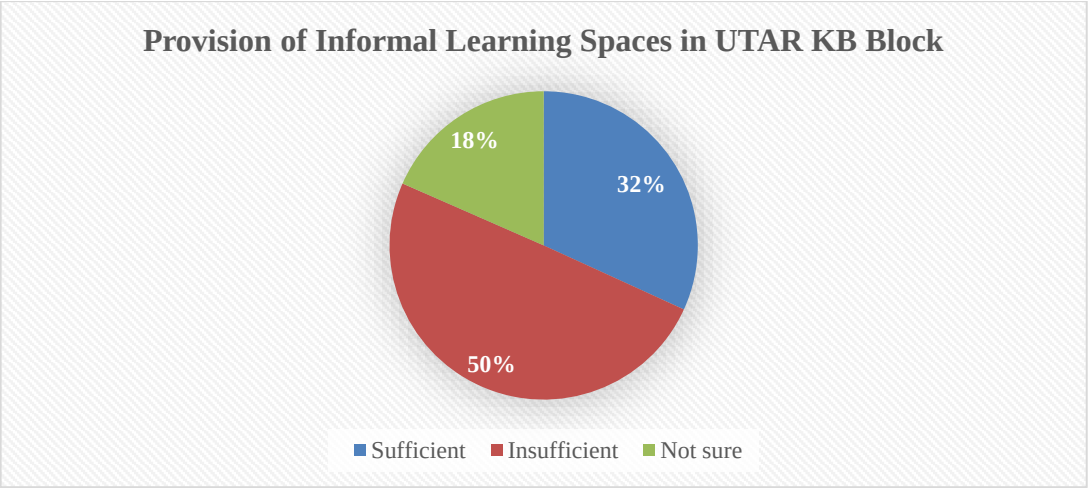


Figure 4.59: Provision of Informal Learning Spaces in UTAR KB Block.

As can be seen from the figure above, half of the respondents reported that the ILS provided is insufficient. Students get frustrated when there is lack of ILS available in their university (Riddle and Souter, 2012). When there is limited ILS available in the university, the chances for students to learn informally decrease. This might restricted them to gain extra knowledge through self-study or limited ideas sharing among their friends. Interviewee 1 reported that occupants sit on the floors because no chair is provided. During walkthrough at the staircase area, it was noticed that some students sit in a group at staircase landing for group study. This shows how serious the problem of lacking of ILS in the block.

Due to the lack of ILS around the campus, a DEF staff reported that some occupants tried to move the tables and chairs originally inside the classroom to the concourse areas. Problem arose when the occupants failed to return the tables and chairs back into the classroom. DEF tried to solve the problem by providing more tables and chairs at the concourse areas i.e. at 3rd floor and 5th floor. However, another problem occurred when the exam period approached. During exam period, occupants who stay at the ILS at concourse area may make noise and disturb the students who are performing in the exam. This concur the findings above that the environment at ILS is noisy. The tables and chairs at the concourse area would be collected and stored at somewhere else during exam period but some occupants would still move the tables and chairs back to the concourse area and stay there during the exam period.

Due to the disturbance caused by occupants who stay at the ILS, ILS would not be increased by the DEF at the lower floors where teaching process occurred

frequently i.e. from 1st floor to 5th floor. 6th floor would be used for students' activities i.e. dancing after office hour and the loose furniture may block their way. 7th floor usually occupied by FCI students. Based on the observation during walkthrough, there is spaces at 8th floor but sometimes events would be organised thus ILS is not suitable to be provided there. DEF is taking action to increase the provision of ILS at 9th floor concourse area, because that area is suitable to be converted to ILS. As most of the administrative offices and president's office were located at 10th floor and they should not be disturbed, ILS would not be provided at 10th floor. Hence, 9th floor is currently the best area to be converted into ILS to increase the provision of ILS to the occupants.

However, Figure 4.1 shows that majority of the respondents (46 %) wished to have more ILS at the lower floors i.e. ground to 3rd floor. This might be due to most of the occupants commonly study or work on these floors. Thus, there is higher demand of ILS at these floors. Nevertheless, as mentioned by the DEF staff, 9th floor is currently the best area to be converted into ILS instead of the lower floors due to the disturbance caused by the ILS users to the teaching process in the classroom located at the lower floors. Unless the ILS users could remain silent at the ILS to avoid disturbance to the teaching process in the classroom, provision of ILS at the lower floors is still possible. As suggested above, a warning chart requesting the ILS users to stay quiet may be pasted at the wall around ILS proximate to the classroom.

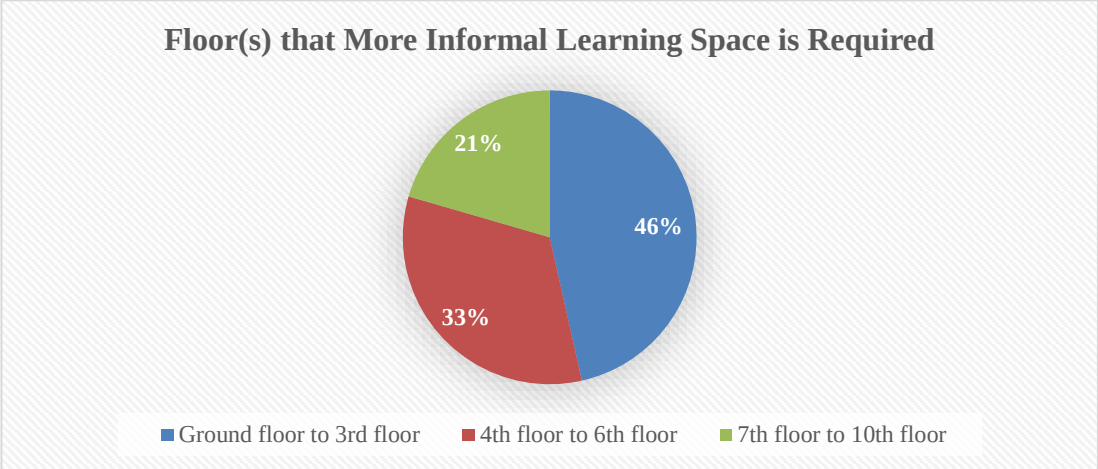


Figure 4.60: Floor(s) that More Informal Learning Space is Required.

Other than provision, the comfort level of ILS should be taken into consideration. Interviewee 1 suggested to have simple sitting or wood around the campus to allow occupants to sit. Other than provision, maintenance on the furniture

is required as based on the observation by the author, some tables and chairs are broken i.e. chairs at 2nd floor.

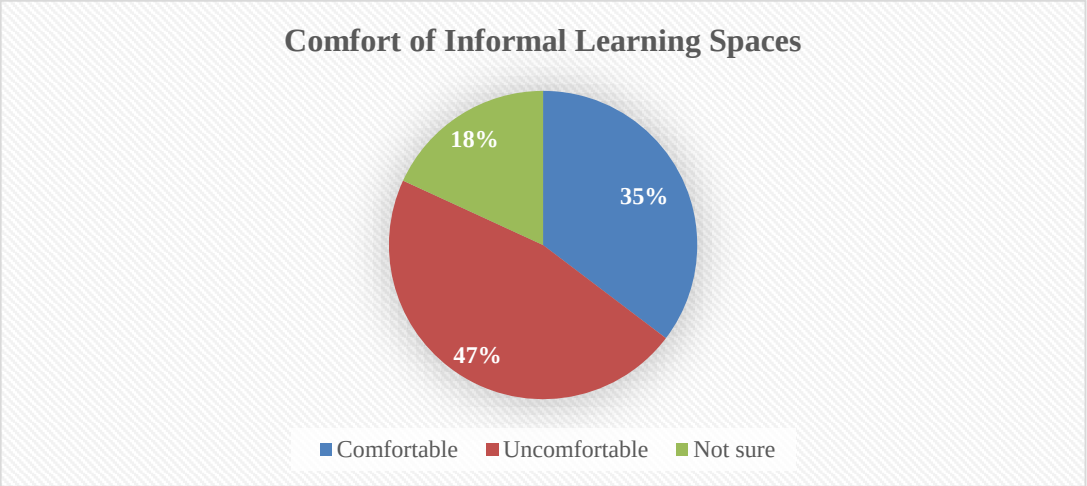


Figure 4.61: Comfort of Informal Learning Spaces.

Comfort of the ILS could be looked from the aspects of furniture, seating arrangement, temperature and lighting. ILS which consists of soft and cosy furniture, comfortable seating, appropriate temperature and sufficient lighting increase participation of students in that area (Scannell et al., 2016). Figure 4.61 depicts that almost half of the respondents (47 %) felt uncomfortable towards the ILS in the block. Interviewee 1 were also unsatisfied towards the comfort level of ILS. The building surveyor reported that the ILS was not private and the lighting was not bright enough and this may affect occupants' study. The temperature in the ILS was cool. The seating arrangement in the 4th floor is for groups study while in the 8th floor is for individual study.

More soft and cosy furniture i.e. sitting lounge could be provided to increase satisfaction of occupants on ILS, stated by interviewee 1. Suggestions to improve comfort in ILS such as incorporating vegetation and soft material could be adopted (Scannell et al., 2016). Furthermore, Interviewee 1 suggested to have yellow light instead of fluorescent light because fluorescent light would lead to tiredness while studying. Furthermore, the brightness of lighting at the ILS could be improved by increasing the lighting power density of lighting in order to have illumination of at least 500 lux which is suitable for reading and writing. Another alternatives to lighting is to provide table lamp. "Layered" lighting design is a concept of pairing lower levels

of ambient light with task lighting, in which higher illumination is brought nearer to the working surface while reducing the lumens needed to light the entire space (GE Lighting Pressroom, 2013). Hence, table lamp could be provided. Another suggestions provided by the building surveyor was to install partitions between tables at the ILS to provide a sense of secure and privacy.

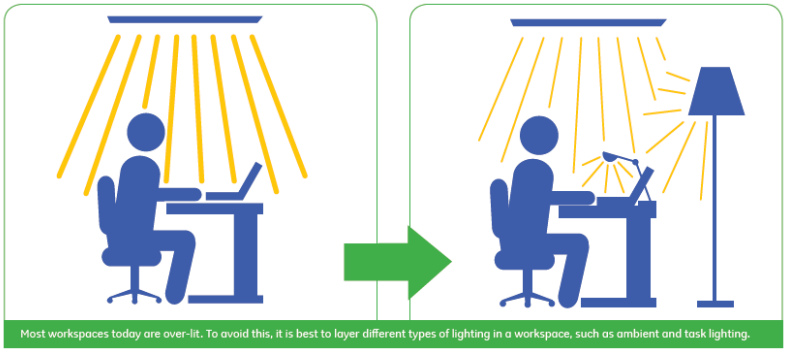


Figure 4.62: “Layered” lighting design (GE Lighting Pressroom, 2013).

Another dissatisfaction of ILS users is inaccessibility to the resources as illustrated in Figure 4.63. Resources in this context refers to the IT facilities, visual aids, food and drinks. Accessibility to wireless network, plug socket or personal computer is required by certain students while they are in ILS (Harrop and Turpin, 2013). Interviewee 1 mentioned that there was lacking of vending machine in ILS. Based on the observation during walkthrough, ILS at the 8th floor has weak wireless network, insufficient number of plug socket and no computer is provided. Besides, ILS at 4th and 8th floor is not accessible to any source of food and drinks. The occupants have to go to 1st floor to buy foods and drinks at vending machine or walk to the nearby restaurants. Based on the walkthrough results, there is no accessibility to visual aid i.e. whiteboard at ILS.

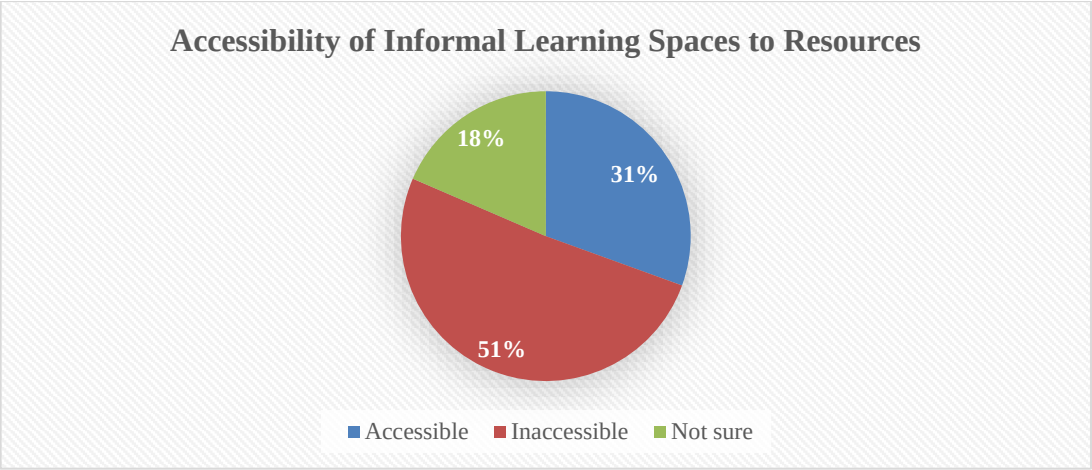


Figure 4.63: Accessibility of Informal Learning Spaces to Resources.

The recommendation to the above problem is to have stronger wireless network and more plus socket to be installed at ILS. This allowed occupants who bring laptop into the campus could access to these facilities. Some computers could be provided so that users could use the computers in case the computers in library and computer lab is fully utilised. Since there is no canteen in the block, vending machines could be provided at the ILS as a source of food and drinks to the ILS users. Food and drinks should be allowed in ILS as study shown that food and drinks help students to stay concentrated while studying (Harrop and Turpin, 2013). If the students felt tired, they could easily reach for foods and drinks, stated by interviewee 1. Whiteboards could be provided on the wall so the ILS users could discuss directly if they think of something important (Architecture and Design, 2015).

Figure 4.64 shows the important factors of ILS by the respondents. As can be seen from the figure, 27 % of the respondents stated that they want a comfortable ILS. Thus, in order to improve occupants' satisfaction towards ILS, the comfort level of the ILS should be emphasised first, followed by sufficient provision of ILS, accessibility to resources or quiet and private environment, and lastly proximity of the ILS to the next activity. This concur the statement of interviewee 1 that occupants would only stay at ILS if the environment is comfortable.

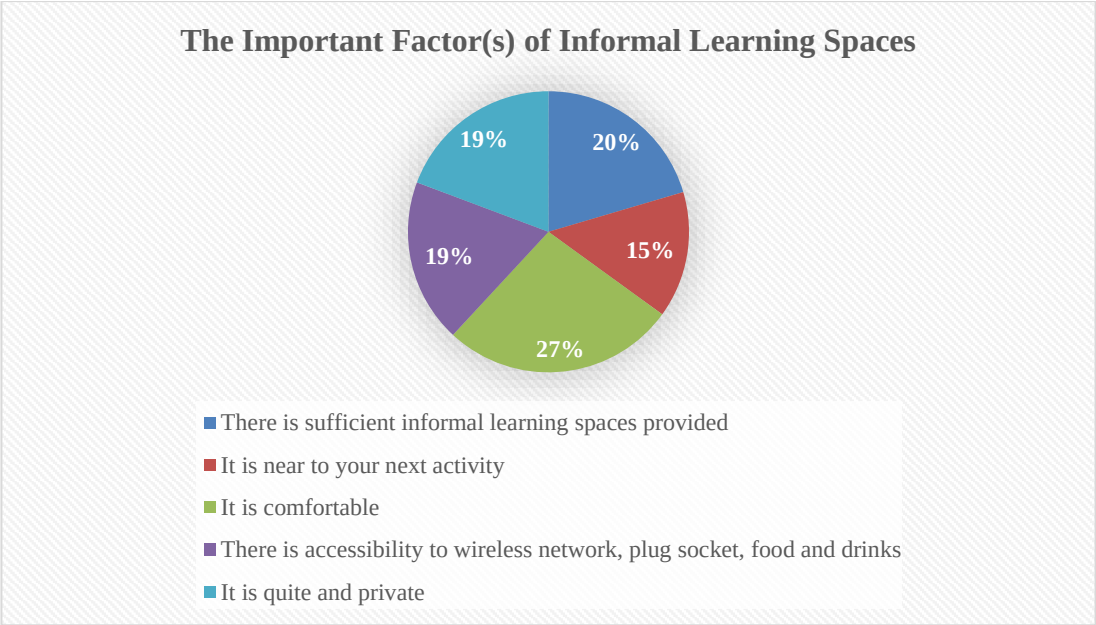


Figure 4.64: The Important Factor(s) of Informal Learning Spaces.

Table 4.10 below summarised the POE done on ILS in this block.

Table 4.10: Summary of Results on Informal Learning Spaces.

Objectives Achieved	Results from Survey, Interview and Walkthrough
1 – To determine the users' perception on the ILS	➢ Majority of the respondents were satisfied with the ILS which might be due to ILS is proximate to their next activity and it is suitable for group discussion and activity. ➢ Dissatisfaction on ILS might be due to insufficient provision of ILS, discomfort in ILS and inaccessibility to resources.
2 – To investigate whether there is existence of design inadequacy to the ILS	➢ ILS provided is insufficient especially at lower floors i.e. ground to 3rd floor. ➢ ILS is uncomfortable to stay – it is not private, the lighting is dim. ➢ The environment is noisy. ➢ ILS at the 8th floor has weak wireless network, insufficient number of plug socket and non-provision of computers.

Table 4.10 (Continued)

Objectives Achieved	Results from Survey, Interview and Walkthrough
	➢ ILS at 4th and 8th floor is not accessible to any source of food and drinks. ➢ There is no accessibility to visual aid i.e. whiteboard at ILS.
3 – To establish possible improvement to the inadequacies of ILS based on users' perception	➢ The comfort level of the ILS should be emphasised and improved first, followed by sufficient provision of ILS, accessibility to resources or quiet and private environment, and lastly proximity of the ILS to the next activity. ➢ More ILS should be provided at lower floors i.e. near to the classroom to allow pre-reading before class and time-saving to reach for study areas. ➢ More soft and cosy furniture i.e. sitting lounge could be provided. ➢ Install yellow lighting instead of fluorescent lighting ➢ Brightness of lighting at the ILS should to have illumination of at least 500lux. ➢ "Layered" lighting design could be adopted. ➢ Silence warning chart to be pasted at the wall around ILS proximate to the classroom. ➢ New comers to be informed the necessity to keep quiet around ILS. ➢ Emails could be sent to the occupants to use the ILS in a good manner. ➢ ILS at 8th floor to have stronger wireless network and more plug socket to be installed at ILS. Computers could be provided. ➢ Vending machines and whiteboards to be provided at the ILS. ➢ Maintenance on furniture have to be done.

4.3 Results of Interview Survey

Two registered architects with experience of 30 years (Interviewee 1) and 24 years (Interviewee 2) participated in the interview session with the author. The 1st interview with interviewee 1 was conducted on 15 May 2017 while the 2nd interview with interviewee 2 was held on 7 June 2017. Their feedbacks were recorded in Table 4.11.

Table 4.11: Results of Interview.

Results of Interview	Interviewee 1	Interviewee 2
Section 2 - Vertical Movement Facilities		
Section 2A - Lift		
The interviewers were unsatisfied towards the quality of lift service. The main reason is due to insufficient provision of lift.	"…the lift… is not sufficient…" "…the waiting time is too long…" "even though they try to use the odd and even numbers… the efficiency is not there"	"The lift for this building is under design, it is not sufficient although they have make improvement by changing the lift stop over levels." "...Maybe the type of lift they used is not calculated properly…the speed of the lift is not fast enough… maybe the size of the lift they also never calculate properly."

Table 4.11 (Continued)

Results of Interview	Interviewee 1	Interviewee 2
Quantity of lift suggested at Lobby 1 is around 6. Three (3) groups of lift should be provided instead of 2 groups.	"Actually we need 6, and then another 4 then equals to 10 lifts. But the best thing is we need 3 groups of lifts, now only has 2 groups."	"…you got 6-7 lifts go like that, along the wall, under temporary structure." "Nothing is impossible you can add more lift, but will management agree or not to add more lift, you add at least 2 more lifts will solve the problem."
The quantity of lift could be increased as it would not take a lot of space.	-	"(Installation of lift) no need a lot of space… (an office room) can put 2 lifts already…"
The university only provided limited number of lifts perhaps due to the lift is very expensive and requires additional spaces. **The occupants are encouraged to climb the staircase if the lift is insufficient.**	"Whatever being provided is just for fundamental/ basic requirement…" "From the developer side point of view, lift is a very expensive equipment… one lift sometimes costs around half a million… come along with other additional space like lift lobby, and a staircase around it"	"…The whole building is totally designed with very minimum thinking in architecture."

Table 4.11 (Continued)

Results of Interview	Interviewee 1	Interviewee 2
	"They consider about the occupancy rate… cannot afford the essential space is being for a lift… it is a win-win situation, where I provide something that is just enough… if not enough, will need to think about another way…encourage students to use the staircase as a way of green technology or green energy..."	
The odd and even floor lift zoning design improved the lift congestion problem but with little effectiveness.	"Of cause there is an improvement in terms of system, efficiency and waiting time… efficiency is increased but in general it just a bit of improvement but it did not solve the overflow problem"	"The lift for this building is under design, it is not sufficient although they have make improvement by changing the lift stop over levels."
A designated lift to transport people to the higher floors is unnecessary as the lower floors should be prioritised.	-	"When you say (a designated lift only to transport people to floor) 6,7,8, it may not help because the students to climb up from ground floor to 4th floor, it's very tough.… floor to floor height… is double height"

Table 4.11 (Continued)

Results of Interview	Interviewee 1	Interviewee 2
The current quantity of lift would be sufficient if: - **The occupancy rate drops by 30 % to 40 % (Interviewee 1)** - **The space allocation of the block is corrected i.e. allocate spaces that always visited by the occupants at ground floor (Interviewee 2)**	"Maybe, they build another building and then shift 30 or 40 % of the students to the new block. And let say we use a number of 6k using 6 lifts, and that's good." "Now the economic is so bad… student involvement may drop… the lift becomes more efficient."	"…You always see people go to level 2 or 3A… Why can't you design lecture theatre and library in ground level… then they don't need to use the lift… the problem is the space allocation is wrong"
Installation of escalator could help to solve lift congestion problem. However, the university may hesitate to install escalator due to cost, maintenance and safety aspects.	"The other thing that I personally is lacking is escalator…during the peak hour, sometimes escalator is much more efficient than the lift." "Maybe one of the thing the developer have come along is the cost plus the maintenance. Nowadays if you see from the public media, the escalator has become a very dangerous…these may be why we do not have an escalator."	"I think the most practical method is you install an escalator until library level." "Then at least 4 levels of people will not take the lift, then the lift will function."

Table 4.11 (Continued)

Results of Interview	Interviewee 1	Interviewee 2
The lift was suggested to be submitted and installed as a temporary structure that would use part of the space of setback.	-	"…Submit the lift as a temporary structure… eat into the setback… it's permanent, but it can be removable… just like your terrace house (and) car porch"
Service lifts should be provided. When goods have to be transported from floors to floors, it would not disturb other occupants to use the lift.	-	"…another 2 service lift for all the maintenance people to use… kakak push the rubbish bin… fight for the lift with the students in the morning"
Section 2B - Staircase		
The interviewers were unsatisfied towards the staircase. The staircase could be upgraded but it was just to meet the fire escape requirement. The staircase with windows allowed nice view while using but the middle staircase is dark and seldom used by the occupants.	"Talking about the good experience about staircase, no." "…staircase could be upgraded to a better quality and feel good to walk on it."	"…only a few staircase facing outside and you got the view when you walked down it's nice" "The main staircase in the middle, is so dark…so big but nobody use."

Table 4.11 (Continued)

Results of Interview	Interviewee 1	Interviewee 2
	"…staircase is not for luxury or satisfaction use but just to meet the fire escape requirement…"	
The stairs climbing campaign encouraged the occupants to climb the staircase by promoting climbing is good for health. It created awareness and occupants used to climb the staircase after some time. However, some occupants of greater age cannot afford to climb the stairs. Occupants may suffer while climbing the staircase as it has double volume. **The top management should become occupant's role model to climb the staircase.**	"…there is a campaign to encourage people to walk upstairs… they try to make people feel that if I walk up the staircase I feel good." "Well awareness is there but in certain case there is unhappiness of some." "Talking about walking up for youngster is ok, what about the professors, some of them are 60 or 70 years old... we don't mind to walk down, but while walk up our knees may not able to support it." "…majority of the occupants in this building is 85 % youngster. So still work." "…after the campaign, you realise that actually if I walk, it is good for my health, that's a psychological affect. Actually it works." "…we get used to certain thing after sometimes."	"Although it's good for health, but how many people have that kind of mental prepare to do this kind of climbing?" "Students to climb up from ground floor to 4th floor, it's very tough.… floor to floor height… is double height" "…they ask the students to climb the stairs and give a lot of slogan like better for your health, your sugar level etc… top management climb, show examples to the students."

Table 4.11 (Continued)

Results of Interview	Interviewee 1	Interviewee 2
Fundamental of Feng Shui was not observed as some of the flights have fourteen steps. The occupants may not feel pleasant to stay in this block. It was suggested to have thirteen or fifteen steps in a flight in the future.	"…fundamental Feng Shui is not observed." "…flight is 14 steps. If you're talking about Feng Shui, it's definitely a no-no…if someone particular about this, they will feel a bit uncomfortable…very discourage…don't feel like working in the environment…don't feel good." "…13 is best… Or you can compact it make it 15"	-
Angle of staircase was uncomfortable and tiring.	"… (The staircase) is uncomfortable… if you want a comfortable staircase it should be 22 or 25 degree… But in a public building, we cannot afford this kind of achievement…" "(Double volume staircase) inclination is not so flat, so it is tiring."	-
It is acceptable if the dimension of steps in a flight is different from another flight as long as the steps within a flight has consistent dimension.	"The bio law says that the steps between the same flight must be same, but this flight and another flight they don't have to be the same… it is still acceptable"	-

Table 4.11 (Continued)

Results of Interview	Interviewee 1	Interviewee 2
Section 3 - Learning Facilities		
Section 3A - Audio Equipment (Microphone and Loudspeaker)		
The interviewers were unsatisfied towards the performance of audio equipment due to frequent breakdown and poor quality.	"…it meets the basic requirement…" "…it serves its purpose, of cause off and on, you realised that some quality is too bad"	"…most of the microphone are breakdown, are malfunctioned"
The authorised staff should take initiative do frequent checking on the equipment.	-	"In UTAR you need to key in the report, you need to inform people… the technical person must keep on rounding and check the whole things…"
If good quality audio equipment is provided, stealing may happened.	"…when you have a better quality equipment, people will steal."	-

Table 4.11 (Continued)

Results of Interview	Interviewee 1	Interviewee 2
Section 3B - Visual Equipment (Whiteboard, Projector and Projection Screen)		
The whiteboard would be blocked by the projection screen if the screen was pulled down. This affected the teaching process.	-	"…you have projector to project the screen then you pull down the screen, then the whiteboard cannot use already." "…in a good teaching method, when you show projector, you must have a whiteboard beside that you can write something.
The interviewer prefer whiteboard as it is less dusty.	-	"I prefer whiteboard because it is less dust… but the school doesn't provide marker…"
The interviewer was unsatisfied towards the performance of projectors provided in the university because they are outdated and poor quality. The university should provide a better quality projector in every classroom as it is important in the teaching and learning process.	-	"…not a good projector, the colour is not correct, the sharpness is not there." "…projectors we have is very outdated." "…new projector they make it very small and they do it very advanced, the resolution very sharp and it's very cheap."

Table 4.11 (Continued)

Results of Interview	Interviewee 1	Interviewee 2
		"Why UTAR cannot buy this equipment, it's so important to teach and deliver knowledge to 100 over students per time to give a lecture." "…not all the classroom has projector… Majority don't have, we have to book the projector from the ICT… very troublesome for the lecturer… should be all ready in the whole classroom"
Section 3C - Informal Learning Spaces		
The interviewers were unsatisfied towards the comfort level of informal learning spaces. Furniture should be provided for a more comfortable study environment.	"The comfort level is not sufficient from the designer point of view." "…they turn some of the corner into study area… should put nice furniture around to make people happier."	-
There was no chairs for occupants to sit in the informal learning spaces.	"If you walk around the building, you realise that the only thing is just sit on the floor."	-

Table 4.11 (Continued)

Results of Interview	Interviewee 1	Interviewee 2
	"Can we have simple plan or wood, so people can sit there to have some chitchat?"	
The comfort level of the informal learning spaces would affect the willingness of occupants to stay and study at the area.	"…it's not about are we enough, is are we having comfortable space for the student to feel that it is nice to sit in" "If the space is comfortable, it is always not enough, but if the space is just basic then people know and feel that it is not a comfortable space, I'm going home…"	-
There was lack of privacy in the informal learning spaces. Enclosed space should be provided. **The lighting condition at the area was fluorescent which was tiring, yellow light should be provided.** **There was lack of sitting lounge and vending machine in the area.**	"…privacy is a major concern." "…lighting condition, all fluorescent, which is very tiring, it is not a good learning condition." "…we will prefer to have some yellow light, cosier… you have a much more enclosed space, sitting lounge." "This area is very lacked of vending machine that sells drinks and food… so that at least the students feel tired, they don't need to go out…"	-

4.4 Results of Walkthrough

A walkthrough with a registered building surveyor with 15 years of experience was conducted on the 12th of July, 2017 from 11.00 a.m. to 1.00 p.m. The building surveyor's point of view on vertical movement facilities and learning facilities were recorded in Table 4.12 and Table 4.13 respectively.

Table 4.12 shows the details of staircase to support the walkthrough results.

Table 4.12: Walkthrough Results for Vertical Movement Facilities.

No	Items	Comments
Vertical Movement Facilities		**Lift Lobby 1 (GF – 3F)**
	Lift	
1	Operation of lift	All the lifts are fully function at the time of walkthrough.
2	Provision and operation of landing hall buttons[3]	Four lifts are provided with two landing hall buttons (up and down) at the lift lobby. Two sets of landing hall buttons (from B floor to 10th floor) are provided inside three of the four lifts. Another lift only provided with one set of landing hall buttons[4].
3	Provision of fire lift[5]	One fire lift is provided among the four lifts.

[3] Refer to Figure 5.3 and Figure 5.4.
[4] Refer to Figure 5.5.
[5] Refer to Figure 5.5.

Table 4.12 (Continued)

No	Items	Comments
4	Provision of signage indicating not to use lift in case of fire[6]	Yes.
5	Provision of Permit Mesin Angkat (PMA) and signage[7]	Yes.
6	Provision of Load capacity data plate[8]	Yes – it is allowed for 24 persons or a total weight of 1635kg.
7	Provision of procedures to be followed during mantrap[9]	Yes.
8	Provision and operation for floor indication[10]	Each lift consists of two floor indication – one outside (at the lift lobby) and one inside (within the lift) to show passenger the floor where the lift stops.

[6] Refer to Figure 5.6.
[7] Refer to Figure 5.7.
[8] Refer to Figure 5.8.
[9] Refer to Figure 5.9.
[10] Refer to Figure 5.3Figure 5.3 and Figure 5.4.

Table 4.12 (Continued)

No	Items	Comments
9	Provision and operation of lift sensor	The sensor located at both sides of the lift car door can sense the people walking into the lift. There is another lift sensor to detect the weight of the lift – when the lift is full or reaches its maximum weight, the floor indicator will show “FULL LOAD”.
10	Lighting condition	Lighting is sufficient for normal vision.
11	Ventilation in the lift car	When the lift is fully packed, poor ventilation occurs.
12	Noise and vibration during running	One of the lift produces noises occasionally while the lift is travelling.
13	Levelling accuracy with floor of the lobby	The level accuracy is high.
14	Condition of lift car door	It is workable most of the time. However, sometimes it is not workable and external energy has to be used to prevent the lift car from closing or opening, stated by the building surveyor.
15	Experience of jerk in the lift car at the time of starting or stopping	There is existence of jerk at the time of starting and stopping due to the landing of the lift car was not properly placed.

Table 4.12 (Continued)

No	Items	Comments			
	Staircase	**Ground Floor**	**1st Floor**	**2nd Floor**	**3rd Floor**
16	Average dimension of rise	153	164	169	169
17	Average dimension of going	240	255	264	265
18	Angle of staircase	Comfortable.	Comfortable.	One of the flight angle is very steep.	Comfortable.
19	Dimension of landings	Suitable.	Suitable.	Suitable (wider landing due to steeper angle of staircase)	Suitable.
20	Evenness of steps	Even in overall.	Even in overall.	Uneven.	Uneven.
21	Number of steps between landings	15	10 - 15	8 - 10	8 - 14
22	Condition of handrail	The balustrades is not sturdy.	The balustrades is not sturdy.	The balustrades is sturdy.	The balustrades is sturdy.

Table 4.12 (Continued)

No	Items	Comments			
23	Provision of handrail[11]	Side and middle handrails are provided.	Side and middle handrails are provided.	Side and middle handrails are provided.	Side and middle handrails are provided.
24	Finishes of staircase[12]	It is slippery-proof.	It is slippery-proof.	It is slippery-proof.	It is slippery-proof.
25	Lighting condition of staircase area	Good.	Good.	Dim.	Dim.
26	Ventilation of staircase area	Good ventilation (it is near to the open spaces at ground floor).	Poor ventilation.	Poor ventilation.	Poor ventilation.
27	Provision of diffuser or staircase pressurization system[13]	Yes. One diffuser is provided.	Yes. One diffuser is provided.	Yes. One diffuser is provided.	Yes. One diffuser is provided.
28	Obstruction in staircase	No.	No.	No.	No.

[11] Refer to Figure 5.10.
[12] Refer to Figure 5.11.
[13] Refer to Figure 5.12.

Table 4.13: Walkthrough Results for Audio Visual Equipment.

No	Items	Comments					
	AV Equipment	**Lecture Hall**		**Tutorial Room**	**Computer Lab**	**Practical Lab**	**Studio**
		KB208	**KB520**	**KB517**	**KB607**	**KB505**	**KB622**
		Microphone					
1	Condition of microphone	Good.	Good.	-	-	-	-
2	Quantity provided	There is one portable microphone (perhaps due to breakdown that time) It should have one more microphone for the students.	One wired microphone connected to a portable speaker is used, the quantity is sufficient.	No microphone is provided. It is not required as the room is very small.	Microphone is not required in a small computer lab.	Microphone is not provided as it is unnecessary. Lecturer always walk from group to group for discussion.	No microphone is provided as lecturer usually walk from table to table for discussion.
3	Provision of solution notice during breakdown[14]	Yes.	Yes.	Yes.	No.	No.	No.

[14] Refer to Figure 5.13 and Figure 5.14.

Table 4.13 (Continued)

No	Items	Comments					
AV Equipment		**Lecture Hall**		**Tutorial Room**	**Computer Lab**	**Practical Lab**	**Studio**
		KB208	**KB520**	**KB517**	**KB607**	**KB505**	**KB622**
4	Suitability of microphone	Wireless microphone is more suitable than wired microphone.	Wireless microphone is preferable for lecturer who always writes.	-	-	-	-
		Loudspeaker					
5	Condition of speaker	Good.	-	-	-	-	-
6	Location of speaker	Each wall speaker at both sides of the wall, suitable.	One wall speaker system in front of the room, suitable.	-	-	-	-
7	Quantity provided	There are two speakers, it is sufficient.	A portable speaker system is provided, the quantity is sufficient.	No speaker is provided as it is unnecessary.	Speaker is not required in a small room.	Speaker is not required as there is no microphone.	No speaker is provided as it is not required.

Table 4.13 (Continued)

No	Items	Comments					
AV Equipment		**Lecture Hall**		**Tutorial Room**	**Computer Lab**	**Practical Lab**	**Studio**
		KB208	**KB520**	**KB517**	**KB607**	**KB505**	**KB622**
8	Provision of solution signage during breakdown	Yes.	Yes.	Yes.	No.	No.	No.
9	Suitability of speaker	Wall speaker is suitable.	Portable speaker system is suitable, but it is required to be booked before the class which is inconvenient.	-	-	-	-
				Whiteboard			
10	Condition of whiteboard	Good.	Good.	Good.	Good.	Good.	Good.
11	Location of whiteboard	Three whiteboards are provided on the	A fixed whiteboard in the middle may be blocked while the projection screen is scrolled down. Thus a	The whiteboard is in the middle of the room which is suitable. In this case the	A fix whiteboard is located in the middle of the room, the	The fixed whiteboard is located in the middle of the front wall while the	Two fixed whiteboards are provided at the left and the right side.

Table 4.13 (Continued)

No	Items	Comments					
	AV Equipment	Lecture Hall		Tutorial Room	Computer Lab	Practical Lab	Studio
		KB208	KB520	KB517	KB607	KB505	KB622
		left and the right due to the big hall.	portable whiteboard is provided at one side of the room. The location of fix whiteboard is considered suitable as there is no better choice.	projector screen will not block the whiteboard while the screen is scrolled down.	projection screen will block the whiteboard once it is pulled down[15].	portable whiteboard is put at one side of the room.	
12	Quantity provided	Sufficient for fix whiteboard. No portable whiteboard is provided.	Two whiteboards – one fix and one portable – are provided.	A whiteboard is provided.	A whiteboard is provided.	There are one fix and one portable whiteboard provided[16].	Two whiteboards are provided.

[15] Refer to Figure 5.15.
[16] Refer to Figure 5.16.

Table 4.13 (Continued)

No	Items	Comments					
	AV Equipment	**Lecture Hall**		**Tutorial Room**	**Computer Lab**	**Practical Lab**	**Studio**
		KB208	**KB520**	**KB517**	**KB607**	**KB505**	**KB622**
13	Suitability of whiteboard (fix/ portable)	Portable whiteboard can be provided because it can be moved nearer to the students.	Both fix and portable whiteboard is provided. It is suitable in a huge room.	A fixed whiteboard is suitable for the room.	A fix whiteboard is suitable in the small computer lab. Portable whiteboard will be too big to be fitted in the computer lab.	Both fix and portable whiteboard is suitable to be used in the practical lab as lecturer may need to illustrate diagram and graphs to the students frequently.	Fix whiteboard alone is sufficient as lecturer and students usually write or draw on the paper.
	Projector and Projection Screen						
14	Condition of projector and projection screen	Projector is workable. There is no projection screen provided[17].	It is workable.	It is workable.	It is workable.	-	-

[17] Refer to Figure 5.18.

Table 4.13 (Continued)

No	Items	Comments					
	AV Equipment	**Lecture Hall**		**Tutorial Room**	**Computer Lab**	**Practical Lab**	**Studio**
		KB208	**KB520**	**KB517**	**KB607**	**KB505**	**KB622**
15	Location of projector and projection screen	The projected image is placed at upper centre of front wall, it is a suitable location[18].	The projector and projection screen is in the middle, the screen will block the whiteboard if it is scrolled down[19].	The projector and projection screen was located at the left side of the room. Students who sit at the right side may face difficulty to read the projected image[20].	The projector and projection screen is in the middle, the screen will block the whiteboard if it is scrolled down.	-	-
16	Quantity provided	One projector is provided which is sufficient.	One projector and screen is provided which is sufficient.	One projector and screen is provided which is sufficient.	One projector and screen is provided which is sufficient.	There is no projector and screen in the practical lab.	No projector is provided in the studio.
17	Provision of solution signage during breakdown	Yes.	Yes.	Yes.	No.	No.	No.

[18] Refer to Figure 5.17.
[19] Refer to Figure 5.18.
[20] Refer to Figure 5.19.

Table 4.14: Walkthrough Results for Informal Learning Spaces.

No.	Items	Comments	
	Informal Learning Spaces (ILS)	**Open Spaces**	
		4th Floor[21]	**8th Floor[22]**
1	Location of ILS	Suitable location near to the library and computer lab, space is properly utilised.	The area is too opened – there may have other event organised at the same area. This may cause disturbance to the ILS users.
2	Quantity provided	Sufficient as the small area is properly utilised.	Insufficient tables and chairs provided although the area is big. The space should be utilised fully.
3	Provision of appropriate furniture	Partitions should be provided to separate tables from tables.	Partitions should be provided to provide a sense of secure and privacy. This can also minimise disturbance.
4	Provision of lighting	Lighting is too dim, sometimes the shadow of human body block people from reading clearly.	Lighting is too dim. This may obstruct the vision during study.
5	Temperature (very cool/ cool/ warm/ very warm)	Cool.	Cool.

[21] Refer to Figure 5.20.
[22] Refer to Figure 5.21.

Table 4.14 (Continued)

No.	Items	Comments	
Informal Learning Spaces (ILS)		**Open Spaces**	
		4th Floor[23]	**8th Floor[24]**
6	Seating arrangement	It's suitable for group study but not for individual, since each table has 4 seats.	It is more suitable for individual study, since each table has only 1 seat. However, the tables and chairs should occupy other empty spaces as well.
7	Access to IT facilities (wireless network, plug socket, computer)	Strong wireless network. Insufficient plug socket provided. Computers are provided in the computer room.	Weak wireless network. Insufficient number of plug socket. No computer is provided.
8	Access to visual aid (whiteboard)	No whiteboard is provided. It is not required.	No whiteboard is provided. It is not required.
9	Accessibility to food and drinks	There is no canteen or vending machine around the area.	No provision of canteen and vending machine around the area.

[23] Refer to Figure 5.20.
[24] Refer to Figure 5.21.

4.4.1 Staircase Details

One floor consists of four flights as shown in Figure 4.65. The rise, going, number of steps per flight and number of diffuser were recorded in Table 4.15 below. The angles of staircase were calculated using Equation 2.1 and 2.2.

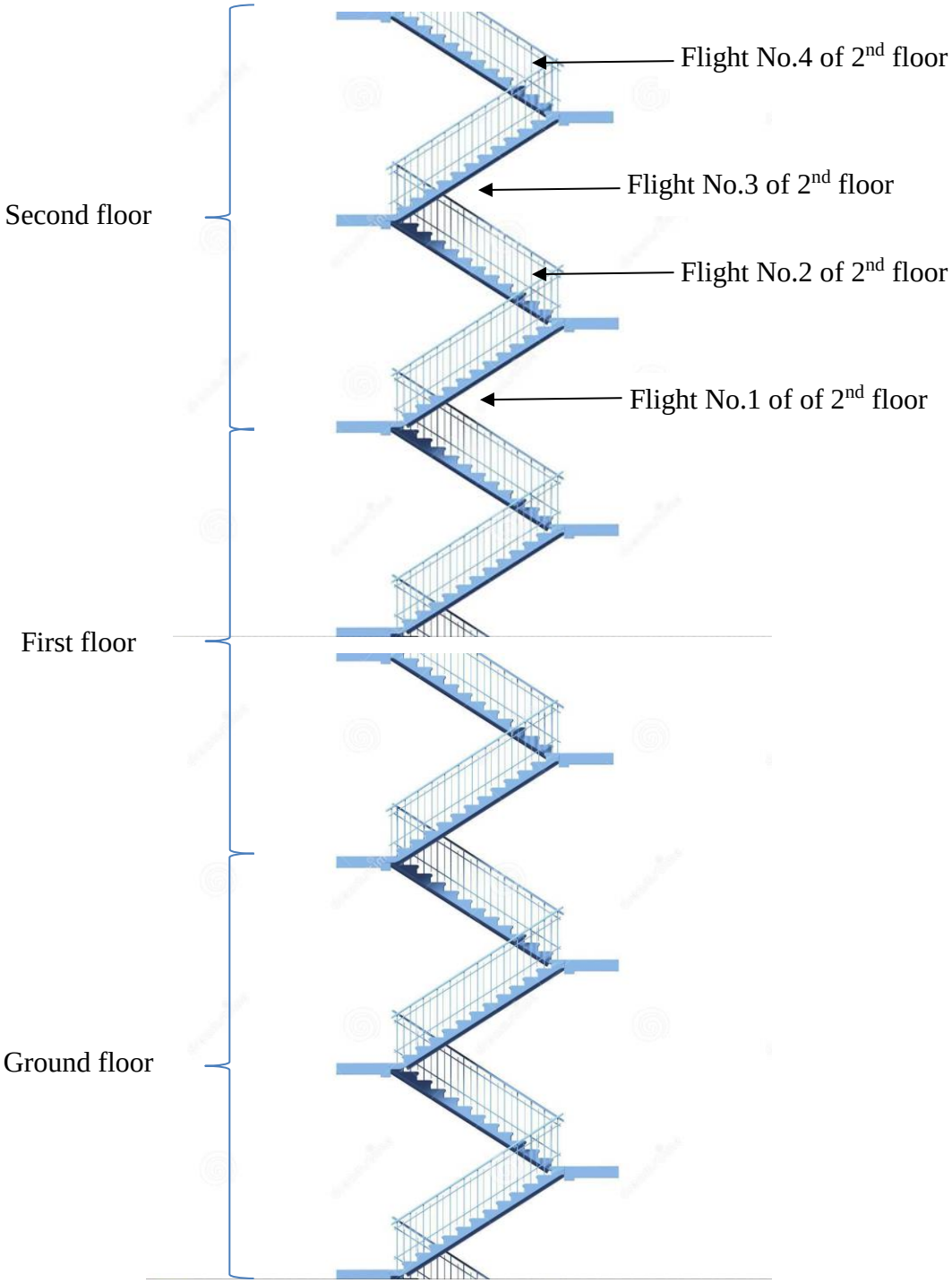


Figure 4.65: Section View of Staircase from the Ground Floor to the Second Floor.

Table 4.15: Details of Staircase in UTAR KB Block.

Floor Level	Rise (mm)	Going (mm)	Angle (°)	No. of Steps per Flight	Provision of Pressurisation System
			Ground floor		
Flight No.1	150	265	34.33	15	1
	175	270			
	160	270			
	170	260			
	155	260			
	160	260			
	175	245			
	165	255			
	165	260			
	165	260			
	170	250			
	165	255			
	160	255			
	160	260			
	150	-			
Subtotal	2295	3360			
Flight No.2	175	240	35.24	15	-
	155	245			
	165	240			
	170	265			
	160	255			
	165	255			
	165	255			
	175	245			
	155	255			
	180	255			
	160	250			
	160	250			
	170	255			
	170	260			
	165	-			
Subtotal	2490	3525			
Flight No.3	170	270	33.27	15	-
	160	265			
	150	265			
	155	265			
	150	260			
	160	270			

Table 4.15 (Continued)

Floor Level	Rise (mm)	Going (mm)	Angle (°)	No. of Steps per Flight	Provision of Pressurisation System
	155	250			
	165	255			
	155	250			
	150	250			
	155	255			
	170	255			
	160	250			
	155	260			
	165	-			
Subtotal	2375	3620			
Flight No.4	180	265	34.71	12	-
	175	260			
	175	265			
	165	265			
	160	260			
	155	260			
	175	265			
	170	255			
	165	270			
	175	265			
	150	265			
	160	-			
Subtotal	2005	2895			
			First Floor		
Flight No.1	165	280	34.04	10	1
	155	280			
	165	275			
	165	270			
	160	275			
	175	265			
	170	265			
	175	270			
	175	270			
	150	-			
Subtotal	1655	2450			
Flight No.2	155	260	35.41	10	-
	165	265			
	160	260			
	160	270			

Table 4.15 (Continued)

Floor Level	Rise (mm)	Going (mm)	Angle (°)	No. of Steps per Flight	Provision of Pressurisation System
	180	250			
	175	260			
	165	275			
	175	270			
	170	260			
	180	-			
Subtotal	1685	2370			
Flight No.3	175	260	37.15	10	-
	190	275			
	175	265			
	170	250			
	175	240			
	165	250			
	175	255			
	170	245			
	180	250			
	160	-			
Subtotal	1735	2290			
Flight No.4	170	265	35.97	8	-
	170	260			
	165	270			
	160	275			
	160	260			
	170	260			
	175	270			
	180	-			
Subtotal	1350	1860			
		Second floor			
Flight No.1	165	275	34.36	10	1
	170	265			
	165	270			
	165	265			
	175	270			
	165	275			
	165	270			
	165	265			
	180	280			
	150	-			
Subtotal	1665	2435			

Table 4.15 (Continued)

Floor Level	Rise (mm)	Going (mm)	Angle (°)	No. of Steps per Flight	Provision of Pressurisation System
Flight No.2	170	260	35.70	10	-
	170	255			
	170	260			
	175	255			
	165	260			
	175	265			
	160	265			
	165	260			
	170	265			
	165	-			
Subtotal	1685	2345			
Flight No.3	175	260	35.17	11	-
	180	265			
	170	265			
	175	265			
	170	270			
	165	265			
	175	270			
	170	270			
	180	270			
	165	275			
	160	-			
Subtotal	1885	2675			
Flight No.4	180	265	36.80	8	-
	180	265			
	170	270			
	175	260			
	170	275			
	175	265			
	185	265			
	160	-			
Subtotal	1395	1865			
		Third floor			
Flight No.1	155	265	33.42	14	1
	155	275			
	160	265			
	170	255			
	160	265			
	170	260			

Table 4.15 (Continued)

Floor Level	Rise (mm)	Going (mm)	Angle (°)	No. of Steps per Flight	Provision of Pressurisation System
	170	260			
	150	265			
	170	260			
	160	275			
	170	265			
	160	265			
	160	265			
	160	-			
Subtotal	2270	3440			
Flight No.2	170	250	34.37	13	-
	165	255			
	170	255			
	165	255			
	155	255			
	160	250			
	155	255			
	155	260			
	160	260			
	170	255			
	155	270			
	170	265			
	160	-			
Subtotal	2110	3085			

4.5 Achievement of Hypotheses in Theoretical Framework

Table 4.16 below shows the retained and new hypotheses in theoretical framework. New hypotheses were derived from the findings of POE in the areas of study.

Table 4.16: Achievement of Hypotheses in Theoretical Framework.

No.	Hypotheses	Retained/ Rejected/ New theory
	Vertical movement facilities – Lift	
1	The shorter is the waiting time of lift, the higher is the satisfaction of occupants.	Retained

Table 4.16 (Continued)

No.	Hypotheses	Retained/ Rejected/ New theory
2	The shorter the travelling time of lift, the higher is the satisfaction of occupants.	Retained
3	The better is the lift zoning design, the higher is the satisfaction of occupants.	Retained
4	The lesser is the breakdown of lift, the higher is the satisfaction of occupants.	Retained
5	The longer the travel distance, the more likely the occupants will take the lift.	New theory
	Vertical movement facilities – Staircase	
1	The more consistent is the dimension of steps, the higher is the satisfaction of occupants	Retained
2	If the rise and going of staircase are in proper dimension, then the satisfaction of occupants is high.	Retained
3	The gentler is the slope of the staircase, the higher is the satisfaction of occupants.	Retained
4	If the number of steps between landings is appropriate, then the satisfaction of occupants is high.	Retained
5	The shorter the travel distance, the more likely the occupants will climb the staircase.	New theory
6	The taller is a person, the higher the comfort level in using the staircase.	New theory

Table 4.16 (Continued)

No.	Hypotheses	Retained/ Rejected/ New theory
7	The better is the ventilation at staircase, the higher is the satisfaction of occupants.	New theory
	Learning facilities – AV equipment	
1	The lesser is the frequency of breakdown, the higher is the satisfaction of occupants.	Retained
2	If the AV equipment is placed at a proper location and height, then the satisfaction of occupants is high.	Retained
3	If the proper type of equipment is provided, the then the satisfaction of occupants is high.	Retained
4	If the quantity of AV equipment is sufficiently provided, then the satisfaction of occupants is high.	Retained
5	The better is the quality of AV equipment provided, the higher is the satisfaction of occupants.	New theory
	Learning facilities – Informal Learning Spaces	
1	If the informal learning space is comfortable, then the satisfaction of occupants is high.	Retained
2	There is a relationship between the surrounding environment of informal learning space and the satisfaction of occupants.	Retained
3	The nearer is the informal learning space to occupant's activity, the higher is the satisfaction of occupants.	Retained

Table 4.16 (Continued)

No.	Hypotheses	Retained/ Rejected/ New theory
4	If the informal learning space is accessible to various resources, the then the satisfaction of occupants is high.	Retained
5	If the provision of informal learning space is sufficient, then the satisfaction of occupants is high.	Retained

4.6 Summary

Figure 4.66 summarised the satisfaction of respondents towards the vertical movement facilities and learning facilities in KB Block. Most of the respondents were satisfied towards the staircase, loudspeaker, projector and projection screen, whiteboard and ILS provided in the block. Dissatisfactions of respondents mainly concentrated on the lift and microphone in the lecture hall.

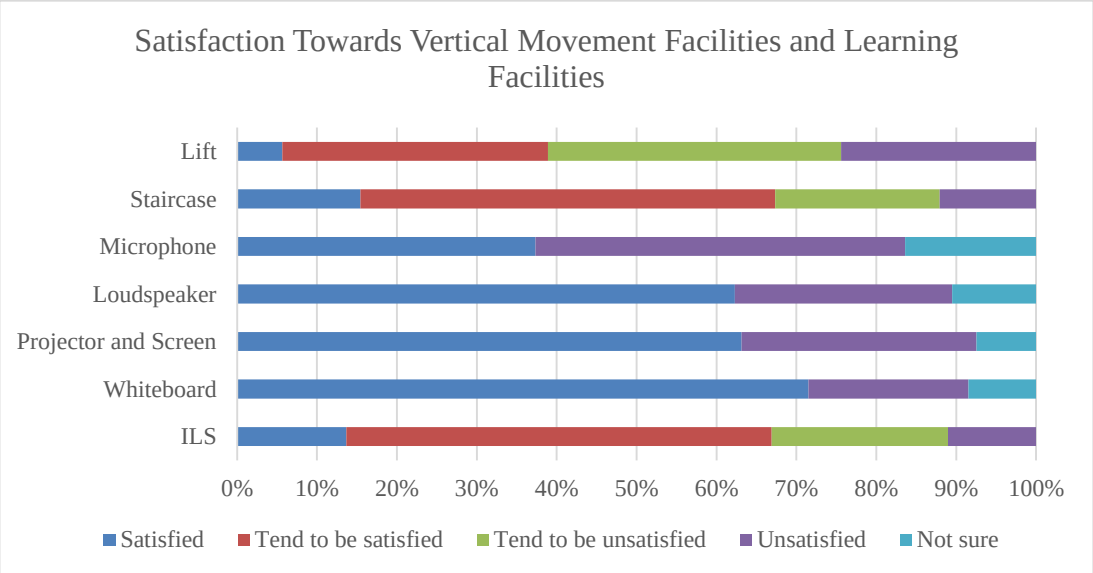


Figure 4.66: Satisfaction Towards Vertical Movement Facilities and Learning Facilities.

The dissatisfactions on lift were due to insufficient provision of lift, which primarily leads to long waiting time at the lift lobby and many intermediate stops while travelling in the lift. A few suggestions had been provided by the respondents to

address the issues i.e. to re-programme the lift zoning design, to provide escalator at lower floors and to add more lifts.

Respondents expressed their dissatisfactions towards the performance of microphone in the lecture hall which mainly due to the frequent breakdown of microphone in lecture hall. The root cause of breakdown is due to loose cable connection of the microphone. The wired microphone if upgraded to wireless microphone, the problem could be solved. Frequent and regular maintenance on microphone is required to minimise the breakdown.

In short, in order to increase occupants' satisfaction towards the building, the university should consider the suggestions given by the respondents for the areas of study in KB Block above, especially on lift and microphone.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This chapter concluded the achievement of research objectives of this paper, the limitations of this research and the recommendations for future development. Figure 5.1 portrayed the achieved research aim and objectives.

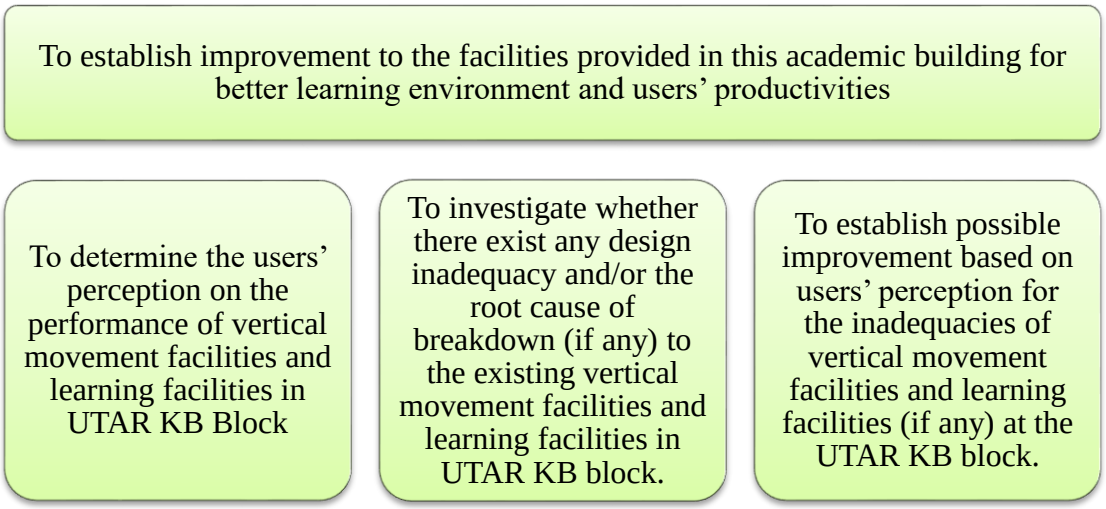


Figure 5.1: Research Aim and Objectives Achieved in this Research.

Users' perception on the performance of vertical movement facilities and learning facilities in KB Block was summarised as in Figure 4.66. Majority of the respondents perceived that the performance of vertical movement facilities and learning facilities in the block were satisfactory, except the lift and the microphone.

The respondents felt unsatisfied towards the performance of lift which were due to insufficient provision of lift in this block. This caused long passenger waiting time at the lobby and many intermediate stops while travelling in the lift. Possible improvement based on users' perception for such inadequacies of lift included to re-programme the lift zoning design, to provide escalator at lower floors and to add more lifts.

Dissatisfaction towards the performance of microphone in the lecture hall by the respondents were primarily due to frequent breakdown of microphone in lecture hall. Loose cable connection of microphone is the root cause of breakdown. Wireless

microphone which are preferred by the respondents should replace the wired microphone to eliminate cable-related problem and to better assist the occupants in their teaching and learning process. Authorised person should do frequent and regular checking on the microphone to reduce breakdown.

Although majority of the respondents reported their satisfaction towards the other areas of study, there are still those who expressed dissatisfaction or poor experience with the facilities. In this case, it had be worth to find out what went wrong in their experience in using the facilities and to establish possible improvement towards the facilities. The summaries of dissatisfaction, the causes of dissatisfaction and possible improvement on staircase, loudspeaker, projector and projection screen, whiteboard and ILS were described below.

The respondents were unsatisfied with the staircase mainly due to excessive steps between landings, steep staircase and uneven steps. Thus, future design should consider these design inadequacies to minimise fatigue and discomfort level of staircase users. Hence, to increase the number of occupants using the staircase, more promotion or more campaign should be made to publicise the importance of taking staircase for health purposes or as part of trending lifestyles which may attract the youngsters or students to use the staircase.

Breakdown which occurred occasionally, insufficient provision of loudspeakers and occurrence of inappropriate sound from loudspeakers in lecture hall are the main source of occupants' dissatisfaction on loudspeaker. Suggestions provided were to have regular and frequent check on loudspeakers, and more provision of loudspeakers in the lecture hall. Precaution has to be taken while using the facility.

The respondents claimed that there are insufficient provision of whiteboard especially in tutorial room, and the location, height and size of whiteboard in certain room were inappropriate. More whiteboards either portable or fixed type should be provided in the tutorial room. Future design of the classroom should take into account the location and mounting height of whiteboard to ensure occupants could use the whiteboard more comfortably.

Dissatisfactions on the projector and projection screen were mainly because of the poor quality of projector provided, insufficient provision of projector and projection screen especially in lecture hall and inappropriate location of projection screen. Thus, more advanced projectors with good quality should be provided. Projection screen should also be mounted in lecture hall to provide better learning and

teaching experience. The design of a classroom in the future should take into consideration of the location of projector and projection screen.

Last but not least, the respondents were unsatisfied with the ILS primarily due to insufficient provision of ILS, discomfort in ILS and inaccessibility to resources. Hence, improvement towards ILS such as more provision of ILS at lower floors, more loose furniture to be provided and provision of yellow lighting and resources i.e. strong wireless network and vending machines at ILS were suggested by the respondents.

In a nutshell, the author has achieved the three research objectives of the paper. Feedback from the respondents should be taken into consideration to improve the facilities for better learning environment and users' productivities.

5.2 Recommendations for future work

There are some recommendations by the author for future work. For instance, future research of UTAR KB Block could be developed on:

i) Lift zoning design of the block. Simulation could be done to obtain the most suitable lift zoning design;
ii) Provision of escalator and its effect on the flow of movement of occupants; and
iii) A comparative study among educational institutions on the POE on vertical movement facilities and learning facilities.

This research paper only focus on vertical movement facilities and learning facilities due to time constraint. Based on the results of pilot study, except of the two areas of study above, there are a few other areas that future research could be conducted. The feedback from respondents on UTAR KB Block in pilot study could be taken into consideration:

i) Acoustic and sound insulation of classroom
ii) Heating, ventilation, and air conditioning (HVAC) system
iii) Wayfinding system
iv) Universal design of built environment
v) Building layout or space allocation
vi) Indoor environmental quality

Furthermore, the interviewees had suggested a few other areas of study to be looked into:

i) Landscape and greenery

ii) Security and 24 hours campus accessibility

iii) System to improve car park and shuttle bus

5.3 Limitation of Research

One of the limitation faced by the author in this research was the building areas to be covered which were limited to two, the vertical movement facilities and learning facilities, due to time constraint. The POE had to be conducted within two long semesters since a large sample of more than 400 responses had to be collected which required substantial amount of data to be analysed from the targeted respondents. Hence, within the limited time frame, only two areas of study were concentrated to obtain detailed results.

Moreover, due to limited resources, the feedback from the original project team who designed and constructed the building were not able to be obtained. Experts from the industry who could provide constructive solution and improvement to the investigated areas could not be employed. Thus, the research was based on the feedback from the targeted building users, DEF staff, ITISC staff and a few experts occupying the block – two architects and a building surveyor – who were users of the building too.

During walkthrough, only the selected areas were observed. For example, the walkthrough were done to lift and staircase on the lower floors from ground to 3rd floor as these areas are frequently used by the occupants. The walkthrough included at lecture halls and tutorial rooms which were available during that time, i.e. when there was no lecture or tutorial. When teaching were in progress at the lecture hall, POE was not able to be done as it will be a disruption to the process Limitation to time caused only selected areas were assessed as it would take a long period to examine the whole building.

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APPENDICES

APPENDIX A: Results of Pilot Study

Table A - 1: Results of Pilot Study.

No.	Gender	Course	Year/ Sem	Feedback
1	Male	Civil Engineering	3/1	- Lift capacity is insufficient - Frequent breakdown of PA system in lecture hall - Bad acoustic and sound insulation in lecture hall and tutorial room - Wordings from whiteboard is not noticeable if students sit at back row of classes
2	Male	Quantity Surveying	2/1	- Informal learning spaces are limited - Leakage of air-conditioner exists - Chairs in lecture hall are low quality - Cracking on walls observed
3	Male	Software Engineering	3/1	- Lift waiting time is too long - Staircase is too steep - Lack of informal learning spaces available - Lifts provided are not sufficient - Parking spaces are insufficient
4	Female	Quantity Surveying	2/1	- There is no microphone and loudspeakers available in the computer lab - Building plan is irregular - Not all the computer in the lab has Wi-Fi
5	Male	Civil Engineering	3/1	- Lifts provided is not enough to cater huge demand of occupants - Signage is not obvious to guide people to the destination, he often lost his way - Insufficient study areas provided - Lack of carpark areas - Column at carpark is very big in dimension
6	Male	Civil Engineering	3/1	- Insufficient lift, forced to use staircase which is double volume - Good ventilation in the building - Water ponding at ramp areas - Good accessibility for disabled

Table A - 1 (Continued)

No.	Gender	Course	Year/ Sem	Feedback
7	Female	Architecture	3/1	- Staircase angle is large, uncomfortable in climbing the stairs - Poor ventilation of staircase - Large columns become an obstacle - Hard to find classroom and toilet due to poor signage
8	Female	Quantity Surveying	3/1	- Study areas provided is not enough, a lot of empty spaces should be properly utilised - There may have tripping hazards because the steps of staircase is not uniform - There is small number of windows available, limited outside view - Markings on whiteboard is not visible from behind, especially those marked in red colour
9	Female	Actuarial Science	2/2	- Departments are centralised - There is lack of car park - Environment in library is nice
10	Male	Mechanical Engineering	3/1	- Lift capacity is insufficient - PA system in lecture hall always not functioning - Chairs in lecture room is bad quality which may cause safety risk to the students - Air-conditioners leakage happened in lecture hall and corridors
11	Female	Actuarial Science	3/1	- Students sitting in the first row at lecture hall for few hours may face neck pain - Staircase is too high due to double volume, very tired after climbing the staircase just to the 2nd floor - Wi-Fi is not accessible from computer lab - Library environment is good
12	Male	Building and Property Management	4/2	- Steps of staircase is uneven - The lift is slow and there is frequent breakdown - Layout at 4th floor is weird because male toilet is not accessible from the same floor - Noticeable cracking on the floor of corridor

Table A - 1 (Continued)

No.	Gender	Course	Year/ Sem	- Feedback
13	Female	Architecture	3/1	- Microphone in the lecture room always breakdown - There are not enough signage - Indoor temperature is very cold - Male and female toilet are separated causing confusion
14	Male	Quantity Surveying	4/3	- Lift is insufficient especially during peak hours - Students sitting far away from the lecturer (at back row) may face difficulty in hearing the voice of lecturer - The signage in this building is minimal - Air-conditioner works well
15	Male	Software Engineering	2/2	- There is limited informal learning spaces provided - Bad acoustic and sound insulation in lecture hall and tutorial room - Carpark area is small - Office size seems too small
16	Male	Mechatronic Engineering	3/1	- Corridors outside lecturer's office is too narrow - Departments are centralised at ground floor, students can access easily - There is malfunction on the PA system in lecture hall, maintenance should be done frequently
17	Female	Quantity Surveying	3/1	- Lift in this building is not sufficient especially during peak hours - Staircase is in double volume and quite steep, so she dislikes taking the staircase
18	Male	Electrical and Electronic Engineering	2/3	- Wi-Fi is not accessible from every part of the building - There is limited socket provided in the building, hard to find a place to charge laptop while studying using own laptop - Students cannot bring in food and drinks at the study areas outside the library

Table A - 1 (Continued)

No.	Gender	Course	Year/ Sem	- Feedback
19	Female	LKC FES Lecturer	-	- PA system in lecture hall often breakdown - Air-conditioner at office is too cold, sometimes there is leakage - Microphone is wired, it is inconvenient to move your hands around while teaching
20	Female	LKC FES Lecturer	-	- The lecturers are forced to wait for the lift since their office is at 7th floors and above, staircase is really not a good option to reach their office - Air-condition should have more maintenance as there is always leakage in the room - Malfunction of air-conditioner leads to a very warm temperature in the office, lecturers cannot concentrate on works

APPENDIX B: Walkthrough Photos

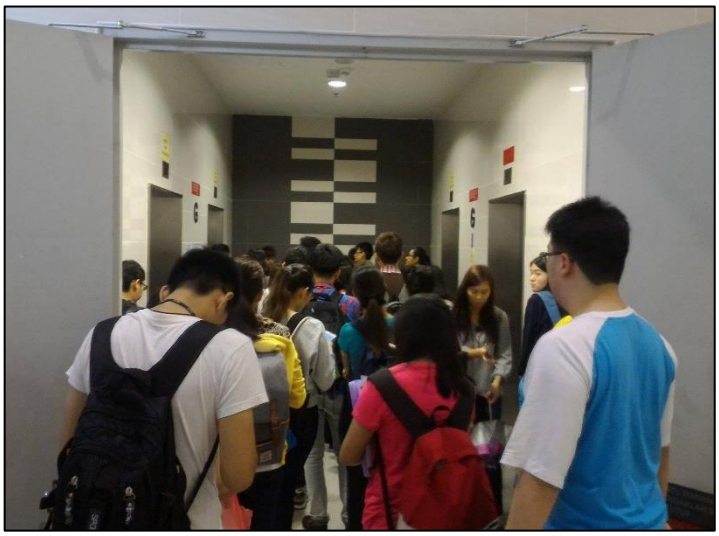


Figure 5.2: Long queue at Lift Lobby 1.

Figure 5.3: Provision and Operation for Floor Indication at Lift Lobby in UTAR KB Block.

Figure 5.4: Provision of Two Sets of Landing Hall Buttons in the Lift in UTAR KB Block.

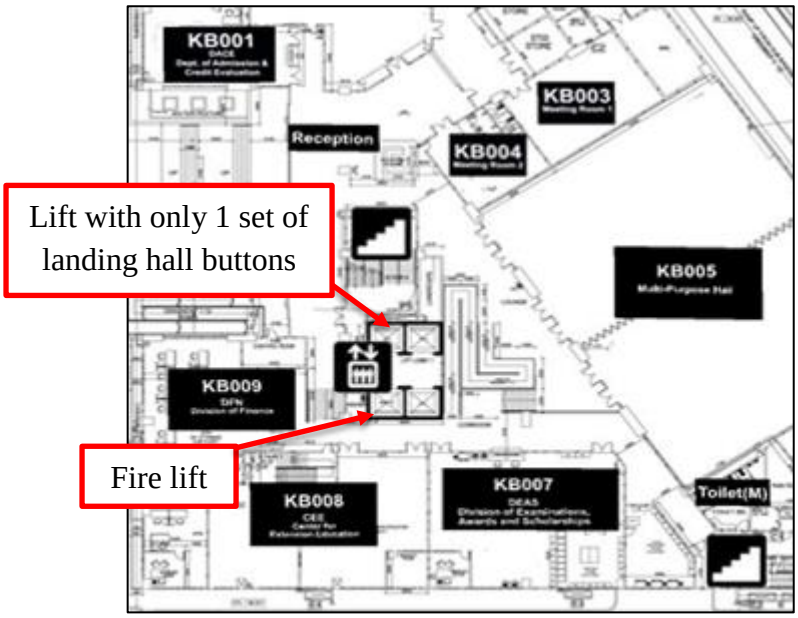


Figure 5.5: Lift with Only One Set of Landing Hall Buttons at Lobby 1 of UTAR KB Block.

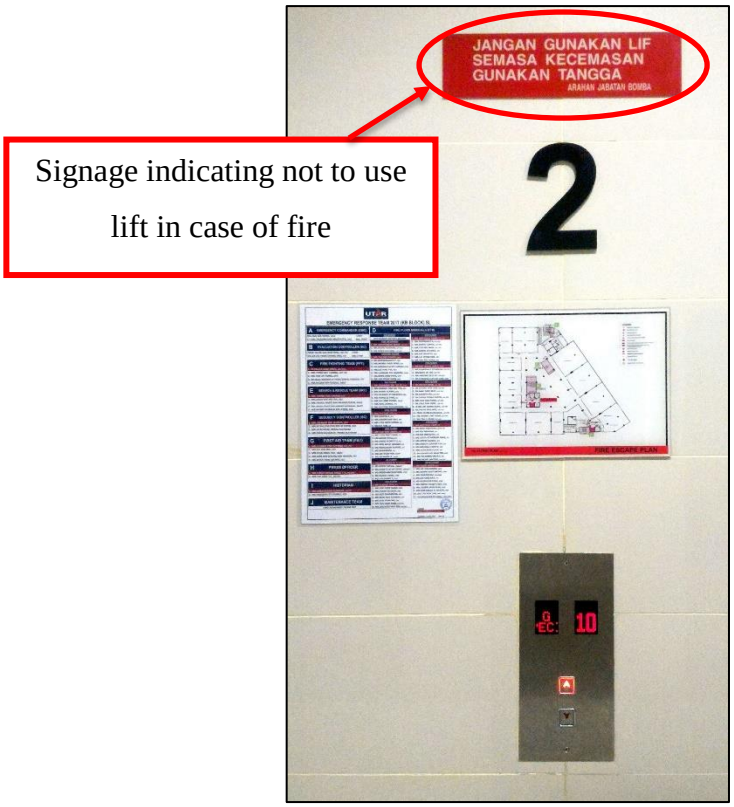


Figure 5.6: Provision of Signage Indicating Not to Use Lift in Case of Fire in UTAR KB Block.

Figure 5.7: Provision of PMA and Signage in the Lift in UTAR KB Block.

Figure 5.8: Load Capacity Data Plate in a Lift.

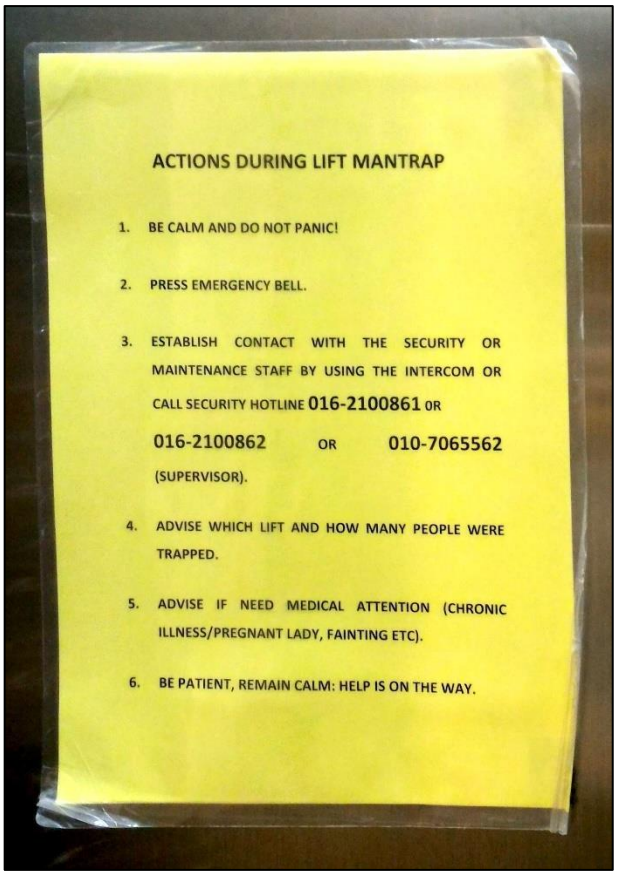


Figure 5.9: Provision of Procedures to be Followed During Mantrap in the Lift in UTAR KB Block.

Figure 5.10: Handrails Provided at Staircase in UTAR KB Block.

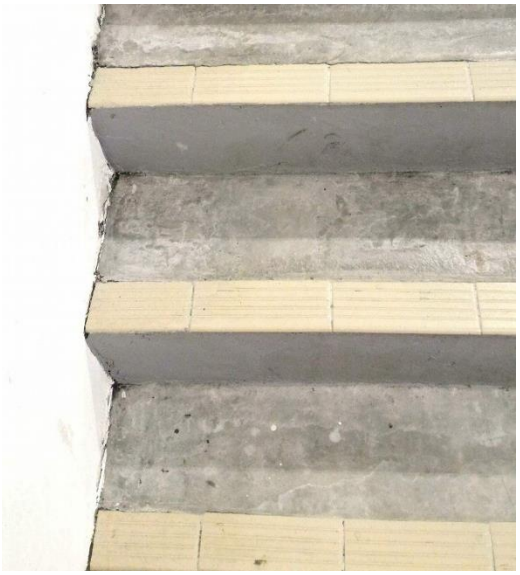
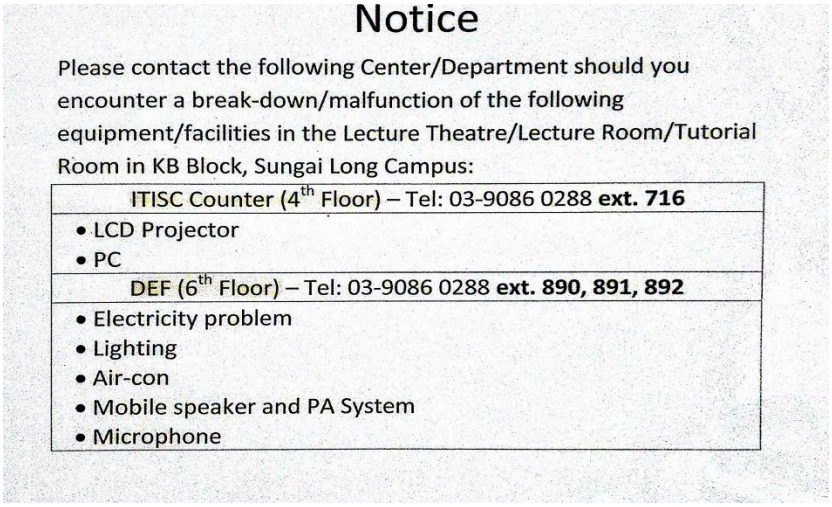


Figure 5.11: Slippery-proof Staircase Finishes in Staircase of UTAR KB Block.

Figure 5.12: Provision of Diffuser or Staircase Pressurization System in UTAR KB Block.

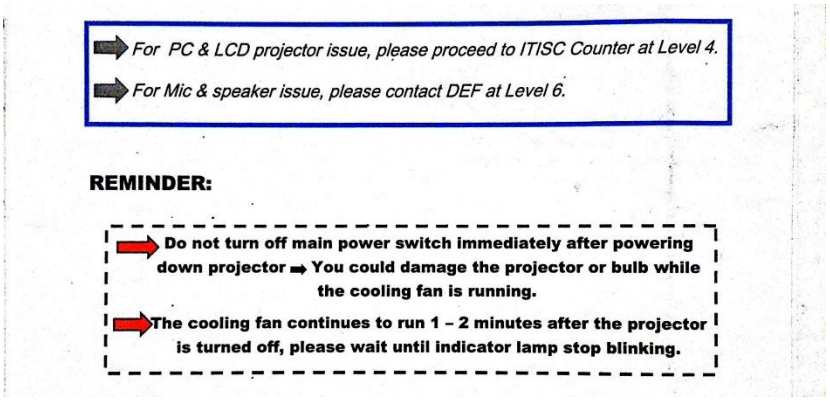


Notice

Please contact the following Center/Department should you encounter a break-down/malfunction of the following equipment/facilities in the Lecture Theatre/Lecture Room/Tutorial Room in KB Block, Sungai Long Campus:

ITISC Counter (4th Floor) – Tel: 03-9086 0288 **ext. 716**
• LCD Projector • PC
DEF (6th Floor) – Tel: 03-9086 0288 **ext. 890, 891, 892**
• Electricity problem • Lighting • Air-con • Mobile speaker and PA System • Microphone

Figure 5.13: Notice for Equipment in the Classroom in UTAR KB Block.



For PC & LCD projector issue, please proceed to ITISC Counter at Level 4.

For Mic & speaker issue, please contact DEF at Level 6.

REMINDER:

Do not turn off main power switch immediately after powering down projector ➡ You could damage the projector or bulb while the cooling fan is running.

The cooling fan continues to run 1 – 2 minutes after the projector is turned off, please wait until indicator lamp stop blinking.

Figure 5.14: Solution Notice for AV Equipment in Classroom.

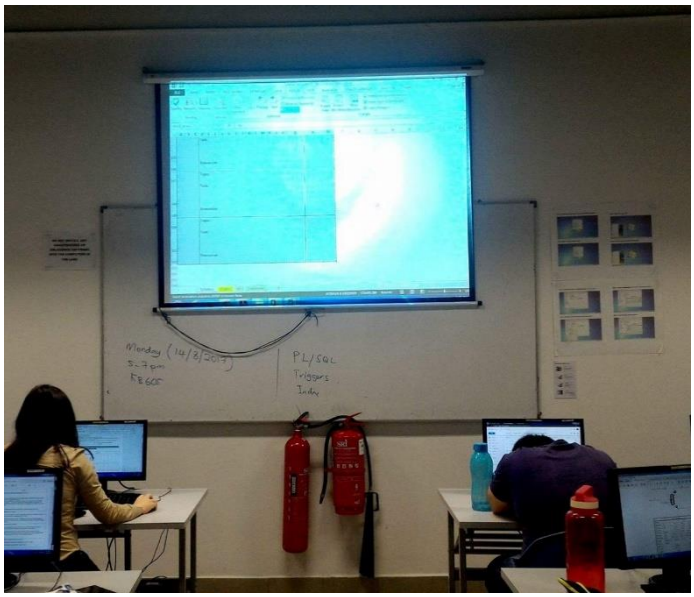


Figure 5.15: Projection Screen and Whiteboard at the Computer Lab (KB607).

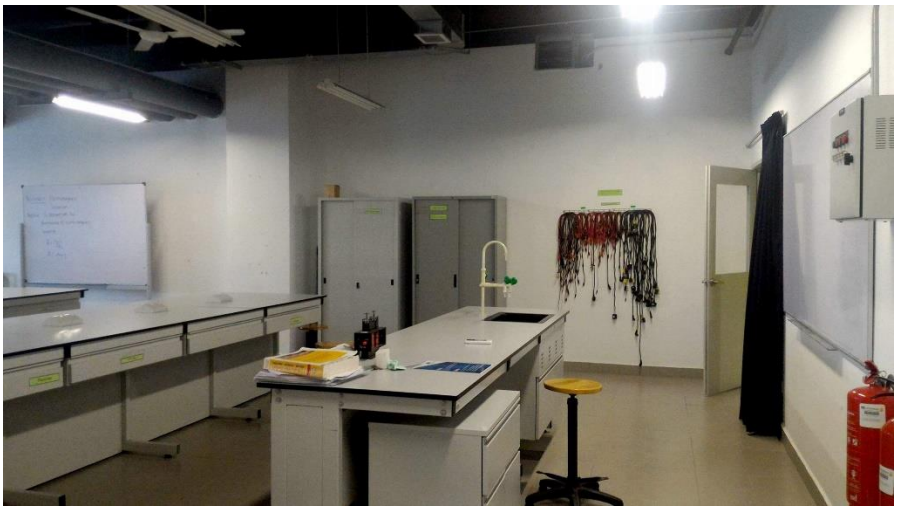


Figure 5.16: Whiteboards in Laboratory (KB505).

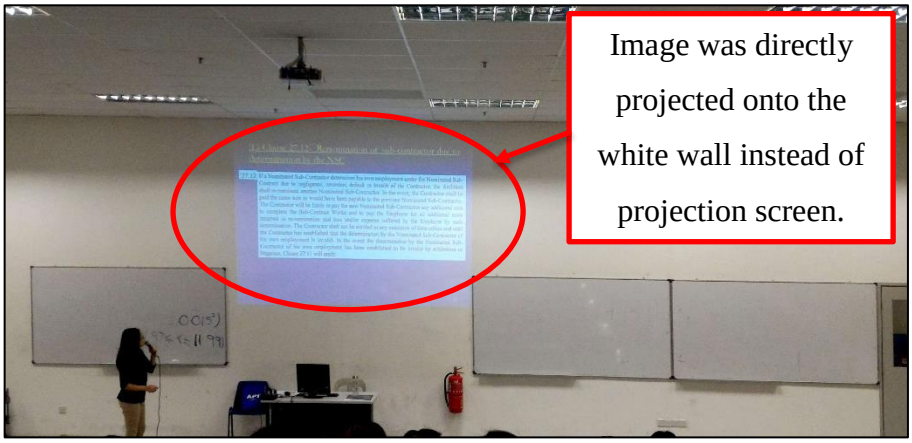


Figure 5.17: Lecture Hall (KB208) in UTAR KB Block.

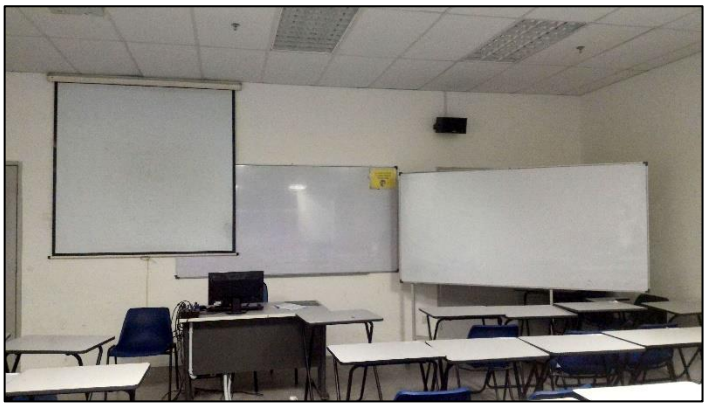


Figure 5.18: Lecture Room (KB520) in UTAR KB Block.

Figure 5.19: Tutorial Room (KB517) in UTAR KB Block.

Figure 5.20: Informal Learning Spaces at 4th floor of UTAR KB Block.

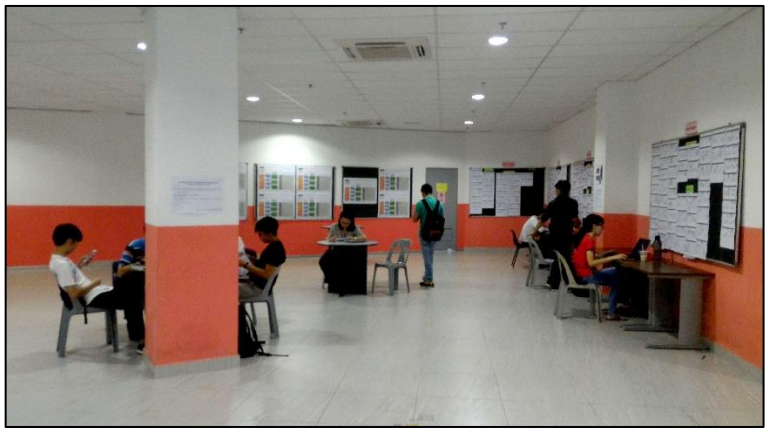


Figure 5.21: Informal Learning Spaces at 8th floor of UTAR KB Block.

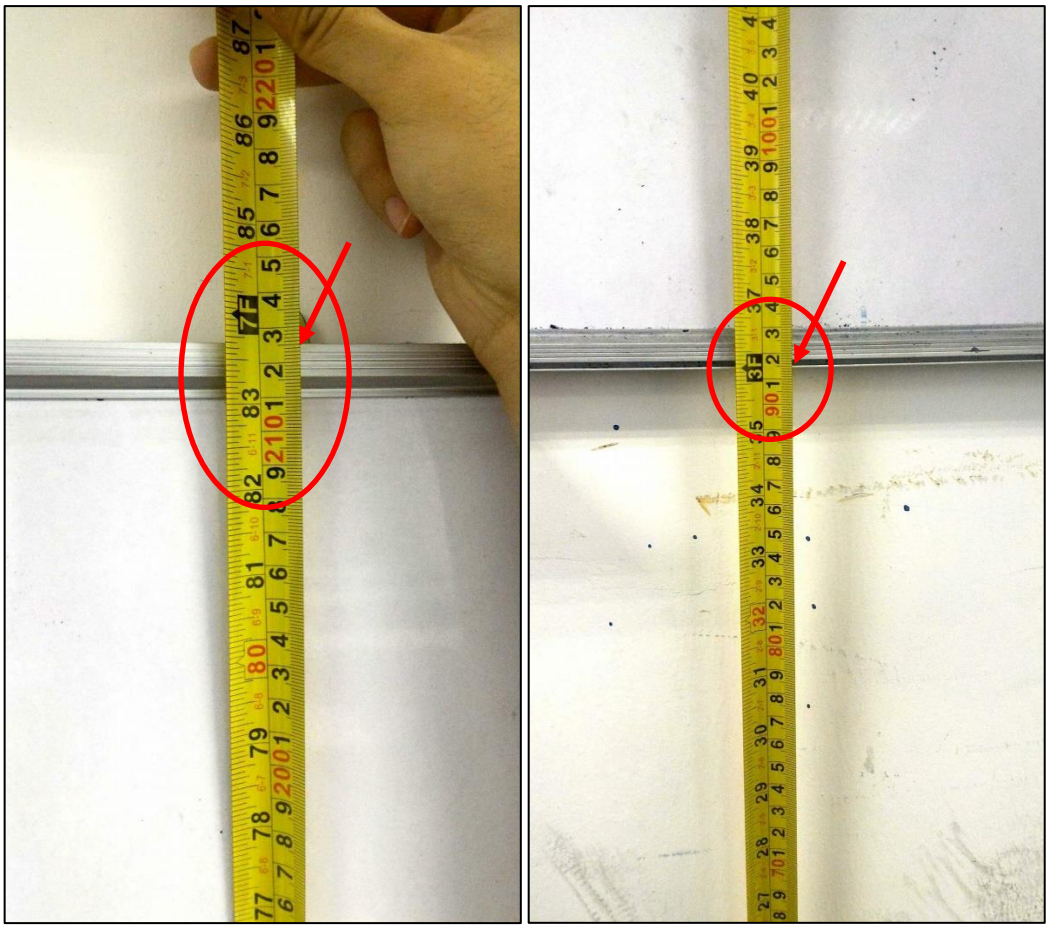


Figure 5.22: The Top Height of Whiteboard (Left) and the Bottom Height of Whiteboard (Right) from the Floor Level.

APPENDIX C: Questionnaire Survey

Post Occupancy Evaluation (POE) to the New Academic Building, UTAR Sungai Long (KB Block)

Dear respondents,

I am Chin Hui Ling, a UTAR Quantity Surveying (QS) student who is currently preparing a final year project titled "Post Occupancy Evaluation (POE) to the New Academic Building, UTAR Sungai Long (KB Block)".

The purpose of this survey is to collect feedback of occupants on the vertical movement facilities (lift and staircase) and learning facilities (AV equipment and informal learning space) in UTAR KB Block. Your feedback is important for possible improvement in the current or future academic building.

The targeted respondents in this survey are students, lecturers or staff who are occupying and using the facilities of UTAR KB Block. Most of them are from Lee Kong Chian Faculty of Engineering and Science (LKCFES), Faculty of Creative Industry (FCI) and Centre for Foundation Studies (CFS).

This survey would take about 5 minutes of your time. Your responses are voluntary and will be confidential. Responses will not be identified by individual. All responses will be compiled together and analysed as a group.

I would appreciate you taking the time to complete the following survey. Please proceed to next page to answer the survey.

Thank you!

Section 1 – Demographic Information

1) What is your gender?
   a. Male b. Female

2) Which Faculty/Institute/Centre/Division are you from?
   a. Lee Kong Chian Faculty of Engineering and Science (LKCFES)
   b. Faculty of Creative Industry (FCI)
   c. Centre for Foundation Studies (CFS)
   d. Other:_____

3) How long have you been occupying and using the facilities of UTAR KB Block?
   a. Less than a month b. One month to one year c. More than one year

4) How many hours do you spend in UTAR KB Block per week?
   a. Less than ten hours b. Ten hours to twenty hours c. More than twenty hours

5) What is your height?
   a. Less than 1.50 m b. 1.50 m to 1.60 m c. 1.60 m to 1. 70 m d. More than 1.70 m

6) Please tick the following(s) if you have any. You can choose more than one answers.
   a. Overweighed b. Visual impaired c. Handicapped d. I don't have any of the above
   e. Other:_____

7) Are you a student, lecturer or staff in UTAR?
   a. Student b. Lecturer c. Staff

8) Which floor(s) do you commonly study/ work on?
   a. Ground floor to 3rd floor b. 4th floor to 6th floor c. 7th floor to 10th floor

Section 2 – Vertical Movement Facilities

1) What is your preferred mode of travel to the floor(s) you commonly study/work on?
   a. Staircase b. Lift

Section 2A – Lift

1) Why will you choose lift as your preferred mode of travel? You can choose more than one answers.
   a. It saves time
   b. You are not willing to use the staircase
   c. Lift is not your preferred mode of travel
   d. Other:_____

2) What is your satisfaction level towards the quality of lift service in UTAR KB Block?
   a. Satisfied b. Tend to be satisfied c. Tend to be unsatisfied d. Unsatisfied

3) How long are you willing to wait for the lift at the lift lobby?
   a. Less than 30 seconds b. 30 seconds to 60 seconds
   c. 60 seconds to 90 seconds d. More than 90 seconds

4) How long are you willing to travel in the lift car?
   a. Less than 30 seconds b. 30 seconds to 60 seconds
   c. 60 seconds to 90 seconds d. More than 90 seconds

5) What problem(s) do you face while taking the lift? You can choose more than one answers.
   a. The waiting time at the lift lobby is too long
   b. There are too many intermediate stops while travelling in the lift car
   c. The lift often breakdown
   d. The lift has no problem
   e. Other:_____

6) In your opinion, which of the following lift operation method(s) saves more time? You can choose more than one answer.
   a. Lifts which transport people from and to every floor.
   b. Lifts which only transport people from and to certain floors (even or odd floors)
   c. One or few designated lift to only transport people from and to higher floors, i.e. 5^{th} to 10^{th} floor
   d. Other:_____

Do you have any other feedback on lift? If yes, please write it down:

_____

_____

Section 2B – Staircase

1) Why will you choose staircase as your preferred mode of travel? You can choose more than one answers.
   a. It saves time
   b. The waiting time at the lift lobby is too long
   c. Staircase is not my preferred mode of travel
   d. Other:_____

2) What is your satisfaction level towards the staircase in UTAR KB Block?
   a. Satisfied b. Tend to be satisfied c. Tend to be unsatisfied d. Unsatisfied

3) What problem(s) do you face while using the staircase? You can choose more than one answers.
   a. The staircase is too steep
   b. The steps are uneven
   c. There are too many steps between landings
   d. There is no problem on the staircase
   e. Other:_____

4) What will motivate you to use the staircase instead of lift? You can choose more than one answers.
   a. Beautiful mural paint
   b. Posters
   c. Able to burn calories or as part of your workout
   d. Other:_____

Do you have any other feedback on staircase? If yes, please write it down:

_____

_____

Section 3 – Learning Facilities

Section 3A – Audio Equipment (Microphone and Loudspeaker)

1) Please tick (√) the following questions on microphone in the lecture hall.

	Yes	No	I don't know
Are you satisfied with the performance of microphone?			
Is breakdown frequently happened?			
Is there enough provision of microphone?			

2) If you are going to deliver speech to the audience, or if you are going to listen to the speaker, which of the following types of microphone would you prefer?

a. Wired microphone	
b. Wireless handheld microphone	
c. Wireless headset microphone	
d. Lapel microphone (Clip-on vocal microphone)	
e. Other:	

Do you have any other feedback on microphone? If yes, please write it down:

_____

_____

3) Please tick (√) the following questions on loudspeaker in the lecture hall.

	Yes	No	I don't know
Are you satisfied with the performance of loudspeaker?			
Is breakdown frequently happened?			
Is there enough provision of loudspeaker?			

Do you have any other feedback on loudspeaker? If yes, please write it down:

_____

_____

4) Will breakdown of microphone and loudspeaker affects your learning/teaching process?
   a. Yes b. No

Section 3B – Visual Equipment (Whiteboard, Projector and Projection Screen)

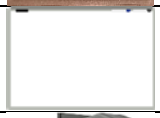
1) Please tick (√) the following questions on whiteboard in the lecture hall.

	Yes	No	I don't know
Are you satisfied with the performance of whiteboard?			
Is there enough provision of whiteboard?			
Is the whiteboard located at a comfortable height and location?			

2) Please tick (√) the following questions on whiteboard in the tutorial room.

	Yes	No	I don't know
Are you satisfied with the performance of whiteboard?			
Is there enough provision of whiteboard?			
Is the whiteboard located at a comfortable height and location?			

3) If you are a lecturer who could choose a writing board when teaching, or if you are a student who could choose a writing board when learning, which of the following types of board would you prefer?

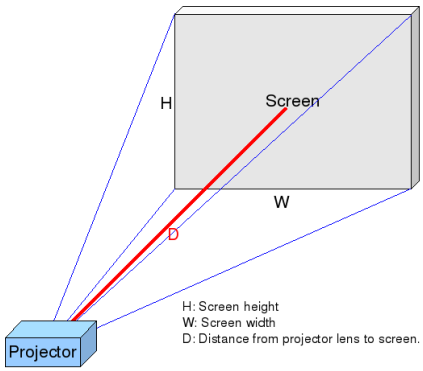
a. Chalkboard	
b. Whiteboard	
c. Interactive board*	
d. Other:	

*An interactive whiteboard is an instructional tool that allows images from the computer to be displayed onto a board using a digital projector. The instructor can then manipulate the elements on the board by using his finger as a mouse, directly on the screen.

Do you have any other feedback on whiteboard? If yes, please write it down:

_____

_____



1) Please tick (√) the following questions on projector in the lecture hall.

	Yes	No	I don't know
Are you satisfied with the performance of projector?			
Is breakdown frequently happened?			
Is there enough provision of projector?			
Is the projected image located at a comfortable height and location?			

2) Please tick (√) the following questions on projector and projection screen in the tutorial room.

	Yes	No	I don't know
Are you satisfied with the performance of projector and projection screen?			
Is breakdown frequently happened?			
Is there enough provision of projector and projection screen?			
Is the projector screen located at a comfortable height and location?			

Do you have any other feedback on projection screen? If yes, please write it down:

_____

_____

Section 3C – Informal Learning Space

Informal learning spaces refer to spaces where people could stop by for discussion, social activities and consultation, generally in the empty or open area outside the lecture and tutorial room.

1) How frequent you use/visit the informal learning space in a week?
   a. Daily/ almost daily b. Two to three times c. One time/ rarely d. Never

2) What is your satisfaction level towards the informal learning space in UTAR KB Block?
   a. Satisfied b. Tend to be satisfied c. Tend to be unsatisfied d. Unsatisfied

3) Do you think informal learning space is important/ not important in your learning process?
   a. Important b. Not important

4) Why do you think that informal learning space is important/ not important in your learning process? (Please answer this question)

   _____

   _____

5) Please tick (√) the following questions on informal learning space (ILS).

	Yes	No	I don't know
Is there sufficient ILS provided?			
Is ILS near to lecture hall, tutorial room, student activity area?			
Is comfortable furniture, seating arrangement, temperature and lighting provided?			
Is it accessible to wireless network, plug socket, food and drinks?			
Is ILS quiet or private?			

6) Which of the following factor(s) on informal learning space is important to you?
a. There is sufficient informal learning spaces provided
b. It is near to your next activity
c. It is comfortable
d. There is accessibility to wireless network, plug socket, food and drinks
e. It is quite and private
f. Other: _____

7) In which floor(s) do you think that more informal learning space is required? You can <u>choose more than one</u> answers.
a. Ground floor to 3rd floor b. 4th floor to 6th floor c. 7th floor to 10th floor

Do you have any other feedback on informal learning space? If yes, please write it down:

_____

_____

- END OF QUESTIONNAIRE -

THANK YOU ☺

APPENDIX D: Interview Survey

Specialist field:

Years of Experience:

1) What do you think about the staircase and lift in terms of function and design?

2) Do you think that there is existence of design inadequacy in staircase and lift?

3) Have you observed any breakdown? What do you think about the root cause(s) of breakdown?

4) What is the possible improvement on staircase and lift?

5) What do you think about the learning facilities (i.e. microphone loudspeaker, projection screen and whiteboard; informal learning spaces) in terms of function and design?

6) Do you think that there is existence of design inadequacy in learning facilities?

7) Have you observed any breakdown? What are the root cause(s) of breakdown?

8) What is the possible improvement on the learning facilities?

APPENDIX E: Transcript of Interviewee 1

If talking about lift only, in general I think, or more specifically, is not insufficient. Due to the fact that, one of the thing is the waiting time is too long, and then the second thing would be, even though they try to use the odd and even numbers, but you will realise that people are a bit annoying that sometimes you have to walk down one floor, walk up one floor, sometimes you need to wait for a long time and definitely it is not a sufficient way, or the efficiency is not there. But also come back to another aspect in terms of the developer side point of view. From the developer side point of view, lift is a very expensive equipment, unlike anything else that you can simply install. One lift sometimes costs around half a million, and then lift has to come along with other additional space like lift lobby, and a staircase around it. So it will take up extra space, and when they consider about the occupancy rate, the numbers of students that are going to use in this building and they realise that they cannot afford that/ afford the essential space is being for a lift, and that's why it is it is a win-win situation, where I provide something that is just enough, and if not enough, will need to think about another way for example the odd and even numbers lift, and encourage students to use the staircase as a way of green technology or green energy or for a better and much more healthier life as a good exercise, and that's how we get to it. Talking about the staircase, the staircase is always in a way, the first thing come about is fire escape. In terms of the basic criteria, compliances with the fire requirement, I think the Architect of this building has complied with the regulation. But talking about the good experience about staircase, no. Our staircase is much more means that to walk up and down. It never ever want to spend or think that staircase could be upgraded to a better quality and feel good to walk on it. The location of the staircase is merely to fulfill the fire escape requirement. They never think that more staircase needed in some other places. Therefore, staircase is not for luxury or satisfaction use but just to meet the fire escape requirement, and enough for students to use from one level to the other. The other thing that I personally is lacking is escalator. We do not have escalator because during the peak hour, sometimes escalator is much more efficient than the lift. Maybe one of the thing the developer have come along is the cost plus the maintenance. Nowadays if you see from the public media, the escalator has become a very

dangerous, sometimes it jams, someone get killed, hands get chopped off. These may be why we do not have an escalator.

And another area that I think is not sufficient is toilet where they might on the certain consideration they separate the male and female toilet to be the very far end. And to the end user and the staff want to use, it is very inconvenient. The male has to walk to another side if they are near to the corner of female toilet, so it's not a very good design/ But they might consider safety, as they might think that with female toilet on one side and male toilet on the other side, they won't mix around, the crime can be prevented. That might be one of the consideration but i think as a university, the occupants is not a kid, they are adults, they should be mature enough to think about what is the consequences from their behave. So I think that the decision making is not very ideal.

Another thing to add is insufficiency is the double height volume, from second to third floor. Usually when you have a double height volume, you would like to have a natural sunlight come into the centre and we define it as a light caught or air well. But here on top it is just a floor and you do not have the pressure or pleasant of natural lighting into that area and you realised that they rely on the artificial light and also the lighting is at the minimum, it is a normal fluorescent light and that area is almost an death space.

Another factor would be the noise, and that area is just unbearable. It is in peak hour or peak time, when all the students come to that area, you typically cannot speak to anyone because of the noise. That is something that I think the designer has to be much more sensible.

Another aspect is the walking path within the building. You will realise that there is no designated walking path for the user. One of the factor would be, they just say "OK I have this much space and I put in my space" the rest you just be the walking path which in many of the good designer would think how to walk from one point to another, how can you using the materials, the size of walkway and any other kind of feature so they walking in a building is good. For example, in 10th floor, you have many opened space, columns of no direction, just column, sometimes if you could think carefully, it can placed logically and strategically, so the column can form a column net, but that is something that we do not consider. Then of cause we have

something on the 10th floor, we have natural sunlight from above. What above the landscape? So you realise that this building is almost a concrete jungle, you go anywhere there has solid wall, of cause they will put some good sensors but lacking colour. Human particularly in Malaysia, we have plenty of green and the green has become part of our memory in our mind, if we have the opportunity, not talking about lower ground, but a large part of open space, why not design some greenery or landscape? When you walk up, you feel good. One of the thing they fail to look at it, they thought that open space is good. But in a real sense, when you walk in the 10th floor, you don't feel comfortable because the thing is so open, everyone can see everybody. It become a psychological effect that people feel uncomfortable, because it is like a fish tank, people look at you for enjoy, so you don't feel there is privacy while walking in that space. The space is like "ok you just want to be there, just for certain purposes", but you won't put a chair and table and start to study there, because it's too open, no privacy is provided. Sensible people will willing to spend a bit of money on it.

At the staircase you have some balcony at 5th/ 6th floor and you realise that the balcony is so dry. They just want to keep it nothing there, it's all clear, and you just see the modern technology like concrete, steel, glass and what else? I think those are the areas that probably we can have some green plant because first is when you see green, it's good to your eye and mind, and also we get two things if proper type and height of green is chosen: first is cut off the extra sunlight come into the room, because too much sunlight is no good. Just like when you go out, you want to put on sunglasses, because too much sunlight, and that is not comfortable. And plus heat, so the heat goes in the building, you need to generate more air-cond to cool down the building, that is not a good proportion.

The third thing is of cause any natural plant will take the carbon dioxide, they give us oxygen. So if you are near to the natural environment, you feel some plant around your building, you will able to let the plant to set the level as same height to you, then all the green will give you free oxygen, that is something that we can do it but because of the consideration like the maintenance, keep on watering, dark area to attract mosquitoes. But we need this green building, we are pushing them away and enclosing ourselves into a concrete, steel, glass. And there is something we can improve.

And talking about the staircase itself, I work in an industry, sometimes you never know that staircase, people are very particular on number. The number has play one of the magic, like you won't have level 4 right? But level 3A. But there is something they manage to take note to it. But one thing is whether they miss out something or overlook, if you go to some of the level, particularly on level 3,4,5,6,7,9, you walk, every half flight is 14 steps. If you're talking about Feng Shui, it's definitely a no-no. No 4. And then that's why if you are the one that know the psychological of the Chinese culture, this is something that is not good thing. If someone particular about this, they will feel a bit uncomfortable, and then they feel very discourage, and eventually they don't feel like working in the environment and they don't feel good. So, I don't know, you can just stretch it a bit become 13, 13 is best. Or you can compact it make it 15. And then if you have done that like 13,13, that's perfect. I don't know why, they don't put that into consideration. And this has become something that's permanent. And then that's why, I don't know, you will realise that/ observe that all of the lecturer's turn out rate is very fast, means they work here for few years then go away. But I'm not the Feng Shui expert, but good environment not just come from the outside, but also the physical things happened around. I would say some of the fundamental Feng Shui is not observed. And that's why they might have some bad thing observed.

Whatever being provided is just for fundamental/ basic requirement, they never go beyond that. Except one area is the main entrance. That one I agree is good. People walk in and there is water features at the side. That's impressive. But other than that, you walk around the building and see that, ok it's just meet the basic requirement. I don't think they want to spend some money to upgrade it, maybe at the initial stage, but UTAR is a non-profit organisation, they just build the basic. But a building or we call it as a magnetic effect. If you have a good design, people will come here happily, eventually it become like something that attract people. I'm not involved in the design or management process of this building but as a professional, we deal with a lot of good design, I think that it would happen, but it's not easy, because somehow if you want to try to pursue the client that good design, please think about it, then the person may say that money, do we have the money, if not money, then ended up with this kind of thing, all the standard things, that's enough. But you forget one thing, why

people go to IKEA than go to normal roadside perabot, why? Because people see more things, you see something in the Facebook, internet, people taste and requirement are getting better and better. Therefore, something you provide some basic, but that's not enough. I think that having better taste and design definitely is more productivity. Because if I in a place that's provided with better equipment, table and chair, then I will love to be there and love to work more longer. Here I have to bring in my lighting, chair, artwork, at least I say that this is the space that won't let me so boring. So, this is a building with 10,000 people and 200 staff, it's not easy to make everyone happy. So they give you the basic, you can do whatever you want.

In terms of the overall, it meets the requirement. It's just like a car, you want a car that can go everywhere, it saves the petrol, energy efficient… a Kancil! Are you happy with Kancil? That's the thing. Always remember you can't spend money on every corner, so they did some good job - at main entrance and MPH. At least there is a balance. You can see that not all the spaces here are terrible. I think that if I were to say that, make more possible design to invite sunlight into the building. If you are sitting here you don't know outside is raining, morning, night time. This is not a natural environment. So we try to make the environment more close the nature environment. If possible, to have some green to incorporate into the building. Some of the corner should be designed a bit so it is much more pleasant. If you walk around the building, you realise that the only thing is just sit on the floor. Can we have simple plan or wood, so people can sit there to have some chitchat. Of cause they turn some of the corner into study area, but from a psychological view, should put nice furniture around to make people happier, and some of the important space like 10th floor, main entrance, MPH they should upgrade on it, so at least when you walk there you will feel that oh it is an oasis. For example when you come in you feel like cold jungle, why not to have some landscape, tall trees, you can touch and rub on the surface of the trees. It is very amazing, but somehow you don't have that, and that's my perspective. I think that having a green plant or landscape is much more prudent than you put in some expensive material. Of cause if you say a much more higher grade instead of a normal tile, you talk about marble, granite floor, of cause that oe is a plus, but I think ,we are still part of the nature, if you cut yourself out of a nature, and you talking about this is a university, how can you make the user in the way is like they are within the nature,

you don't see any green plant right? This is the thing that it is good to bring it back. But might not. 29:35 TBC

The author: Just now you mentioned the lift right, now they arrange in odd and even floor but before this they don't, so which one do you think it is better in terms of waiting time?

Of cause there is an improvement in terms of system, efficiency and waiting time. People are more focused, now if I want to go odd number, I use one side of lift, and if I want to go even number I go this side. So efficiency is increased but in general it just a bit of improvement but it did not solve the overflow problem. You still can see that when school starts, when there are 8 or 10k people coming in, then you still hear people try to curse, the queue is so long, then the problem is not a happy solution. It still have room to improve.

The author: What kind of improvement do you expect?

You need more lift but now it is not able to achieve and that's why there is a campaign to encourage people to walk upstairs and saying that it can count your heartbeat, calories burnt and they give you a certificate, they try to make people feel that if I walk up the staircase I feel good. But in terms of exercise this is true, because when you exercise you feel better. Talking about walking up for youngster is ok, what about the professors, some of them are 60 or 70 years old. Do you think they can climb? Improvement is there but not big. Actually we need 6, and then another 4 = 10 lifts. But the best thing is we need 3 groups of lifts, now only has 2 groups. So another corner is always neglected. We think that the corner is not walking distance. Walking is time-consuming.

The author: But they cannot change it already right? You need to add in then you need to hack…

You need to think so many things, talking about vertical, 10 storeys and from floor to floor you will have the steel, stirrups. No. It can change, but what about the justification, what are the trade off you want to give for this change. Maybe, they build

another building and then shift 30 or 40% of the students to the new block. And let say we use a number of 6k using 6 lifts, and that's good. It is one of the way. This thing it comes naturally, because now the economic is so bad, you can feel the pitch, student involvement may drop. By naturally, the student drop, the lift becomes more efficient.

The author: For the staircase, just now you mentioned the developer just fulfill the basics, but do you think that the angle, the steps, rise and going height is…

Ok lah but it is not comfortable. Now you are projecting about 30 degree, so if you want a comfortable staircase it should be 22 or 25 degree. But in a public building, we cannot afford this kind of achievement, we only can do that in a private building.

The author: and its double volume, so it is very tiring right?
Yes, and because of inclination is not so flat, so it is tiring. I totally agree with you and you got to have someone who is physically very strong. But normally for normal people, it is not. For me walking down is ok but walking up for me maximum is…
The author: how about other problems of the staircase like do you feel that the staircase is uneven?

I don't feel that, the bio law says that the steps between the same flight must be same, but this flight and another flight they don't have to be the same. I don't feel that, it is still acceptable.
The author: So you think that the staircase campaign is effective?

Well awareness is there but in certain case there is unhappiness of some. In mind, before that you feel that not happy but after the campaign, you realise that actually if I walk, it is good for my health, that's a psychological affect. Actually it works.

The author: So you climb the staircase now?

No. I won't. Because my age is different with yours. So we don't mind to walk down, but while walk up our knees may not able to support it. So the age gap anything above 40 or 80 plus might not be a good solution. But majority of the occupants in this building is 85% youngster. So still work. Talking about this kind of demography.

The author: So you think there is increase in the use of staircase?

Yes. People are psychologically to think differently by using the staircase. But still heard people cursing “the queue is long” then walk up. We have to understand human are we get used to certain thing after sometimes. So they make us to walk, after walking a few round, weeks or months, eventually you say, that’s it, I accept it, I do it. This is how Asian country think. It achieve the goal.

The author: Can you talk more about the AV equipment? Like the microphone, loudspeaker, whiteboard, projection screen.

As I said before, it meets the basic requirement, like a Kancil. Of cause we wish better car like Toyota, Honda, but the problem is, when you have a better quality equipment, people will steal. Stealing is another problem. They will think that, “wow this speaker worth about thousand ringit” they steal away. So how? Eventually, just go to the basic - “ Oh this one only RM10 ah, just go to the pasar malam and buy” so people don’t steal it. So it serves its purpose, of cause off and on, you realised that some quality is to bad.

The author: Will it affect your teaching process?

In some of the lecture hall yes. That one is because of the wall partition and the acoustic. When I speak, I can hear the noise from other side and it is quite irritating. I think that can be improved by modifying the wall, make it thicker, add more insulation. This is not a difficult problem. You just need to identify where are the source of problem. Another possible acoustic problem is because of the ceiling. Sometimes the wall is up to the ceiling, you never realise that inside the ceiling there is still empty space, so the sound is coming from top down. Then you look at it physically and you open up and see, the wall just up to the ceiling or the wall punch through the ceiling, up to the slab above? So this one you really need to look at it, and if you identified the problem just extend it and seal it, so the problem stop.

The author: So mostly you are teaching in lecture room is it?

No we have our own studio, sometimes we also teach outdoor, this is our architecture they allow our students to go to the site, and we just deliver our lecture there. We have a mix of lecture hall, studio and outdoor. That would be better, because student have different kind of scenario and experience and that's the good thing about our programme. Flexibility and this kind of opportunity.

The author: So AV equipment not much complain right?

No, it's just ok lah, fulfill basic.

The author: How about the informal learning space? What I mean here is the opened area outside the lecture and tutorial room.

Actually I would say that, privacy is a major concern. Another thing is the lighting condition, all fluorescent, which is very tiring, it is not a good learning condition. So we will prefer to have some yellow light, more cozy, so that the feeling is much more comfortable, like you go to Starbucks, you have a much more enclosed space, sitting lounge. Another thing is that this area is very lacked of vending machine that sells drinks and food. If you want to buy anything, you go out. So they should provide some vending machine around so that at least the students feel tired, they don't need to go out, get a cup of coffee. It is not happened?

The author: Do you think that the space is enough? There is many opened space but there is no table and chair.

I think the essential question is have the space comfortable. If the space is comfortable, it is always not enough, but if the space is just basic then people know and feel that it is not a comfortable space, I'm going home, Starbucks and cosy place to study, so people are running away. The fault is design issue, are we comfortable, it's not about are we enough, is are we having comfortable space for the student to feel that it is nice to sit in. Even if I'm sleepy here I want to study I'm so tired and sleepy and when I need to get a cup of coffee, go outside. I walked out, spend half an hour then come back. So the thing that is provided is not sufficient. The comfort level is not sufficient from the designer point of view.

The author: Any other thing you want to add on?

I think I add on quite a number of things already, the car park is another issue and headache.

The author: Do you know why UTAR height is only limited to 10th floor?

Because of planning control, that means if they want to develop a project, the planning department in MPKj will look at it. They will zone it according to the zoning, they might have already zone that UTAR this piece of land, what is the density, they also put in the height control because of the surrounding environment. They don't want to build another giant or monster compared to other building. That one is about the planning control. The next thing is cost. Everyone think that we should build 30 floors, but do we have money? This building's construction cost is around 100 million. Do we have more money? Building an institution, we cannot get loan from the bank, so they build from the cash of donors, cash from the fund raising, from the saving account you saved for past 10 years, so get 100 mil. And it takes years to get back the money, it is not a good investment. This are the thing that come out with the solution, formula or recipe for this building.

The author: UTAR is not the developer?

In this case yes, UTAR is the client and also the developer, means they will get architect to design to design, and they tell architect what kind of space requirement, and the architect will go to the authority and check. "OK, this is the land and how much area they can build" and they just do conclusion saying that "ok, 10th floor is the maximum, you cannot go beyond that". Because you want to build higher, can, authority say pay me lor. You have to fork up another three to five million as a donation. Then they allow you to build high, but do we have money? Or do we need it? Are we simply throwing away the money to the authority because just to build a few floor higher? That is the question that unless you can access the top management then they can only tell you the exact answer. Or it is a political decision because UTAR

is MCA, MCA will link to UMNO… so I don't know, don't ask me, I did not involve in the planning and construction.

The feedback of this professional like that, but don't quote my name ah.

The author: How many years have you be an Architect?

Oh, 30 years. So it's long…

The author: So what are your speciality?

My speciality is to produce good architect students.

APPENDIX F: Transcript of Interviewee 2

Talk about the lift, lift for this building is under design, it is not sufficient although they have make improvement by changing the lift stop over levels. There is some improvement but in actual facts, these lift allocation during the design time is overlooked in terms of the number of lift is not enough and maybe the type of lift they used is not calculated properly because of the speed of the lift is not fast enough. Maybe the size of the lift they also never calculate properly. Therefore the lift is not working properly to cater for this whole building. Of cause it is very stressful when you wait for lift, queueing up, it's very slow. This lift problem, the whole building is totally designed with very minimum thinking in architecture. Because you go to the lift, you always see people go to level 2 or 3A, which is the lecture theatre and the library. Why can't you design lecture theatre and library in ground level? Then they don't need to use the lift, then the lift you have is enough to bring you up to the top floor. Because to go to the 2 places you just enter, or just one level up, people still can walk one level up without using the lift. So the problem is the space allocation is wrong. The library should not be in 4th floor, the lecture theater should not be in 2nd floor. The architect who design don't have a sense how to do the space.

The author: How about the MPH?

MPH can be on the roof, yes, not need to be at ground level, MPH is for you to do exams, functions, why can't you put at the roof, so nice, you have view can do a nice landscape on the roof. MPH can be a very special event on the roof and every student is encouraged to g to the roof for community, interactions for all these kind of things. And the MPH is not important. We need a gallery, we don't have a gallery. Gallery like QS student you can do some projects, architecture so many nice projects they have done, and engineering they have done some special model, then the gallery will exhibit all the student's work which is very interesting, you got so many department here, every department has something interesting to show, a lot of public will come to see new ideas from UTAR, without advertisement, everybody knows UTAR, it's innovative, it's so advanced, they always think something different from other people. Then UTAR just becomes so great, straight away. This is rubbish building.

Then you talk about staircase, the top management they know they made a mistake, this is top management problem. They made the lift not sufficient, their decision causes these. It's not the architect, they take instruction. They try to rectify so they ask the students to climb the stairs and give a lot of slogan like better for your health, your sugar level etc. If you want the students to climb the stairs, you top mangement climb, show examples to the students. The president climb the staircase everyday and made it to the ceremony. The president enters the staircase, let everybody clap, show it to all the students, then become an event for students to follow president and staff to climb up the whole building. But you ask the student do but you don't do but that the lift. You know me or not. Although now they force the students to take the alternate level then you climb down, that's not so bad because the students still can do as climbing down is easier than climbing up. So the staircase they have, only a few staircase facing outside and you got the view when you walked down it's nice. The main staircase in the middle, is so dark and so big but nobody use. If the bigger staircase to use it to circulate to bring people, they think that this is the staircase to bring people up and down the building. But that staircase nobody use, so what the school going to do about it. Then the whole thing jammed. So in order to solve this problem, either you add more lift but is it possible. Nothing is impossible you can add more lift, but will management agree or not to add more lift, you add at least 2 more lifts will solve the problem. And in this building, you don't have service lift. You see you go to the lift, the kakak push the rubbish bin and disturb, the kakak you should make her work during night, why they go to fight for the lift with the students in the morning? Why the management cannot make the kakak to push the rubbish bin after 7 o'clock? Nobody use the lift and he go clean and push the trolley. Why the management so care about the thing and make the system doesn't work? You get me or not. So if these thing happens, how to solve? Either you add lift, you don't add lift, you must add escalator. Escalator from ground to library level. That's it. Then they will not take lift, they take escalator to go up to lecture hall, and from lecture hall they go up to the library and classroom. Then at least 4 levels of people will not take the lift, then the lift will function. Then the escalator is good. The campus is looked like a shopping complex. You can bring people up and down. That's for lift and staircase.

Then in terms of the space, it's not a nice design at all. It's not a nice design you see, they design everything around the building and in the middle they left it as a multipurpose area which is opened. That's a leftover space. It's not you design the space for certain function you want to do, they do it because they cannot solve already the planning. It's just a leftover space in the building. And that space, so dark, no light and view, actually it's not a very attractive space for people to use. Let say that kind of dark space is very dangerous. Let say this building is intruded by outsider, this space is all corridor. When I first come into this building the first month, I cannot find my lift because I always lost in the building, it's not clear, the whole building design is terrible design. Ok I already comment on lift and staircase, what else you want to comment?

The author: and also the AV equipment, ok microphone first.

I went to most of the classes, I never use the lecture theater, I only sit in the lecture theater, I saw there is a microphone, there is a projector, it works. But when I go to classroom, there is also projector, microphone, desktop there for you to key in and plug in all the pendrive etc. To use the classroom, not all the classroom has projector, some have some don't have. Majority don't have, we have to book the projector from the ICT. The problem is we need to book the projector, I think this is very troublesome for the lecturer, everytime they have to think how to key in to request the projector all this kind of thing and the thing is the projector they give somtimes is not a good projector, the colour is not correct, the sharpness is not there. So you the image shown is not clear because the projector is not a good projector. This is a minor thing, you have almost 10k students, this projectors are very cheap and there are good projectors, and some projectors very small only, this projectors we have is very outdated. The new projector they make it very small and they do it very advanced, the resolution very sharp and it's very cheap. Why UTAR cannot buy this equipment, it's so important to teach and deliver knowledge to 100 over students per time to give a lecture? And this is very cheap thing, it's so terrible for school to save this kind of money, better save the big lecturer to go oversea for conference. They should give this equipment to the students. And all this projector and AV thing should be all ready in the whole classroom, not only the lecture hall, all ready you just go in and plug in and you can just use it, and most of the microphone are breakdown, are malfunctions. It is not taking care. In

UTAR you need to key in the report, you need to inform people all this kind of things. You know the lecturer have a lot of duty to do, why we have to do? The technical person must keep on rounding and check the whole things. Not for us to report. We report you only take action if no report you just pretend don't know, how to be like that? Then we architecture we don't have a gallery, every semester we have to do pin up, especially final presentation, we always fight for students to pin up students work to give the assessment. We don't have enough whiteboard, always find that we stick on the corridor we stick on the wall near the staircase they complaint you cannot stick on the wall. You don't stick on the wall why don't you just design the softboard? And you want the softboard, you need to write so many report to justify we need the softboard. Why the top management cannot understand this is the needy by the school. Why we have to justify and argue for a softboard. The top management argue why you need all this kind of things. And architecture school have so many things to show to people, after all the final presentation and exam, we got so many drawing to be exhibited, even the external examinator come, we need a space, we don't have, cannot show all the works, only selective works. We need a lot of softboard a lot of space to pin up all these, but we don't have in this building. And they say we will give u the next block later. This means they want to build another block later which means 5 years later? How can a student waits for five years for this kind of things? If let say you not enough, there is so many buildings here, UTAR can buy all the shoplot here. You can buy one whole lot of shoplot, not whole thing but just one row, convert it into a gallery and also examination hall for architecture. Every time all the examination and assessment go to the buildings. And one row of shoplot can solve the things, why need to wait 5 years for the next building we have it? So you are top management, you should think and understand the needs of all faculties all the department and you must know. And also, for an architecture school, I went for architecture school in the UK, we sleep in the school, all the time. We want to stay overnight in the school, we go and sign our names at the entrance, then before we go out we sign, that's it. In UTAR, you need to apply one day before that and they also cut down the air-cond after 12, they students are forced to stay in the room that is not comfortable. If you want to do a good architecture school, you must have these facilities for the students accessible to the studio 24 hours. And this thing cannot be delivered by UTAR until today.

The author: Do you know why?

They give you the reason because security. What security you're talking about? As long as you make a rule, you say everybody can sign, you must go to solve the security, you say security, you must tell the students let say after 6, whether you come from outside or inside you must go down to which level and must sign on the book. So you know how many students in each level. Then they say the students will move around, they suppose to be in level 6 but you move around go and steal other things. Then you must solve the thing ma, show can be designed in such as way. Then they say, let say if you use the electrical touch system, then you can catch where is the student go, they say they cannot do because they want to save money. I don't know how much money you can save? It's depends, what is your vision as a school. You want to be the best in the world? Then you aim for that you do work for it! You cannot say I want to be the best of the world but I won't take action, I don't solve problem. That's my comment on the AV equipment.

The author: How about the location of the projection screen, and whiteboard, is it comfortable height. Do you architect specify that…

Ok I will tell you, some room they have the screen that you can pull down, then behind it there is a whiteboard for you to write something. Sometimes some room they don't have the screen you can pull down, so you don't have a wall to project the image, so that's the problem. And also, when they do the projection, all the utar design is outdated. You know why outdated? Ok you have projector to project the screen then you pull down the screen, then the whiteboard cannot use already. And in a good teaching method, when you show projector, you must have a whiteboard beside that you can write something. Because teaching must involve a lot of thing, some must be written on the board demonstrate to the students. It's not say power point is the best method. Ppt if is too much you will get sleepy because it is not a good way to teach student by ppt. The best way to teach student is to write on the whiteboard because they will follow step by step, there is knowledge being transferred. So when you see all the classroom except lecture theater I think, when you run the projector you cannot write, you don't have a whiteboard to write, you cannot write, so this is something not…

The author: Do you prefer the chalkboard or whiteboard?

I prefer whiteboard because it is less dust, chalk board you got a lot of dust. And it not good for health, and whiteboard you use the marker it's better. But the school doesn't provide marker, we lecturer have to buy outside. How can you be like that? This is something wrong! I come here and teach but I have to give my salary to buy whiteboard marker to teach the students. And we want to ask for marker, they give all kind of questions. Where are your previous marker? Ask this this this then after you give them your previous marker, you need to refill, you cannot take a new one.

The author: That means I rather refill and use the current one lah…

Even you refill when you write the quality is not good ma. Eh, this is basics ah. Basics you must give to the and student pay fees you know, student is not come for free like government school you know. Student pays fees and let say I deliver fourteen weeks, I need one marker one week, one marker costs how much? RM2? RM2.50? Let say 10 markers 10 weeks, it's only RM25. You got how many students in the class? You got about 50 or 30 students in the class, the fee how much? You take out RM50 for marker to the lecturer to do his work, is it a lot? You cannot do like that, actually you are treating the lecturer badly, you think lecturer will benefit from taking your markers? We got no choice because we also don't want to argue with you school system and we just go and buy our own marker. Ok what else you want to know, I tell you the prank thing, I no scare of the top management or whatever, you as a student, you do your research, you better dare to write what I said.

The author: (haha) Ok no problem, err what else. For the lift design, just now you say add lift or escalator right, other than this, the lift system anyway to enhance it? I mean enhance not to solve the problem. Other than stop at even or odd floor, any other choice you want like a lift designated only for mostly lecturers to use at a higher floors. Like you work at 6, 7, 8th floor right, then the lift will transport people only to 6, 7, and 8th floor, the higher floor only.

Actually when you say from 6,7,8, it may not help because the students to climb up from ground floor to 4th floor, it's very tough. You only can do from ground to 1st

floor only. That's it. The rest you cannot do already. Because your floor to floor height, some of them is double height you know. So when there is double height, even though it's 1 floor but with double height, it is very tiring you know. Although it's good for health, but how many people have that kind of mental prepare to do this kind of climbing? You only can do the most is from ground to 1st. The rest second and 3 and 4th you cannot do. I think the most practical method is you install an escalator until library level. That's the most practical way. So that 4 floors of people will not use lift already. Then lift will sure no problem. And you cannot say that I do not want to solve because this cost more money, you cannot say that, If you think this is the money problem, you should solve this during the construction time already. Even before you finalise the design, why can't you do another 2 service lift for all the maintenance people to use? And people also can use the maintenance lift to go up. I think putting the escalator is the best solution. Just like the shopping complex. And also your top management decide to put the library on the 4th floor, MPH on the ground floor and lecture theater on the 2nd floor? Why during design stage you cannot think properly to do it right?

The author: I think the purpose to put the MPH and all the department of finance at the ground floor because there are outsider, so they don't allow the outsider to go upstairs. They want to enhance the security I think lah. Because outsider come in right they firstly go to…

Ok the finance, the outsider and the finance, there is a place call reception, but you don't need a big space. And not need in KB block, it can be KA block. Let say now you come to UTAR, you arrive at the junction at the road. There is KA and KB, the design also not good. Let say I'm a visitor I come, eh I already reached UTAR, where should I start? Where should I go? These 2 buildings are very close to each other, it's not building in the garden hundred acre of land like Kampar. 2 buildings very far I arrived here I don't know which place to go you know. You arrived in the 2 blocks already then you ask your friend eh where should I go ah how do I start my journey, or my building? A good design, of course you will design in such a way, you go you know, there is an entrance, I go that one first, after that one I know how to go the whole buildings. When you arrive at the junction, you know how you go, you say you put your finance at ground floor, you think they know the ground floor of A block or B

block? Nobody know also, also fail ah. Why can't you just buy one row of shop houses put the finance there? At the moment the design also fail ah although you put at the ground floor it also doesn't make sense because you don't know where is the reception where you start the journey of this 2 blocks of buildings. Nobody know until today. You get a people who don't know and come here they say where should I pay the finance, I must go reception first but where is the reception ah? Which block have the reception? Nobody knows until today.

The author: So they should put signage, direction something like that?

If you put signage, it's not a good design. A good design not need signage. You are right you know there is an main entrance. You go into the entrance, enter the lobby, straight a way you hit the reception. From the reception, you know where to go already for the rest of the building. Then you know where to start to go into the building.

The author: Other than these areas? Anything else you want to add on, a must for an academic building. I mean an idea that you think of that is essential for an academic building. Anything you want to add on like what kind of design suitable for university?

Academic building is a central place for all the people who have knowledge. So this building is called institution building. Institution building in the olden days, it is so important, not everybody will dare to approach to institution building because I feel that I'm not knowledgeable I don't dare to approach this building in the olden days. But education building today, you must make it accessible and communicate well with the public.So that you have the interaction between the public and the institution. So that is the thing that the communication and the public in the institution. So our UTAR is a building which is individually designed. I only comment on these 2 block I'm not comment on Kampar. So this 2 blocks is designed individually. Whether this 2 blocks of building has interaction with public, I don't think so. Because you don't have the space to do the interaction, I mean community connection with the neighbourhood, you don't have. You must have a space like a, just like I say, maybe one row of shoplot houses turns into a gallery or show gallery or whatever and all the student's things will be exhibited there. Then we invite all the neighbourhood people, they can bring their children and friends to come and visit this place then the students will dare to interact.

At least there is a linkage between the public and so on, right this is very important. You may say I don't have the money but this is more than worth well for you doing the advertisement, advertisement is not cheap and this thing will spread like that, and become a big thing for UTAR. You know some other school, I do not know I think lim kok weng or taylor, they purposely buy a shoplot in the city centre like Jalan Sultan Ismail or whatever, they just convert become a gallery, and they just show there, and it becomes so important, and this is UTAR, you want to connect yourself to the Sungai Long people, you should do this and for your branding of your UTAR, then at least you have this interaction, the student will blend with the people here. You know you go to the market or coffee shop, you know what the local comment about the UTAR coming to Sungai Long, they say I hate UTAR coming to Sungai Long, they cause the traffic congestion, they cause all the parking, they cause the students park simply in front of my house, all kind of nonsense, they don't like UTAR to come here. And UTAR, you must see this thing, you are the institution, you think you are part of the society, which you are bring actually good thing to the neighbourhood, you need to do something. Not just like that, become arrogant sitting in the cityscape and take over all the people space around this area. Although the property price go up, but they don't like the environment especially the people who stay here. What else you want me to comment?

The author: Nothing already, just for you to express.

Maybe you can comment on the pre-design level, because they misjudgement on the cost thing and cause this problem, like should we omit important costing from the contract sum, which will cause cause so much problem although they think they can save a little bit which is so important in reality in terms of functioning of the building. They must study how to give air-cond to architecture student, even after office hour, that they must take note because technically can be solved one, they just don't want to give, I don't see any rationale on that. You must encourage the students to come back to school 24 hours work on their assignment. When you encourage then you only can deliver a good result, a good product to show to the public ma. That will help your school ma, it is not that you give the aircond you waste you know because you encourage students to put more hours on their design then the outcome will be fantastic, then only the fantastic products can get students to participate in competition

all this kind of thing, then will bring the name to the UTAR ma. You should not save all this kind of small small money.

The author: I think the main cause is that they don't have enough fund, so they cannot do something like other university.

Ok you want me to comment on building I can comment some more, you see in the newspaper, they publish UTAR is an entity of non-profit organisation, they got philanthropist want to donate money to UTAR, the condition is they want to build hostel for the students, the management has interest in the property surrounding the UTAR, they reject to build hostel, because the top management they have interest on the property around, they bought the property to rent to the students, so if build hostel, nobody will rent their property. So this is for their personal interest, they don't think about student's interest. You say no budget, people want to donate money, you put condition to people. Then UTAR you can say that they don't have enough funding, but I can tell you that UTAR has a lot of students. Some university only got 3-4k students, but their fees may be double than UTAR, but they only 4k, we have 26k, we have volumes, the volumes also money ma, you know me or not, also money ma. I don't' agree let say simple simple money you say no money, let say marker, how can you save the marker, and you make the lecturer go to buy their own marker. That is not right in terms of management, same as providing a few projector, it's not expensive projector. You know there is one school I teach before, the school try to save on the projector, you know what happen? The student come out with money and they go and buy their own projector, you see so embarrassing for that school. Don't tell me UTAR want to reach that level. You know the whole school, they have 100 students, everybody come out RM100, then they buy a projector, and for their class to use only. Eh you don't let student do that level you know then if the news spread around, you will be so embarrassing. Now you got Fb all this kind of thing when you pop up there, you gone. Because not expensive why you want to do this kind of thing? And carpark, carpark is not enough in the school.

The author: Do you know why the building is so, the building only built to 10 floors, not higher?

They build 10 floors maybe they have budget problem, but if they want to build a proper school, they already calculated, they should not save that few floors, let say you need additional 5 floors to do the job, it costs you extra 1 or 2mil you should spend the money. Because the most effective how the building function, you should do it because the funding they think is not enough, this is what happen. And also because maybe the authority they control how many floor you can build but that's not the issue, in Malaysia everything can solve, how many floors also can, provided provide enough car parks. I think something is not right also the car park provision for this building is also not enough, something is done in authority already. Because if you see the built up area for this building, and also it's a school and there is no LRT here, by right the car park requirement, they should have at least another 6 floors of carpark in the basement, but I think they omit the 6 floors of car park, I suspect lah. They should not have so minimum car parks. Something is wrong, you know construction is very dirty. So carpark is not sufficient, so UTAR must solve this problem for the students. This empty carpark also not enough, and have to share with the public. And also not enough. And it's only temporary, next time you going to build something there. So, where you want to put the car park? Let say something construction there, how to do the car park? Now they propose you park somewhere the shuttle bus take you here, unless you solve the shuttle bus, unless you show the shuttle bus very frequent, very comfortable or whatever. Now it's no ma you waiting for shuttle bus take so much time ma. Let say you take the shuttle bus every 5 min, then I can wait there, 5 min then I jump bus to come here, can you do 5 min every shuttle bus or not? If let say every 5 min 1 shuttle bus, running until 10 o'clock at night. Then people can park further away, and free. Then can solve. I do not know here got gym or not in this building.

The author: Oh ya got.

Oh got gym ah, but seldom people use ma. Like you say gym is 1st floor ah, gym is the least important thing, gym should be put at the higher floor ma, not important ma. Why you want to do all this thing, the first floor you put all the lecture theater, library all this thing ma. MPH you can do on the roof ma.

If don't want the escalator then you shift the library all downstairs lor, see what happen (haha).

The author: I only can suggest so maybe the next building, maybe they take into consideration lah. Like installing the escalator.

You don't want escalator can, if the number of lift is sufficient then you don't need escalator.

The author: But the problem is if they install many lifts, then it will take up a lot of space in this building.

Where got a lot of space, no need a lot of space ma, lift is very small only ma. Like this room can put 2 lifts already you know, not need a lot of space what.

The author: But is 10 floors you know, every floor you want to.

It's not a lot! Then you can submit the lift as a temporary structure. You know what is temporary structure? Means you break the rules, but authority want to remove, you can remove, it is under temporary structure. So let say this building is a box, there must be some corner has enough space, you just do a steel structure outside the box, that you have a lift, maybe the lift is like horizontal next to the building. Lift only take that kind of space ma, you got road shoulder right, got plant flowers right, you shift the road, not need the flower, the flower part you take it become the lift, attach to the building, and you got 6-7 lifts go like that, along the wall, under temporary structure. Which means you eat into the set back, but you submit to the authority, you say it's a temporary structure, which means you submit it, in case they want you to remove, you need to remove, but you don't obstruct other thing why you need to remove? You submit as a temporary structure then your lift along the wall, wow so nice. So many lift along the wall, then the flower don't want lah, then you don't obstruct BOMBA circulation ma it's ok ma.

The author: They will allow ah?

Allow!

The author: need to pay money lah?

Not need to pay money, you submit under temporary structure.

The author: But it's like a permanent structure already wor

It's permanent, but it can be removable, you remove this thing the building still function. So it's called temporary structure lor. You can build no problem. Just like your terrace house, car porch, car porch is eating into the setback already, but why they allow you to building the car porch? Because it is a temporary structure, you delete the car park your house is still function, but it's permanent for the house. So you build a temporary structure within the setback is okay.