



# Proceedings of Science and Management

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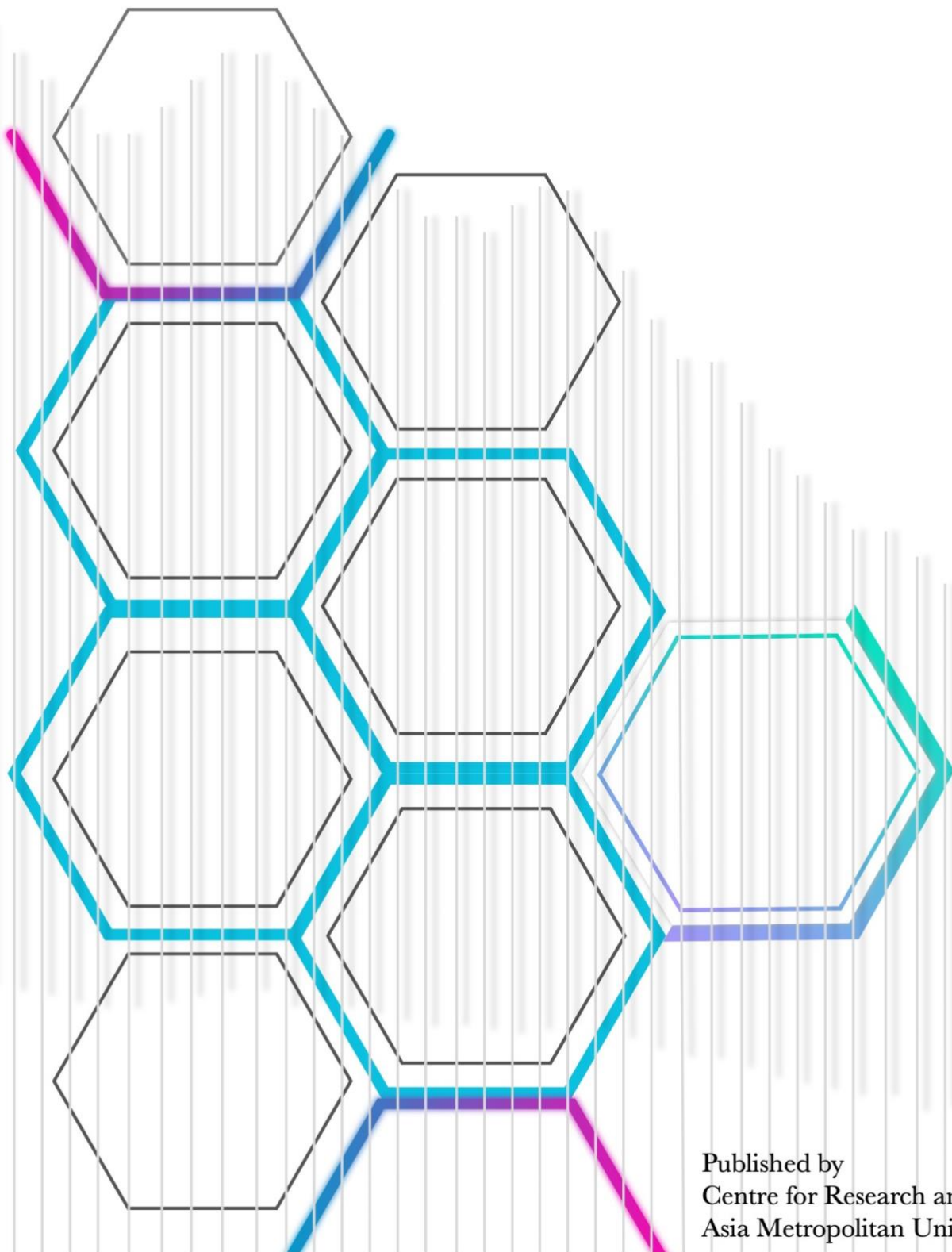
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# Proceedings of **Science and Management**

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# Proceedings of Science and Management

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## Scope

Proceedings of Science and Management (*Proc. Sci. Mgmt.*) was founded in 2023 to publish research papers and student projects. Proc. Sci. Mgmt. is administered by the Centre for Research & Development at Asia Metropolitan University. The *Proc. Sci. Mgmt.* published research papers related to science and management, which are as follows: Science (Chemistry, Physics, Biology, Mathematics, Engineering, Health Sciences, Information Technology and etc) Management (Business, Human Resources, Accounting and etc.)

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## **Acute Skin Toxicity Associated with a 1-week (FAST FORWARD) versus a standard 3-week regimen for Locoregional Breast Radiotherapy delivered in Institut Kanser Negara, Putrajaya**

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### **Abstract**

A retrospective analysis was conducted on data from patients who underwent locoregional breast radiotherapy at Institut Kanser Negara, Putrajaya. Two groups were compared: the 1-week "Fast Forward" regimen group (n=31) and the standard 3-week regimen group (n=234). Acute skin toxicity was assessed based on clinical observations and graded using a validated scale. The study found a significant difference in acute skin toxicity between the two regimens. The Fast Forward group patients exhibited a distinct pattern of acute skin reactions compared to those in the 3-week regime. The Fast Forward regimen was associated with milder skin toxicity in some patients, while others demonstrated more severe skin reactions. The differences in acute skin toxicity were attributed to the shorter treatment duration and variations in treatment planning and dose intensity. This study provides valuable insights into the acute skin toxicity associated with the 1-week "Fast Forward" regimen and the standard 3-week regimen for locoregional breast radiotherapy. The Fast Forward regimen offers a potential advantage in reducing acute skin reactions in some patients. However, further research with more extensive and balanced sample sizes is needed to confirm these findings and guide personalised treatment decisions for breast cancer patients. These results highlight the importance of considering treatment duration and individual patient factors in optimising locoregional breast radiotherapy.

**Keywords:** Acute skin toxicity, Fast-Forward radiotherapy, 3-week radiotherapy, locoregional breast cancer, RTOG scale, breast cancer radiotherapy.

### **Introduction**

Breast cancer is the most commonly diagnosed cancer in women in Malaysia. Breast cancer is a disease in which cells grow out of control and form in the breast's tissues. Based on National Cancer Registry 2003, one in women in Malaysia are at risk of developing breast cancer. Breast cancer's stage is determined based on the characteristics of the cancer cells. It is presented using TNM staging on a scale of 0 to IV, which describes non-invasive to invasive cancer that spreads outside breast tissues. The stages of breast cancer help the doctor determine disease outcomes and possible treatment options to maintain a good quality of life with reasonable disease control. For the early stage (stage 1) of breast cancer, breast conservation therapy has become the treatment standard (Mehra Golshan, 2016), followed by postoperative breast irradiation to reduce the risk of local breast recurrence (Kim et al, 2022). Radiotherapy is a treatment that uses high-energy X-ray to kill the remaining cancer cells in the breast or lymph nodes after surgery. Radiation treatment aims to reduce the likelihood of cancer recurrence or cancer returning. When breast surgery was first performed, complete breast radiation therapy was formerly administered as one treatment per day, five days a week, for five weeks. The American Society for Radiation Oncology (ASTRO) revised its recommendations in March 2018 and now only recommends three weeks of total breast radiation treatment. This adjustment resulted from several randomised clinical trials conducted in the United

Kingdom and North America, demonstrating that three weeks of radiation therapy was as safe and effective as five weeks of treatment. Radiotherapy is given at the breast, reconstructed breast, and chest wall in the international standard regime of 40Gy in 15 daily fractions of 2.67Gy given in 3 weeks, which have been tested with good outcomes (Cante, 2017). The National Institute for Health Research conducted a clinical trial on people diagnosed with stage 1 breast cancer called Fast-Forward study in the United Kingdom. The study aims to know if the radiation schedules between a week and a 3-week regime of radiotherapy would be equally effective at reducing the risk of recurrent breast cancer. After five years of radiotherapy treatment, the estimated recurrence rate for a 1-week radiotherapy regime with 26Gy and 3-week radiotherapy with 40Gy is 1.7% and 2.1% respectively. The result of this study suggests that 1-week radiation therapy gives the same level of recurrence risk reduction after five years as 3-week radiotherapy treatment. Thus, FAST-Forward radiotherapy for breast cancer given in 26Gy in 5 treatments of 5.2Gy over one week offers a short treatment schedule, safe, effective, and more convenient to patients in arranging their daily trips to get treatment. Nowadays, at Institut Kanser Negara, oncologists have applied a 1-week regimen (FAST-Forward) in locoregional breast radiotherapy compared to a 3-week regimen. FAST-Forward regime radiotherapy has been widely used to treat locoregional breast cancer after surgery as it reduces acute skin toxicities' dominant short-term side effects. Various studies have been conducted regarding FAST-Forward implementation in patients after primary surgery for early breast cancer. These studies have consistently found that the acute skin reaction was less intense and mild as less fraction size reduces acute skin reaction severity. Despite this, the comparison of acute skin reaction between a 1-week and a 3-week regime has yet to be robustly researched in Malaysia. All locoregional breast cancer with N0 disease will be treated using FAST-Forward protocol. Any positive-level nodes were treated with the standard regime of radiotherapy. This paper compares the number of fractions (between the 1-week and 3-week regimes) related to acute skin reactions. We investigated the severity level of acute skin reaction using RTOG criteria in two regimes weekly during treatment and 6-week postradiotherapy treatment in patients with early-stage breast cancer at Institut Kanser Negara in 2020 and 2021. It was hypothesised that 1-week locoregional breast radiotherapy was associated with decreased severity of acute skin reactions.

## **Materials and methods**

The population of patients who received radiotherapy at the Institut Kanser Negara from January 2020 to December 2020. There was a total of 265 locoregional breast cancer patients who received radiotherapy treatment from January to 31 December 2020 that were eligible to participate in this study. A total of 31 patients (n=31) were treated with a FAST Forward protocol and the rest of 234 patients (n=234) were treated with 3-weeks radiotherapy. The data was retrospectively chart reviewed and taken from the Hospital Information System (HIS) at National Cancer Institute, Putrajaya. The skin toxicities assessment was done by charged medical officers.

## **Radiotherapy treatment planning**

Patients underwent a non-contrast CT Simulation scan in the supine position, using the breast board with both arms above their heads. The deep inspiratory breath-holding (DIBH) method was considered for all left-sided breast patients under 60 years old or violating cardiac or lung restrictions to reduce exposure to the heart and lungs. The radiation oncologist decided on a temporary tangential field pair. By adjusting the gantry and collimator angles and employing multi-leaf collimators to shape the fields, fields were set up to cover the target and reduce radiation to normal tissues. Mandatory organ at-risk outlines included the ipsilateral lung and heart. The heart and lung on the ipsilateral side were required organs at risk outlines. The medial boundary was at the midsternal line, the lateral border at the mid-axillary line, the superior border at the caudal end of the head of the clavicle, and the inferior border were positioned approximately 2 cm below the inframammary fold. The radiation dosimetrist began by standardising the weighting of the two major tangential fields and then transformed the 95% isodose line, which was 5 mm cut from the surface of the skin and lungs to a

structure. Then an electron beam with the 16 necessary energy was employed to increase the tumour bed, prescribing at the 90% isodose line.

### Radiotherapy treatment

Patients in the standard radiotherapy regime were given 40.05Gy in 15 fractions of 267cGy in three weeks to the whole breast. A sequential electron boost of 6Gy to 20Gy in 3-10 fractions is subsequently given to the tumour bed and delivered in 1-2 weeks. In FASTForward regime, patients were given 26Gy in 5 fractions of 520cGy over a week to the whole breast. All locoregional breast cancer with pT1-3 pN0-1 M0 disease will be treated using FAST-Forward protocol, while positive level nodes of more than one were treated with the standard radiotherapy regime

### Assessment of Endpoint

Up to 95% of cancer patients receiving radiation therapy experience a skin response or dermatitis as a side effect (Amanda Rosenthal, 2019) (Lee, 2017). They can happen as an immediate or delayed side effect of radiotherapy, occurring within 90 days and more than 90 days after radiotherapy, with varying degrees of severity, depending on several intrinsic or extrinsic factors (Sandrine Censabella, 2014). For instance, intrinsic variables can be patient-related. They may include the sensitivity of the exposed area or the size of the breasts, as skin responses are more likely to occur on big breasts and body parts with skin folds, like the groyne. Extrinsic variables include treatment-related such as the concurrent use of other cancer treatments or the total radiation dosage and dose provided per fraction cause the onset and severity of skin responses are may dose-related. The principal investigator collected data on some toxicity using the RTOG scale weekly at first, three, and 6weeks to 2months following the completion of irradiation. The assessment was scored by doctors blinded to patients' characteristics, treatment, and length. The length of followup time was calculated from the date of commencing radiotherapy to the date of follow-up after complete radiotherapy.

## Results and discussion

### Demographic characteristics

Between January 2020 and 31 December 2020, 265 patients were included in the present study. Thirty-one patients were treated with the FAST Forward regime, while 234 were treated with the standard 3-week radiotherapy regime. Table 1 lists the demographic characteristics of patients in this study. Data on patients' condition and acute and late effects of skin toxicities from 10 enrolled patients in this study were missing due to loss of follow-up after three weeks. After completing radiotherapy, they had another follow-up in another hospital, and a patient was dead.

Table 1: Patient characteristics

Characteristics	1-week radiotherapy n(percentage)	3-week radiotherapy n(percentage)	p-value
<b>Age</b>			
27-49	15 (48.4%)	81 (34.6%)	0.972
≥ 50	16 (51.6%)	153 (65.4%)	
Mean (SD)	52 (10.5)	54 (11.5)	
<b>Race</b>			
Malay	23 (74.2%)	141 (60.3%)	0.004
Chinese	2 (6.5%)	46 (19.7%)	



India	3 (9.7%)	44 (18.8%)	
Others	3 (9.7%)	3 (1.3%)	
<b>Tumor stage</b>			
Tis	6 (19.4%)	11 (4.7%)	
T1	10 (32.3%)	58 (24.8%)	0.004
T2	13 (41.9%)	112 (47.9%)	
T3	2 (6.5%)	53 (22.6%)	
<b>Nodal stage</b>			
N0	31 (100%)	82 (35%)	
N1	0	101 (43.2%)	
N2	0	34 (14.5%)	< 0.001
N3	0	17 (7.3%)	
<b>Boost RT</b>			
No	16(51.6%)	164(70.1%)	
3	6(19.4%)	6(2.6%)	
5	6(19.4%)	11(4.7%)	< 0.001
8	3(9.7%)	51(21.8%)	
10	-	2(0.9%)	

SD= standard deviation, Tis = tumor in situ, T1 = tumor is 2cm or less, T2 = tumor is more than 2cm but less than 5cm, T3 = tumor is more than 5cm, N0 = Cancer has not spread to nearby lymph nodes, N1 = cancer has spread to 1-3 axillary or internal mammary lymph node, N2 = cancer has spread to 4-9 lymph node, N3 = cancer has spread to 10 or more axillary lymph nodes with at least one area of cancer spread greater than 2mm or cancer has spread to lymph nodes under the collarbone with at least one area of cancer spread greater than 2mm, # = fraction.

Table 1 showed the characteristics of patients who received either 1-week or 3- week radiotherapy for breast cancer. The p-value is a measure of how likely it is that the difference between the groups is due to chance. A common threshold for significance is 0.05, which means that there is only a 5% chance that the difference is due to chance. There is no significant difference in the age distribution between the two groups, as the p-value is 0.972, which is much higher than 0.05. This means that the age of the patients does not affect the choice of radiotherapy duration. There is a significant difference in the race distribution between the two groups, as the p-value is 0.004, which is lower than 0.05. This means that the race of the patients may affect the choice of radiotherapy duration. For example, Malay patients are more likely to receive 1-week radiotherapy than Chinese or Indian patients. There is a significant difference in the tumor stage distribution between the two regimes, as the p-value is 0.004, which is lower than 0.05. This means that the tumor stage of the patients may affect the choice of radiotherapy duration. For example, patients with Tis or T1 tumors are more likely to receive 1-week radiotherapy than patients with T2 or T3 tumors. There is a significant difference in the nodal stage distribution between the two regimes, as the p-value is less than 0.001, which is much lower than 0.05. This means that the nodal stage of the patients may affect the choice of radiotherapy duration. For example, patients with N0 nodes are more likely to receive 1-week radiotherapy than patients with N1, N2, or N3 nodes.

There is a significant difference in the boost RT distribution between the two regimes, as the p-value is less than 0.001, which is much lower than 0.05. This means that the boosted RT dose of the patients may affect the choice of radiotherapy duration. For the 1-week radiotherapy group, most patients (51.6%) did not receive any boost RT, while the rest received either 3, 5, or 8 fractions of boost RT. No patient received 10 fractions of boost RT in 1-week radiotherapy regime. For the 3-week radiotherapy regime, most 25 patients (70.1%) did not receive any boost RT, while the rest received either 3, 5, 8, or 10 fractions of boost RT. The majority of patients who received boost RT in this regime received 8 fractions (21.8%), followed by 5 fractions (4.7%), 3 fractions (2.6%), and 10 fractions (0.9%). The difference in the boost RT distribution between the two regimes may suggest that patients who received shorter radiotherapy duration were more likely to receive lower doses of boost RT or no boost RT at all, while patients who received longer radiotherapy duration were more likely to receive higher doses of boost RT or no boost RT at all.

Table 2: Correlation analysis

Characteristics	Treatment regime	Age	Race	Tumor staging	Nodal staging	Boost RT
<b>Treatment regime</b>	1					
<b>Age</b>	0.082	1				
<b>Race</b>	0.063	.264**	1			
<b>Tumor staging</b>	0.190**	0.159*	.052	1		
<b>Nodal staging</b>	0.389**	0.164**	-0.030	0.388**	1	
<b>Boost RT</b>	-0.067	-0.443**	-0.074	-0.101	-0.289**	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The Spearman correlation analysis was used to determine the relationship between race, tumor staging, nodal staging, and treatment regime received in Table 2. Spearman product correlation for age, race and boost RT with the treatment regime show no linear relationship and statistically not significant ( $r_s = 0.082$ ,  $p = 0.182$ ), ( $r_s = 0.063$ ,  $p=0.311$ ) and  $r_s = -0.067$ ,  $p = 0.277$ ) respectively. Spearman product correlation for tumor staging with the treatment regime show negligible relationship and statistically significant ( $r_s = 0.190$ ,  $p = 0.002$ ). Spearman product correlation for nodal staging with the treatment regime show moderate relationship and statistically significant ( $r_s = 0.389$ ,  $p < 0.001$ ). Spearman product correlation for both race and tumor staging with boost RT show no relationship and not significant with ( $r_s = -0.074$ ,  $p=0.230$ ) and ( $r_s = -0.101$ ,  $p = 0.102$ ) respectively. There is a negative weak relationship between boost RT and nodal staging with ( $r_s = -0.289$ ,  $p < 0.001$ ). The boost RT and age showing the negative strong relationship and statistically significant with ( $r_s = -0.443$ ,  $p < 0.001$ ). It means that older patients in this study population are more likely to receive less boost radiotherapy compared to younger patients.

Table 3: Toxicity level of treatment weekly (RTOG grading)

RTOG grading	No. of patients in 1-week radiotherapy (n = 31)	No. of patients in 3-week radiotherapy (n = 234)	p-value
<b>Week 1</b>			
G0	22 (71.0%)	217 (92.7%)	<0.001
G1	8(25.8%)	17 (7.3%)	

G2	1 (3.2%)	0	
<b>Week 2</b>			
G0	-	133 (56.8%)	-
G1	-	101 (43.2%)	
<b>Week 3</b>			
G0	-	35 (15%)	
G1	-	179 (76.5%)	-
G2	-	19 (8.1%)	
G3	-	1 (0.4%)	

RTOG = Radiation Therapy Oncology Group, G0 = Grade 0, G1 = Grade 1, G2 = Grade 2, G3 = Grade 3.

Table 3 demonstrates toxicity at week 1 (1-week radiotherapy regime and 3-week radiotherapy regime), week 2, and week 3 (only for 3-week radiotherapy regime) follow-up of assessment for acute skin toxicity. At every weekly follow-up, the assessment of the toxicity of skin patients was performed by the medical officers in charge. Most patients (99.6%) experienced mild acute toxicity (none, Grade 1 and Grade 2), and only one patient in the 3-week radiotherapy regime had Grade 3 skin toxicities. The percentage of patients that had no skin toxicity in the 1-week radiotherapy regime is 71% followed by Grade 1 skin toxicity with 25.8% and only 3.4% showed Grade 2 skin toxicity with one patient. Meanwhile for the 3-week radiotherapy regime, for week 1, 92.7% of patients having no skin reaction (Grade 0), and only 7.3% had Grade 1 skin toxicity. On week 3 follow-up, the respective percentage of patients having Grade 0, Grade 1, Grade 2, and Grade 3 were 15%, 76.5%, 8.1%, and 0.4% respectively.

Table 4: Results of the Friedman Test for Skin Toxicity in a 3-week radiotherapy regime.

N	Chi-Square	Df	Asymp. Sig
234	290.341	2	<0.001

The Friedman test was conducted to assess the differences in skin toxicities across the three repeated measures from week 1, week 2, and week 3 in Table 3. The test revealed a significant effect,  $\chi^2 (2) = 290.341$ ,  $p < .001$ , indicating that the distribution of skin toxicities differed significantly across the time points.

Table 5: The assessment time and RTOG grading post-radiotherapy.

Characteristics	No. of patients in 1-week radiotherapy (n = 31)	No. of patients in 3-week radiotherapy (n = 234)	p-value
<b>RTOG scale</b>			
G0	16(51.6%)	101 (43.2%)	0.652
G1	15(48.4%)	125(53.4%)	
G2	-	7(3%)	
G3	-	1(0.4%)	
<b>Assessment time</b>			
Within 90days	29(93.5%)	213(95.1%)	0.715
More than 90days	2(6.5%)	11(4.9%)	

Table 5 shows the distribution of patients within each skin toxicities grading post-radiotherapy and assessment time category for the two treatment regimes. The RTOG scale was used to evaluate the severity of adverse effects in patients receiving 1-week ( $n = 31$ ) and 3-week ( $n = 234$ ) radiotherapy. The chi-square test was used to assess the association between the RTOG scale and the radiotherapy duration. The p-value obtained from the chi-square test was 0.652, indicating no statistically significant difference in the distribution of RTOG grades between the two treatment regimes.

The assessment time after radiotherapy completion was categorized into "Within 90 days" and "More than 90 days" for patients in the 1-week ( $n = 31$ ) and 3-week ( $n = 234$ ) radiotherapy regimes, respectively. The chi-square test was performed to examine the association between the assessment time and the radiotherapy duration. The obtained p-value was 0.715, suggesting that there is no statistically significant difference in the distribution of assessment times between patients receiving 1-week and 3-week radiotherapy. It can be concluded that there were no significant associations observed between the RTOG scale, assessment time, and the radiotherapy duration (1-week vs. 3 weeks).

## Conclusion

The results indicate a difference in acute skin toxicity between the two regimens. Patients undergoing the 1-week "Fast Forward" regimen experienced a distinct pattern of acute skin toxicity compared to those receiving the standard 3-week regimen. The data suggest that the treatment duration might influence the severity of acute skin toxicity. Patients in the "Fast Forward" group tended to exhibit different grades of skin toxicity when compared to patients in the 3-week regimen group. It appears that the 1-week "Fast Forward" regimen may be better tolerated by some patients concerning acute skin toxicity, while others might find the standard 3-week regimen more suitable. The study highlights the importance of considering individual patient variability when selecting the appropriate radiotherapy regimen for locoregional breast treatment. Factors such as patient age, comorbidities, tumour characteristics, and treatment response may influence the optimal choice of regimen. While this study provides valuable insights into acute skin toxicity associated with the two regimens, further research is warranted to understand better the long-term effects and overall treatment outcomes of each approach. Our findings suggested that the choice between the 1-week "Fast Forward" regimen and the standard 3-week regimen for locoregional breast radiotherapy should be carefully considered, considering individual patient factors and the potential variation in acute skin toxicity responses. The decision-making process should be guided by a multidisciplinary approach involving oncologists, radiation therapists, and patients to tailor the treatment plan and ensure the best possible outcomes while minimizing acute skin toxicity.

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## Satisfaction on AMU Facilities among Staffs and Students

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### Abstract

This study is done to investigate satisfaction of facilities among Asia Metropolitan University staffs and students. Questionnaires were distributed selectively to 9 staffs and 69 students in various faculties and departments to obtain primary data research topic. The overall findings of the study showed that staffs and students both do face dissatisfaction towards the AMU facilities. Through the questionnaire we came to know that majority have stated that AMU lacks in facility. The students and staff have similar view point on the facilities and it was found that students and staffs have many ideas to improve AMU facilities. The study's questionnaire aids in identifying areas for enhancement in quality and helping university facility managers prioritize satisfaction elements. This data can be used to solve some of the problems stated by the staffs and students.

**Keywords:** Facilities; Satisfaction of facilities; Asia Metropolitan University, Evaluation

### Introduction

#### Background of study

Facilities are structures, items of technology, or services offered with a specific purpose in mind. Because we'll be on campus a lot, it's crucial to have a place where we feel at ease, whether we're relaxing after lectures, engaged in a group project with our peers, or working as staff. University buildings should be with all needed facilities such as learning and leisure centre combines access to the library, sports, computing, leisure and eating space all under one roof, where students can meet and relax before their lectures. There should be a number of cafes and restaurants available at campus for the students to eat tasty and affordable foods. Other than that, Student Central is the hub of the campus where the students can find everything they need, which is, Info Point, an ATM, Career Service and Job Shop for the students to choose the right path for their future planning and sport, fitness and health with complete sport facilities. Besides, the library should be open 24/7 by providing PCs with a wide range of software packages, access to the university Wi-Fi system, bookable meeting pods, printing and photocopying facilities and a wide range of books available to borrow on an honesty basis. Safety facilities are one of the most important factors due to increasing number of crime rates. For instance, the guards in premises should ensure proper safety of students in university premises. AMU does have some of these facilities such as lecture room, library, lobby, student lounge, few laboratories, and Student Resource Centre room and computer labs. Some of the resources, such as the computer lab, are solely accessible to IT students, IT professors, and IT personnel. However, the shortage of facilities at AMU has a negative impact on the students.

#### Problem Statement

The issue that needs to be addressed through this study is the lack of facilities, such as the insufficient number of lecture halls at AMU that should be appropriately handled; also, there isn't a suitable space for professors and students to hold discussions since we cannot make a disturbance in the library and there should be a valid and adequate space to contain the total population of

students in the lecture halls. Overcrowding of students in the lecture halls can lower the level of student's motivation.

Then there is the issue of improper maintenance. For instance, the bathroom roof has flaws that allow water to pour through, which is a hassle for the employees and students to use the restroom. Students and staff may decide to refrain from urinating in the washroom because they feel uncomfortable utilizing the facilities.

Furthermore, student's progression and staff development will be limited because some of the difficulties that staffs face have to do with administration, a sense of anonymity, a lack of flexibility, and the diversity of the students. The pupils are further challenged by their reluctance to ask questions, the lack of enough teacher attention and access to information, and the requirement for independent effort (Ives 2000).

### **Objective**

This study seeks to evaluate the satisfaction level between student and staff. Next, this study is done to allow management better insight into how they can improve student and staff feedback. Furthermore, it is able to analyse how current facilities would affect staff and student progression.

### **Scope of Studies**

This study focuses on the satisfaction about AMU facilities among staff and students. There are total of 414 students and 54 staffs in AMU. The data collection will be conducted to 69 students and 9 staffs. The total number of students and total number of staffs is divided by 6 to get an appropriate sample.

There are 2 faculties and 2 centres at AMU JB campus which is Faculty of Health Sciences, Faculty of Business Management and Information Technology, Centre for Foundation Languages and General Studies, and Centre for Postgraduate Studies.

This study will not cover other problems that are not considered as one of the concerns of the study. Each of the staffs and students are given the same questionnaires to answer. The results of this study will be applicable only to the respondents of this study and will not be used as a measure to evaluate the satisfaction of facilities to the students or staffs who do not belong to the population of this study. The main source of data will be the questionnaire, which is prepared by the researchers.

### **Significance of Studies**

The study's principal beneficiaries are the students. This is due to the fact that having enough facilities will encourage students to study discreetly. Having adequate facilities such as spacious lecture rooms can sharpen the mind and improves student's concentration. It is also crucial to increase employees' loyalty to the organisation and job satisfaction because these factors have been directly related to a number of notable advantages (Lambert et al., 2020).

Given that the university is where they work, the study will also be helpful to the staff members. On staff morale, having well-managed facilities has a big impact. They are able to focus better, feel happy to work at their job, and appreciate the organization they work for. Additionally, it reduces absences due to illness, boosting worker productivity.

Next, adequate facilities give parents of students a method to gauge their view of the level of education their children are receiving from the institutions. In addition to providing education, a university is dedicated to the general growth and development of its students. Therefore, the more effective and cutting-edge the facility, the more students can learn and grow as individuals.

### **Materials and methods**

#### **Introduction**

In this section, we go over the methodology for our study on the "Satisfaction of AMU Facilities among Students and Staff." The goal of this study must be accomplished because many faculty members and students have had difficulties as a result of inadequate facilities. We also take into

account the facility issues that 468 AMU students and staff members have reported. We will do our best to present any minor issues that the management can address at the conclusion of this research. Questionnaires and observations were used to gather the data for this study.

### **Research Instrument**

This study used a quantitative research approach. A questionnaire and observations were employed as the data collection tools. The questionnaire consists of 15 questions, which are broken down into three main sections which are demographics, facilities that are lacking, and suggestions to enhance AMU facilities. The yes-or-no, probable scale, choice, and opinion question formats are utilized in this questionnaire.

Additionally, observation is another approach of gathering data for this study. We, the four members of this study team, looked at potential university facilities that may be added to or enhanced. Additionally, as students at AMU, we are well aware of the state of the university's facilities.

### **Respondents of Study**

The respondents of the study were the students and staff of Asia Metropolitan University (AMU). On 11th September 2023, a total of 90 Google-formed questionnaires were distributed to selected students and staff through Whatsapp and Telegram. Out of these, 78 questionnaires were responded. The research is an assessment of 9 staff and 69 students of male and female.

### **Research Procedure**

During the study, the questionnaires were distributed to students and staff at various faculties' WhatsApp groups, hostel's WhatsApp groups, personal WhatsApp messages to AMU students and staff, and the AMU telegram group. The respondents were presumed to be impacted by the lack of facilities, either minorly or majorly. The respondents were approached politely asking them to spend some time answering the questionnaires at the same time to self-analyse and provide suggestions on adding and improving facilities and give the respondents a better perception of defining facilities.

### **Data Analysis**

As previously indicated, the questionnaire was separated into three primary sections which are demographics, facilities that are lacking, and recommendations for improving AMU facilities. Thus, it provided us with a better perspective from which to examine the data.

We developed the necessary graphs from the 15 questions and analysed each of the questions thoroughly. We decided to communicate the data from the graph by describing the top and lowest percentages, going into greater detail utilizing background information, and citing the literature review. While we did not offer a graph for questions 14 and 15, we did analyse the three categories by adding them all together.

We use percentage as the measurement to enhance the data because it can give us and the readers a clearer image and a better understanding.

## **Results and discussion**

### **Introduction**

This section analyses the opinions and responses towards the research on satisfaction of facilities among AMU staffs and students. The findings are based on 78 of our respected respondents comprising 69 students and 9 staff of AMU.

### **Demography**

#### **Gender**

The questionnaires were distributed to 56 randomly selected female and 22 randomly selected male that consist both students and staffs.



### Age

The age range of staff who participated in this research is from 25-44 years old meanwhile student's is 18-54 years old.

### Class

The class is divided into two which is students and staffs. In this research there are 69 students and 9 staff of AMU as respondents.

### Faculty

There are total 2 centres and 2 faculties in AMU. So, there are 27 respondents from Faculty of Health Science, 31 respondents from Faculty of Business Management and Information Technology, 14 respondents from Centre for Foundation Languages and 3 respondents from General Studies, and Centre for Postgraduate Studies. There was also 3 non-academic staff who answered this questionnaire.

### Question Analysis

#### How satisfied are you with the facilities provided by the university?

From our findings, 52.6% of the respondents are neutral with the facilities provided by the university whereas 9% of the respondents were very dissatisfied with the facilities provided. The majority responded as neutral because the facilities might be moderately provided such as having a moderate library and sitting area for students and staffs while some are very dissatisfied with the facilities in the university because it might not cover their needs that a university should have.

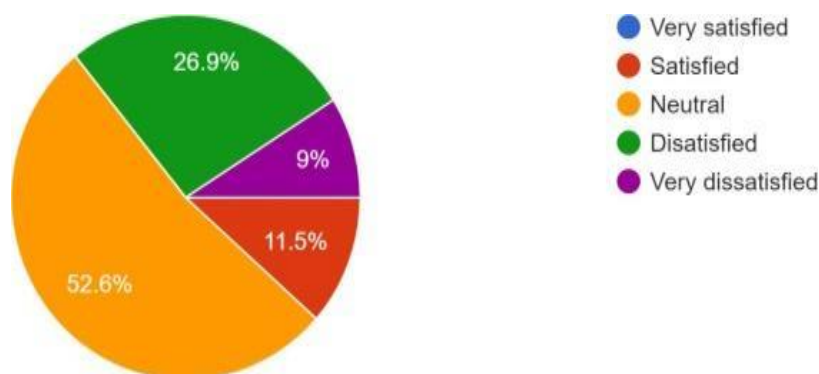


Figure 1      Figure 1 Satisfaction with the accessibility of resources through the university library

#### Is it easy to access the resources through the university library?

According to our graph, we see that 59% of the respondents agreed that it is easy to access the resources through the university library whereas 41% of the respondents disagreed with the statement. The majority responded yes as the resources such as books can be easily accessed through the library portal and some articles purchased through Emerald Insight which gave additional information to the respondents for their study purposes. However, some responded no because the resources provided in the library might not be related to the respondent's study field because not all articles are purchased through Emerald Insight and there are not that much books which are course related.

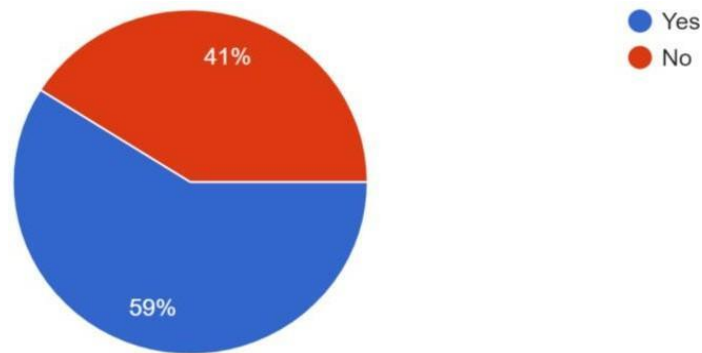


Figure 2 Figure 2 Accessing resources through the university library.

#### How adequate is the university's Student Resource Centre?

Based on the pie chart, 50% of the respondents responded as moderately adequate on the university's Student Resource Centre (SRC) whereas 10.3% responded as not at all adequate. The majority responded moderate since SRC provide resources such as free Wi-Fi system, spaces for students and staffs to discuss and relax are provided while some denied it because the resources are in poor conditions such as the free Wi-Fi system does not work all the time.

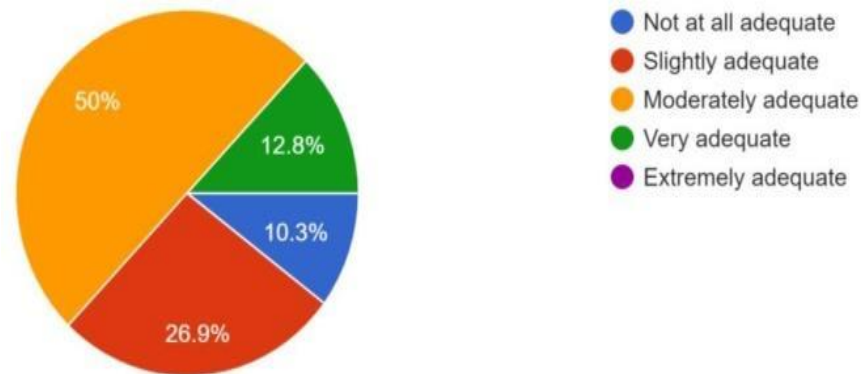


Figure 3 Figure 3 Adequacy of the University's Student Resource Centre.

#### How often are you utilizing the free Wi-Fi Network provided by the university?

Referring to the questionnaire, 35.9% of the respondents utilize the free Wi-Fi network daily whereas 30.8% of the respondents utilize it hourly. The majority responded daily as the respondents spend their days in AMU with Wi-Fi system for educational purposes while some responded weekly because the respondent might not be in university all the time except during class times.

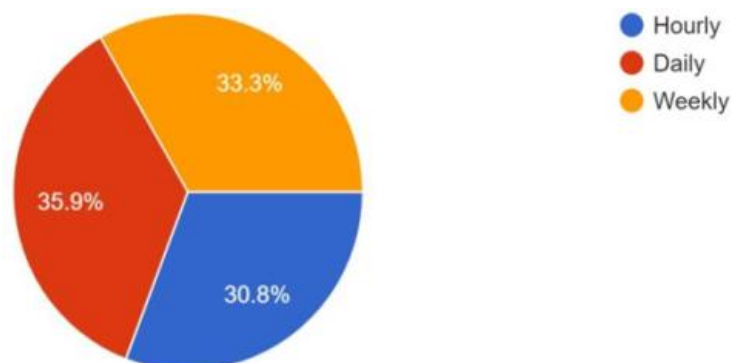


Figure 4 Frequency of utilizing the free Wi-Fi network provided by the university.

### How satisfied are you with the freely available Wi-Fi Network?

In this questionnaire, 28.2% of the respondents are neutral with the freely available Wi-Fi network whereas 3.8% of the respondents were extremely satisfied with the Wi-Fi network. The majority responded as neutral because the Wi-Fi network can be strong or poor depending on the time while some are extremely satisfied because Wi-Fi connections/ speed might be accessed easily for them.

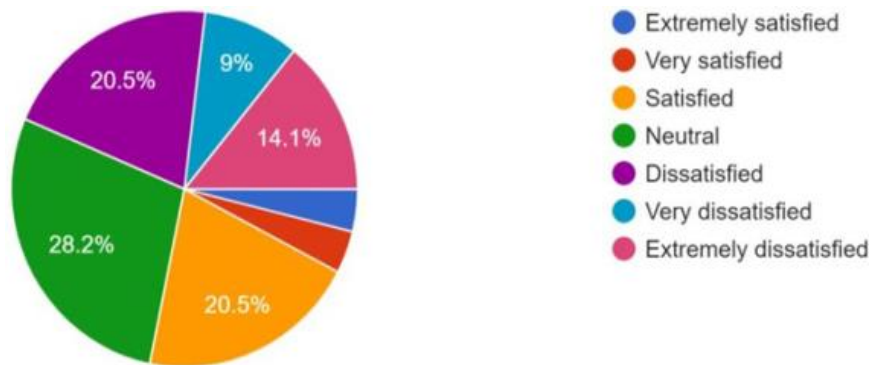


Figure 5 Satisfaction level of utilizing the free Wi-Fi network provided by the university.

### How satisfied are you with the transportation provided by University?

In this research, 44.9% of the respondents are neutrally satisfied with the transportation provided by the university whereas 1.3% of the respondents were very satisfied with the transportation. The majority responded as neutral since the transportation is not provided always and it depends on situation while the minorities are very satisfied because AMU is providing transportation such as bus, van and Starex if students or staffs need to travel for any programmes or events.

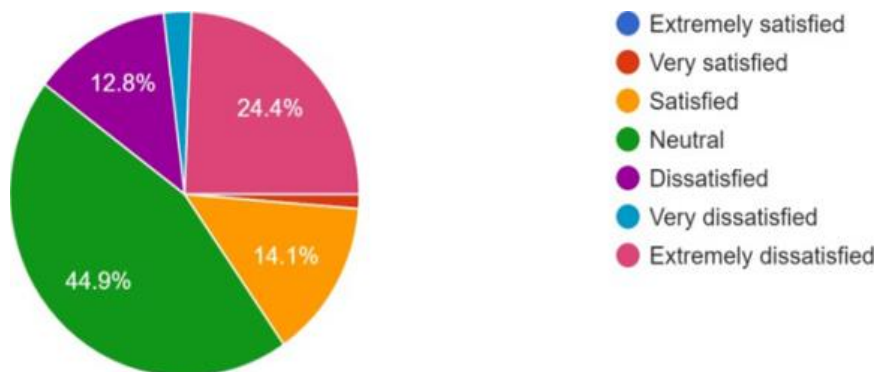


Figure 6 Satisfaction level of utilizing the free transportation provided by the university.

### How satisfied are you with class rooms' environment?

According to our investigation, 32.1% of the respondents are satisfied with the classroom environment whereas 1.3% of the respondents are extremely satisfied with the classroom environment. The majority are satisfied because the classrooms are well provided with chairs, whiteboard, tables, air conditioner and projector while the minority are extremely satisfied because the environment might be comfortable in their point of view since there are not many students per class it might feel like the classroom is spacious.

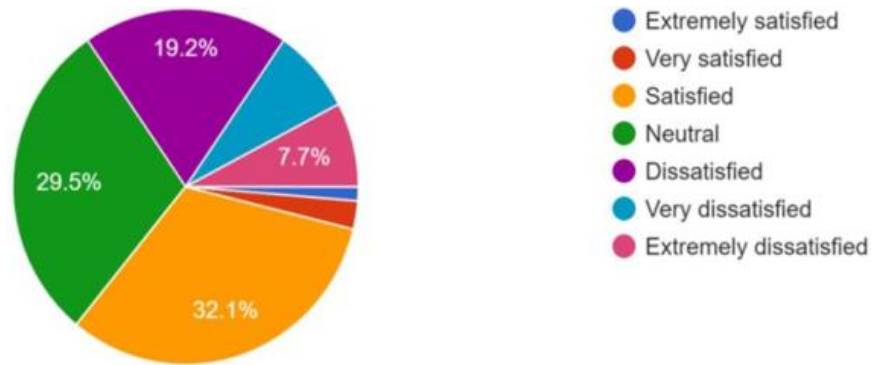


Figure 7 Satisfaction level of classroom environment.

#### Is the IT Lab sufficiently equipped?

Based on the graph, 50% of the respondents responded that maybe the IT lab is sufficiently equipped whereas 9% of the respondents answered yes. The majority of responses were maybe because the IT Lab might not be fully equipped such as some important software for the students to access for their studies while some responded yes because it may be sufficient for their level.

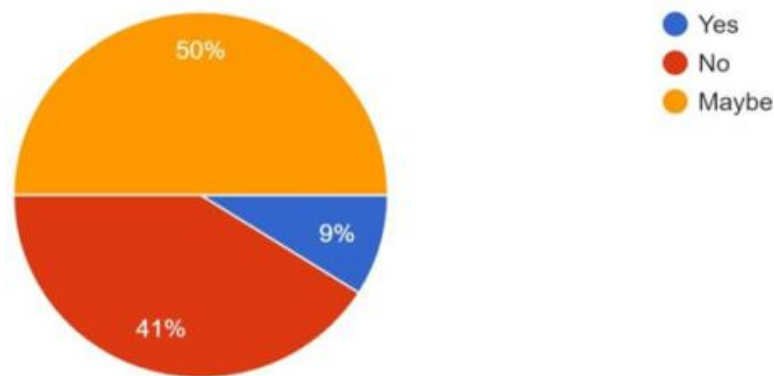


Figure 8 IT lab equipment satisfaction level

#### Is the university equipped with the required standard of computer?

In the pie chart, we can see that 71.8% of the respondents disagreed that the university is equipped with the required standard of computer whereas 28.2% of the respondents agreed with the statement. Most responses were no because most of the computers in AMU are damaged and if it is functioning; it might not be fully equipped with a proper system or not the latest version of software. Minority responded yes because the two computers in the library is still in a good condition and students can use that for editing their assignments and for printing at the library.

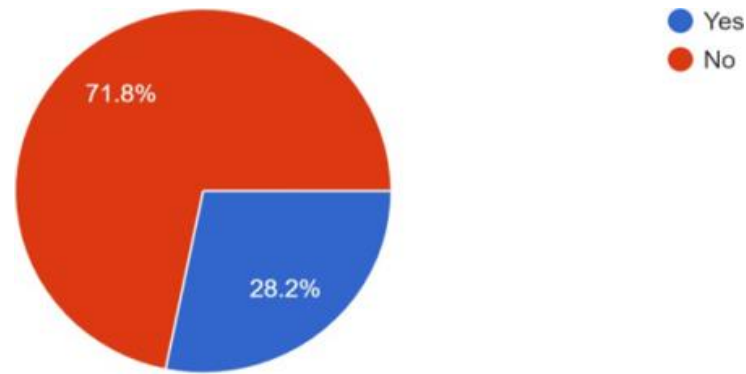


Figure 9 Evaluation of the University's Compliance with Computer Standards.

#### How adequate is the Science Lab equipment?

In this study, 60.3% of the respondents responded that the Science Lab equipment is moderately adequate whereas 5.1% of the respondents are not at all adequate. The majority responded as moderately adequate because the science students are able to do lab work with the some of the proper apparatus and materials provided by the lab assistant. However, minorities said it is not at all adequate because the lab is not in an up to date manner and does not have enough equipment that students can use during their industrial training causing them to share lab facilities from UTM to do their research.

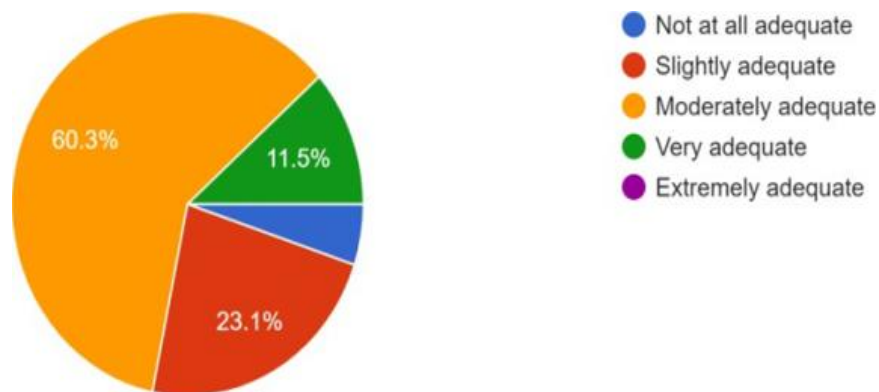


Figure 10 Science lab equipment satisfaction level

#### How often do you use campus facilities?

As shown in the graph below, 33.3% of the respondents use the campus facilities daily whereas 9% of the respondents never use the campus facilities. Most of the responses were daily because the staff will be using computers for their working purposes while the students will be using chairs, tables and classrooms during their classes while minorities responded as they never use the campus facilities because they might be students who are currently doing their internship so they do not have the need to use the facilities.

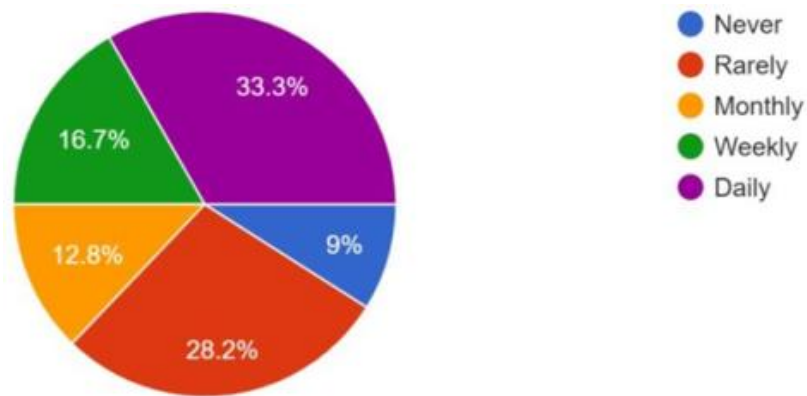


Figure 11 Utilization Frequency of Campus Facilities

#### How adequate is the university's sports equipment?

As shown in the pie chart below, 38.5% of the respondents responded that the university's sports equipment is moderately adequate whereas 11.5% of the respondents answered as very adequate. The majority responded as moderately adequate since the equipment is provided in a good condition while least number of responses was very adequate because the equipment might be complete, but it might be provided in least number.

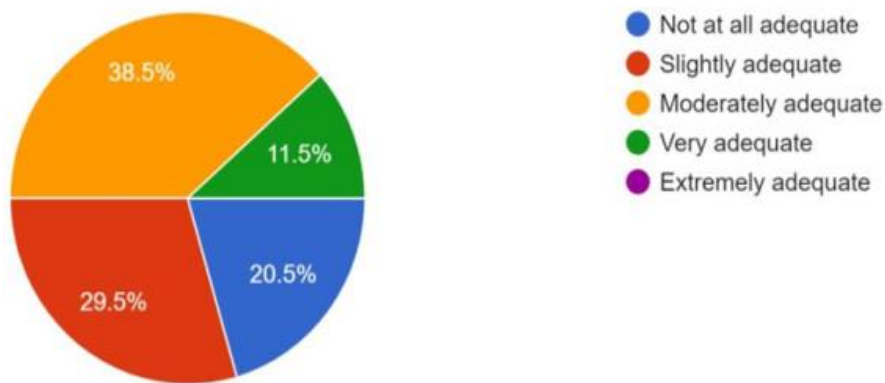


Figure 12 Evaluation on the University's Sports Equipment

#### How up-to-date are campus facilities?

According to this study, 37.7% of the respondents responded that the campus facilities are moderately up-to-date whereas 9.1% responded as very up-to-date. The major responses were moderately up-to-date because the damages are not repaired immediately, which might be not convenient for the students and staffs. While some said it is very up-to-date because some resources in the university are convenient for the students and staffs.

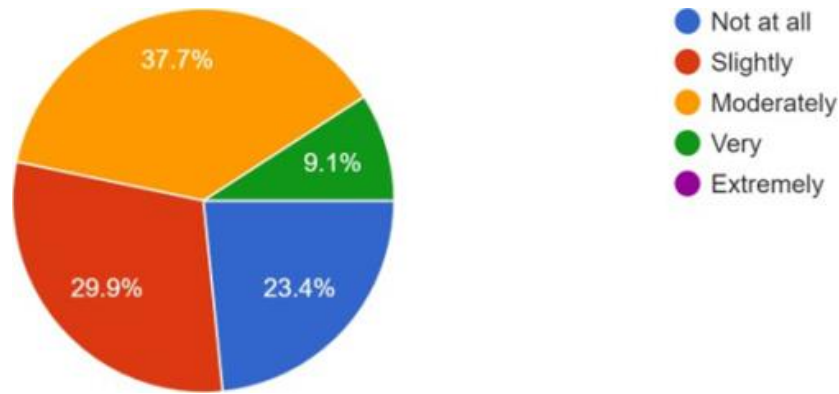


Figure 13 Current Status of Campus Facilities

**How can campus resources be improved to aid students' coursework? List your suggestions below.**

For this question, various answers were given by both staffs and students. The majority of the responses are about having access to more educational materials. For example, improving the e-book, journal subscription, more reference books and providing relevant study materials in the library. Next, would be providing more accessible free Wi-Fi around the campus. Furthermore, doing any workshop that can explain the resources in the campus. Lecturers can provide hard copies of the slides to the students. Moreover, the books in the library should be updated to the latest version. The university can also provide enough databases for all related fields in AMU portal. There were only 52 respondents out of 78 that responded to this question. This is because they might use ChatGPT or AI for their assignments or research that they might not be aware of tools that can help with our studies.

**Please suggest any facility that you would the university to provide.**

According to this question, most of the responses are about providing cafeteria, more room for students' discussion, decreasing the food price in the vending machine, improving transport facility for students who are staying at the hostel, improving sports facilities, and having proper ventilation and hygienic toilets.

**Conclusion**

In conclusion, the study demonstrated that most of the participants were aware with their satisfaction of the facilities provided in AMU. Students have already recognized the advantages and disadvantages of facilities in AMU that must be improved. We are confident that AMU would do their best to improve the facilities in AMU, so that the student experience can be enhanced.

**Acknowledgement**

We thank our colleague from Asia Metropolitan University for assisting in the writing of this article.

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## Effect of Mental Health Among AMU Students

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### Abstract

This study is done to investigate the effect of mental health among AMU students. Questionnaires were distributed randomly to 30 students in various faculties to obtain primary data research topic. The overall findings of the study showed that AMU students have occasionally experience the symptoms of stressed and anxious such as changing in diet habits. The main cause of AM students experience stressed and anxious is personal life. AMU students does not engage in any substance abuse while experiencing stressed or anxious. Most of AMU students do not feel comfortable to discuss the problems with their closer friends and even family. Last but not least, AMU students felt that exercise or physical activities is suitable for coping stressed and anxious and support mental health well-being.

**Keywords:** Mental health well-being, stress, anxious

### Introduction

Mental health is a condition of overall well-being where an individual is conscious of their own capabilities, capable of managing typical life pressures, proficient at performing effectively and able to give back to their community (World Health Organization: WHO, 2022). Mental health encompasses our emotional, psychological, and social well-being. Mental health and well-being impact all aspects of development. Mental health is more than merely being free of mental disorders or disabilities (World Health Organization: WHO, 2022). Well-being depends not only on the absence of issues and risks but also on the presence of factors that contribute to healthy growth and mental development.

Good mental health is associated with improved physical health, increased learning, creativity, and productivity, more positive social interactions and relationships, and a healthier lifestyle. Good mental health gives us a sense of purpose in life (Barfoot, 2023). Poor mental health, on the other hand, is related to higher stress levels, and low self-esteem and can result in substance misuse. Mental illnesses like anxiety and depression can develop as a result of persistently poor mental health. (Barfoot, 2023).

According to a study by The Insight Network a student organisation found out that one in five students have a current mental health diagnosis. University students are particularly vulnerable to experiencing mental health issues, given the challenges they often encounter in various aspects of emotional and mental well-being. The shift to independent living and academic responsibilities frequently acts as a catalyst for these difficulties. Among the most common mental health challenges encountered by students are depression, anxiety, substance abuse, and eating disorders (Pesko, 2020).

Mental health plays a major role in a person's well-being. Mental health issues encompass psychosocial impairments, mental illnesses, and other emotional states associated with high levels of suffering, functional limitations, or risk of self-harm. Although this will not always be the case, individuals affected by these issues tend to experience a lower level of mental well-being (World Health Organization, 2022). Mental health issues have affected almost everyone in a certain way, including the students of Asia Metropolitan University (AMU). The statistics report shows that 970 million people worldwide have mental illnesses (SingleCare Team, 2020). This clearly shows that

there is a lack of knowledge on handling mental illnesses. Consequently, poor mental health issues will cause irrelevant stress which will affect the well-being of AMU students. Conditions such as depression, stress, and anxiety can subsequently result in certain students turning to substance abuse. Poor mental health will lead the students to have low self-esteem. Therefore, it is crucial to find the problem caused by mental health and effective ways to prevent further consequences.

The aim of this study is to evaluate the mental health of students at Asia Metropolitan University through a survey-based assessment. Through this survey, we are able to study the effect of mental health among Asia Metropolitan University students. Different students will have different ways of managing mental health issues. Thus, the survey will be conducted to view different perspectives on managing mental health issues. Firstly, the survey will be conducted to study the stress level among AMU students. Secondly, to evaluate how mental health issues led to the use of substance abuse among students. Lastly, it serves as a means to observe how mental health influences one's self-esteem.

Mental health occurs most frequently between college and university students (Pedrelli et al., 2015). This phenomenon can be explained by heavy academic commitment and numerous examinations (Limone & Toto, 2022). The purpose of this study is to investigate the effects of mental health issues among students at Asia Metropolitan University. The scope of the study is limited to recruiting 50 students who study at Asia Metropolitan University Johor Bahru. Each of the 50 volunteers will be asked to complete the questionnaire in order to evaluate the effect of mental health among them.

The study of mental health effects among university students is important because mental issues will affect the student's ability to focus in class (Wilks et al., 2020). Eventually, it will affect the student's academic performance. The focus of the study is to analyze how mental health affects the well-being of the university's students. By this study, we can understand the reasons for mental health issues faced by each student in the university. Thus, we can help the students to solve their problems. Furthermore, this study can observe how university students handle their stress levels effectively. Based on NHS 2021, handling stress effectively can act as a momentum for students to work harder to achieve the goals they aim for.

Additionally, this study assessed the impact of mental health issues on the academic performance of university students. According to Barbayannis et al. (2022), students with stress conditions can affect the students' motivation and hinder their academic achievements. As a result, it is crucial for university students to effectively manage their stress levels to prevent a decline in their academic performance and potential to drop out.

## **Materials and method**

This research is concerned with the study of the effect of mental health among the students of Asia Metropolitan University (AMU). This research hopes to discover how mental health will affect the overall well-being of AMU students. This section focuses on what methods of data collection were used for this study. This section will outline the process of participant selection for this research.

## **Research Instrument**

This research utilized the quantitative research methodology. The instruments used to collect data were questionnaire. The questionnaire contains 20 questions that are divided to two main sections which are respondents' demography and mental health questions. The different types of question used in this questionnaire are the likely-scale, choice and category.

## **Data Collection**

As the result of understanding the effects of mental health among students of Asia Metropolitan University (AMU), the type of research chosen was quantitative research. The quantitative method used in this research was a questionnaire. A questionnaire is a research tool used to gather data from respondents by presenting them with a series of questions. 30 questionnaires were distributed to students who study at Asia Metropolitan University. These 30 students were randomly chosen from 3

different faculties, namely the Faculty of Health Science (FOHS), Faculty of Business, Management and Information Technology (FBMIT), and Centre of Foundation, Languages and General Studies (CFLGS). There were 10 students selected randomly from each faculty.

## Result & discussions

### Section A: Demographic Questions

#### 1. Age

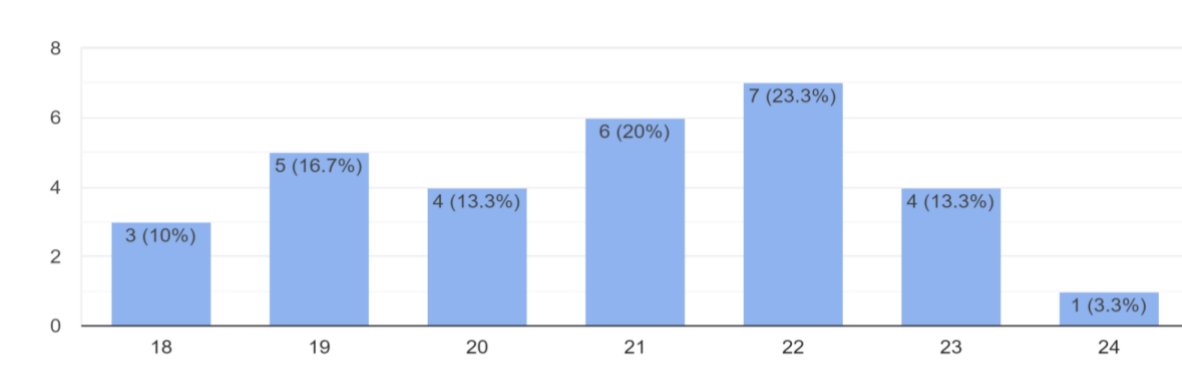


Figure 1 Bar chart of age distribution

Table 1: Frequency distribution table of age

Age	Number of respondents	Percentage (%)
18	3	10
19	5	16.7
20	4	13.3
21	6	20
22	7	23.3
23	4	13.3
24	1	3.3

There are 7 respondents (23.3%) of the age of 22 years old while there is a smaller number of respondents, of which 1 respondent (3.3%) is the age of 24 years old. This might be due to the academic pressure from the demands of assignments and exams, along with the expectation to achieve high grades (Aiman et al., 2020).

#### 2. Gender

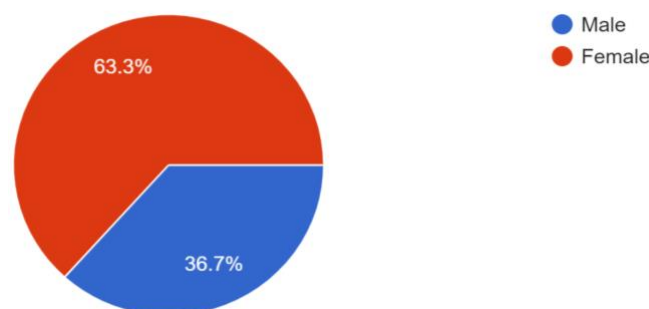


Figure 2 Pie chart of gender

Table 2: Frequency distribution of gender

Gender	Number of respondents	Percentage (%)
Female	19	63.3
Male	11	36.7

There are 19 respondents (63.3%) who are female while the rest of the respondents (11) or 36.7% are male. Psychological distress in female students can result from being in an unfamiliar environment, living far from family, experiencing disinterest in their chosen field, encountering compatibility issues with peers, and facing insufficient educational, economic, and welfare resources (Mokhtari et al., 2013).

### 3. Ethnicity

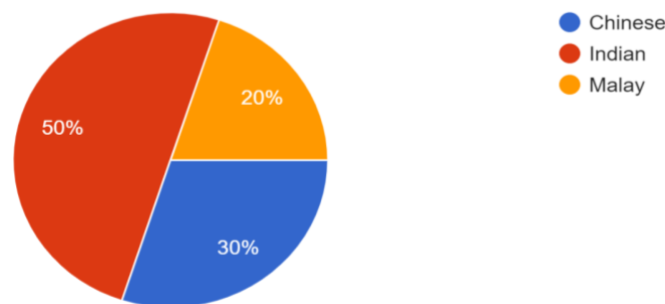


Figure 3 Pie chart of ethnicity

Table 3: Frequency distribution table of ethnicity

Responses	Number of respondents	Percentage (%)
Indian	15	50
Chinese	9	30
Malay	6	20

The highest number of respondents (15) or 50% are Indian students while 20% of respondents (6) are Malay students, 30% of respondents or 9 respondents are from Chinese students. This is due to being negatively impacted by the atmosphere that has been created by the pressure to perform well academically and the high expectations of society and parents (News, 2023).

### 4. Faculty

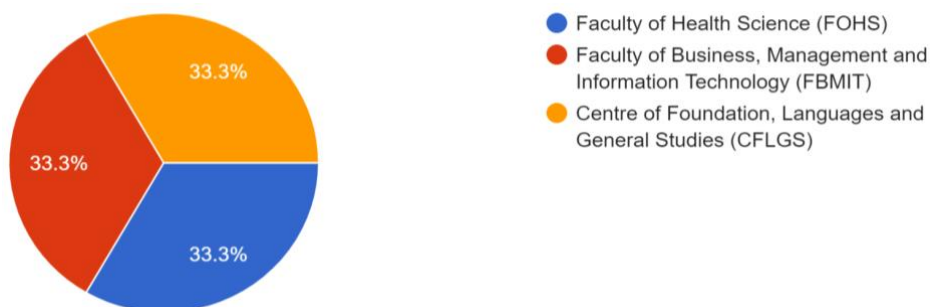


Figure 4 Pie Chart of faculty

Table 4: Frequency distribution table of faculty

Faculty	Number of respondents	Percentage (%)
FOHS	10	33.3
FBMIT	10	33.3
CFLGS	10	33.3

There are an equal number of respondents (10) or 33.3% from FOSH, FBMIT and CFLGS. This might be due to the three faculties having an equal number of assignments and examinations.

## Section B: Mental Health Questions

### 1. How would you rate your overall mental health as a student?

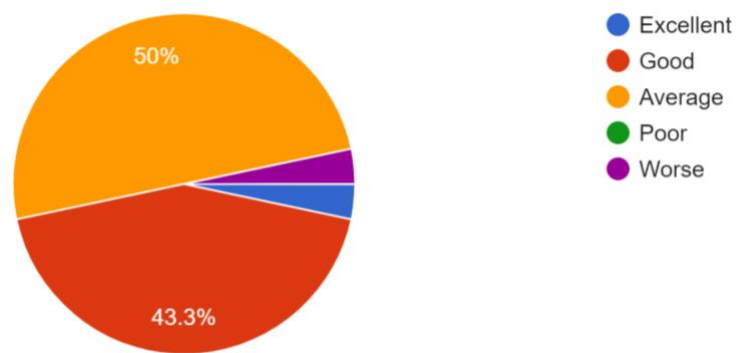


Figure 5 Students' overall mental health condition

Table 5: Students' overall mental health condition

Mental health condition	Number of respondents	Percentage (%)
Excellent	1	3.3
Good	13	43.3
Average	10	50
Poor	0	0
Worse	1	3.3

Most of the respondents (50.0%) rate their overall mental health as students as average while the least respondents (3.3%) rate their overall mental health as students as excellent and worse. This is due to the number of assignments given by the lecturer to students is not too much and less difficult.

**2. Have you experienced any symptoms of anxiety, such as excessive worry or restlessness?**

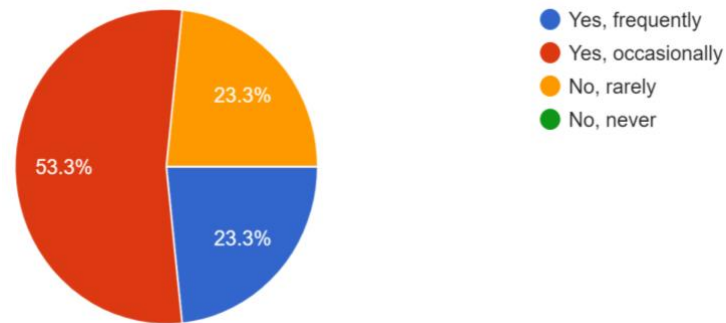


Figure 6 Students' experience in symptoms of anxiety

Table 6: Students' experience in symptoms

Responses	Number of respondents	Percentage (%)
Yes, frequently	7	23.3
Yes, occasionally	16	53.3
No, rarely	7	23.3
No, never	0	0

From the findings, there are 53.3% of respondents which are highest occasionally experience symptoms of anxiety such as excessive worry or restlessness while there are no respondents who never experience any symptoms of anxiety. This is due to low self-esteem, a disadvantaged socioeconomic background within the family, and a heavy academic workload (Mofatteh, 2020)

**3. How have you felt particularly low or down recently?**

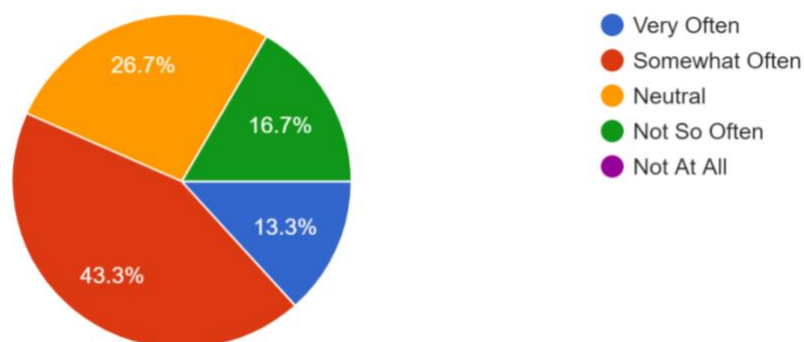


Figure 7 Number of times students felt low or down

Table 7: Number of times students felt low or down

Responses	Number of respondents	Percentage (%)
Very Often	4	13.3
Somewhat Often	13	43.3
Neutral	8	26.7
Not so often	5	16.7
Not at all	0	0

The highest percentage of respondents (43.3%) somewhat often felt particularly low or down recently while the least percentage of respondents (13.3%) very often felt particularly low or down recently. This is due to the student's lack of physical activity such as jogging after learning hours (Mofatteh, 2020). The lack of physical activities of students may be due to the lack of sports facilities on campus,

#### 4. Are you going through a tough emotional situation?

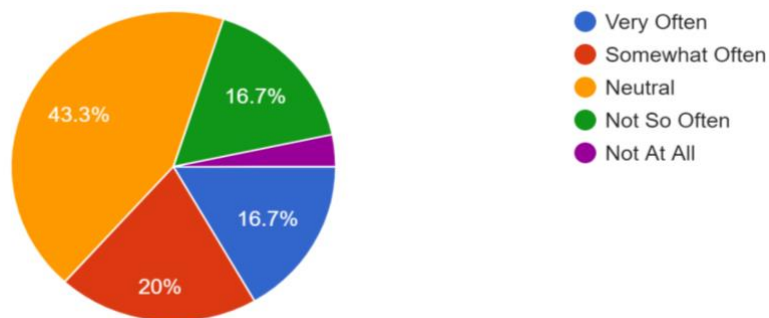


Figure 8 Experience of students through tough emotional situation

Table 8: Experience of students through tough emotional situation

Responses	Number of respondents	Percentage (%)
Very often		16.7
Somewhat often		20
Neutral		43.3
Not so often		16.7
Not at all		3.3

The highest percentage of respondents (43.3%) have rates neutral for Question 4 which is they might or might not go through a tough emotional situation while the least percentage (3.3%) of respondents did not go through a tough emotional situation. As they become adults, they have extra responsibilities in education, personal life, and so on. Besides, they lack good time management. For example, they do not have study life balance (Ross et al., 2019).

**5. What are the things that will make you stressed or anxious?**

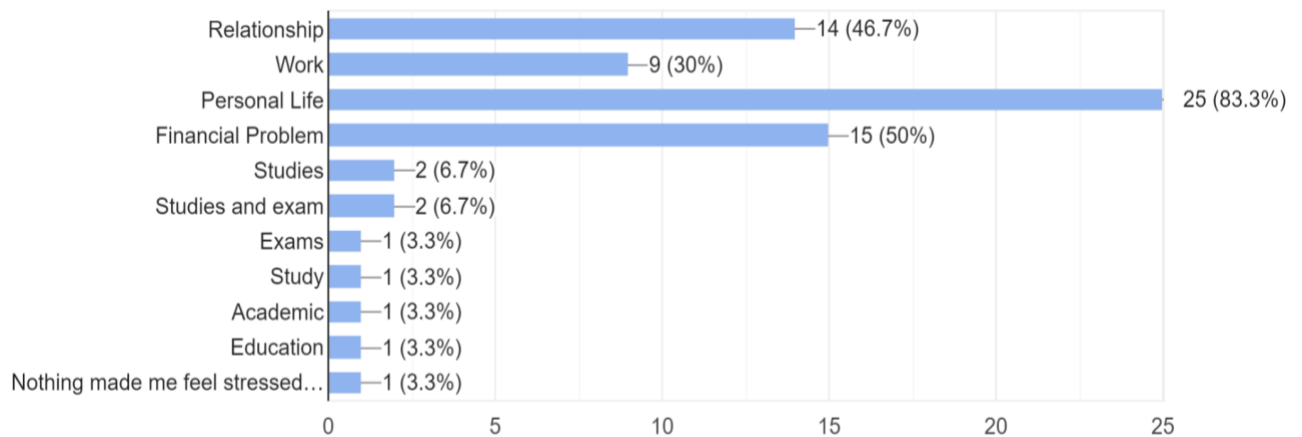


Figure 9 Things that make AMU students stress and anxious

Table 9: Things that make AMU students stress and anxious

Responses	Number of respondents
Relationship	14
Work	9
Personal Life	25
Financial problem	15
Studies and Exam	8
Nothing made me feel stressed recently	1

From the findings above, the highest number of respondents (25), or 83.3% have stress or anxiety due to personal life while the least number of respondents (1) or 3.3% felt that nothing can make them stressed or anxious. This might be due to the relationship either friendship or affection can make the university students feel stressed or anxious. Poor friendship will affect the emotional condition (Piccirillo et al., 2020)

**6. How often has your mental health affected your ability to get work done recently?**

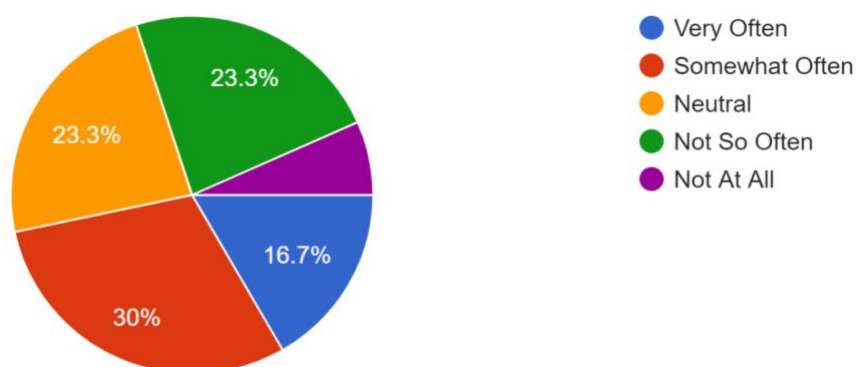


Figure 10 Number of times student's mental health affected their ability to get work done



Table 10: Number of times student's mental health affected their ability to get work done

Responses	Number of respondents	Percentage (%)
Very often	5	16.7
Somewhat often	9	30
Neutral	7	23.3
Not so often	7	23.3
Not at all	2	6.7

The highest percentage of respondents (30.0%) rate somewhat often the mental health affected their workability while the lowest percentage (6.7%) of respondents' workability is not affected by mental health issues at all. Students' work ability might be affected by mental health issues in which they will lose concentration on studies leading to low-quality work submitted and poor performance in examinations (Vanderline, 2017).

#### 7. How often has your mental health affected your relationship recently?

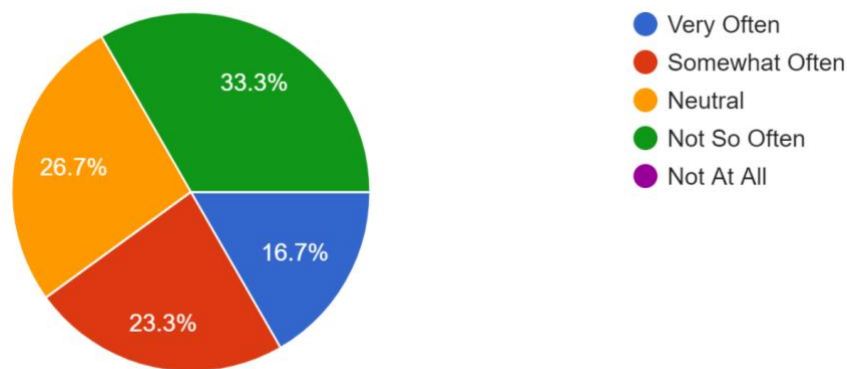


Figure 11 Number of time AMU students' mental health affected their relationship

Table 11: Number of time AMU students' mental health affected their relationship

Responses	Number of respondents	Percentage (%)
Very often	5	16.7
Somewhat often	7	23.3
Neutral	8	26.7
Not so often	10	33.3
Not at all	0	0

The highest percentage of respondents (33.3%) felt not so often that their relationship was affected by mental health while the least percentage (16.7%) of respondents felt that very often their relationship was affected by mental health. Certain people might feel reluctance or anxiety about revealing their mental health condition to their significant other because of the ongoing social stigma associated with mental illnesses.

**8. How many hours of sleep do you get per night on average?**

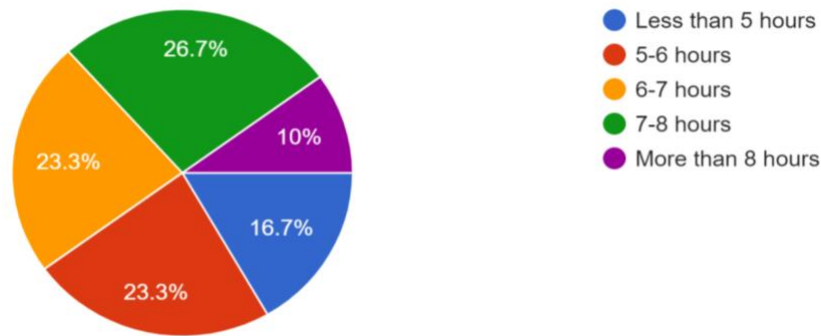


Figure 12 AMU students' sleeping hours per night

Table 12: AMU students' sleeping hours per night

Sleeping hour	Number of respondents	Percentage (%)
Less than 5 hours	5	16.7
5-6 hours	7	23.3
6-7 hours	7	23.3
7-8 hours	8	26.7
More than 8 hours	3	10

Based on the findings, most of the respondents (26.6%) have 7-8 hours of sleeping hours per night on average while the least percentage of respondents (10%) have more than 8 hours of sleeping hours per night on average. Overall, AMU students have adequate sleeping hours per night. Sleeping hours have a strong relationship with academic performance.

**9. Have you noticed any change in your diet habits?**

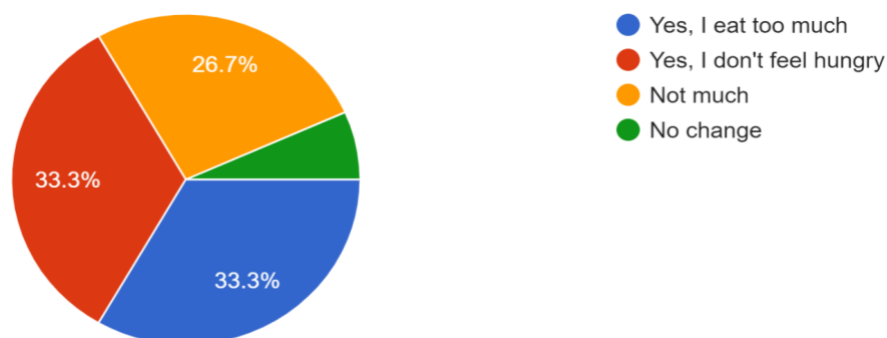


Figure 13 Awareness of AMU students toward change of their diet habits

Table 13: Awareness of AMU students toward change of their diet habits

Responses	Number of respondents	Percentage (%)
Yes, I eat too much	10	33.3
Yes, I don't feel hungry	10	33.3
Not much	8	26.7
No change	2	6.7

Based on findings, 33.3% of respondents have noticed they have changed in their diet habits either eating too much or not feeling hungry while only 6.7% of respondents have not noticed any changes in their diet habits. Individuals experiencing stress might find themselves with limited time or motivation to make healthy, well-balanced meals, or they may end up missing or neglecting their regular meals (Boston & Ma, 2020).

**10. Do you engage in any substance use, such as smoking or alcohol consumption?**

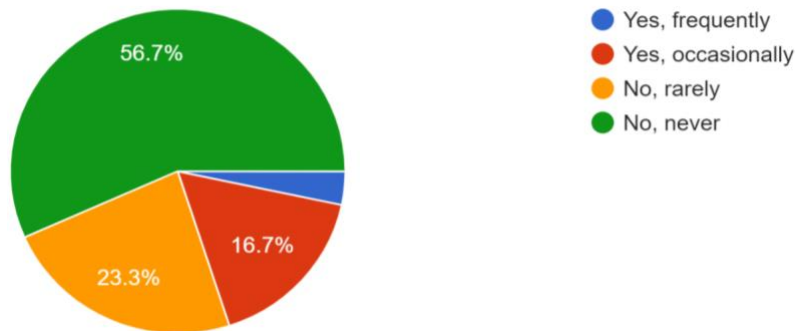


Figure 14 Engagement of students in substance abuse

Table 14: Engagement of students in substance abuse

Responses	Number of respondents	Percentage (%)
Yes, frequently	1	3.3
Yes, occasionally	5	16.7
No, rarely	7	23.3
No, never	17	56.7

The highest percentage of respondents (56.7%) answered 'no, never' toward engaging in any substance use while 3.3% respondents answered 'yes, frequently' to the use of substances. Based on the result, not every AMU student engages in substance use even though they have mental health problems. AMU students might think that substance abuse do not really solve the problem they faced.

**11. When was the last time you were really happy?**

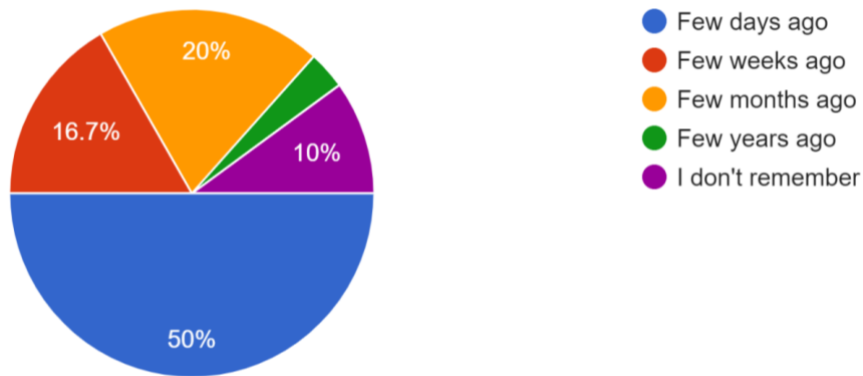


Figure 15 Last time AMU students' really felt happy

Table 15: Last time AMU students' really felt happy

Responses	Percentage (%)
Few days ago	50
Few weeks ago	16.7
Few months ago	20
Few years ago	3.3
I don't remember	10

Most respondents (50%) felt really happy a few days ago while the least percentage of respondents (3.3%) feel really happy a few years ago. This might be due to there being some good news such as the lecturer approving the late submission of an assignment or there are no assignments at all after the class. This will make students feel happy.

**12. When was the last time you felt good about yourself?**

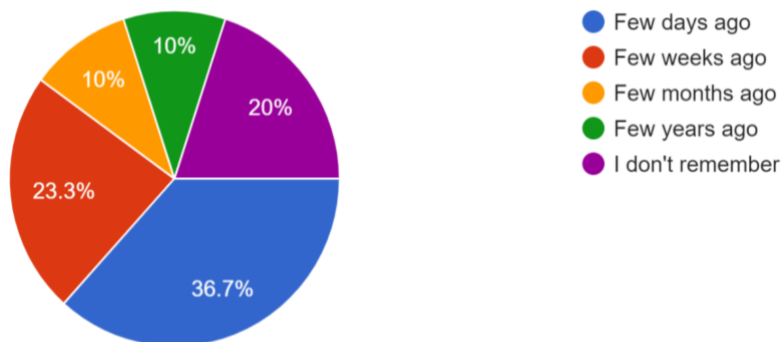


Figure 16 Last time AMU students felt good about themselves

Table 16: Last time AMU students felt good about theirselves

Responses	Number of respondents	Percentage (%)
Few days ago	11	36.7
Few weeks ago	7	23.3
Few months ago	3	10
Few years ago	3	10
I don't remember	6	20

Based on the result, most respondents (36.7%) felt good about themselves a few days ago while the least percentage of respondents (10%) had an equal response to being good about themselves a few months ago and a few years ago. From this result, most AMU students might be motivated after completing the assignment which increases their confidence level.

### 13. How often do you feel positive about your life?

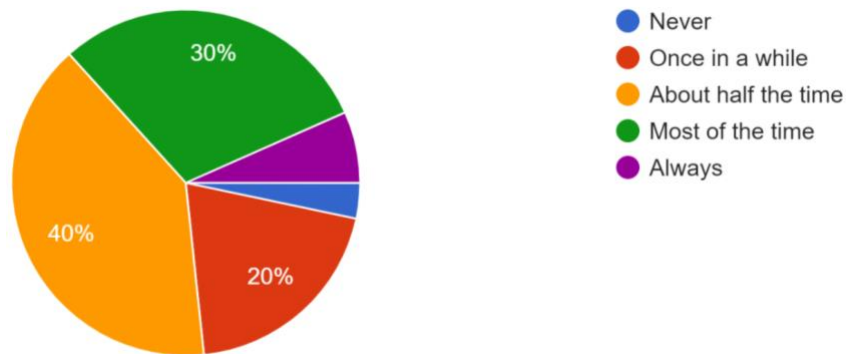


Table 17 Number of time AMU students feel positive about their life

Table 17: Number of time AMU students feel positive about their life

Responses	Number of respondents	Percentage (%)
Never	1	3.3
Once in a while	6	20
About half the time	12	40
Most of the time	9	30
Always	2	6.7

Most respondents (40%) about half of the time feel positive in life while the least percentage of respondents (3.3%) never feel positive in life. Most of the AMU students feel positive in life due to proper mental health management. More social connections can make students more positive than others who do not have a wide social connection.

#### 14. Does your mental health limit you in doing daily activities?

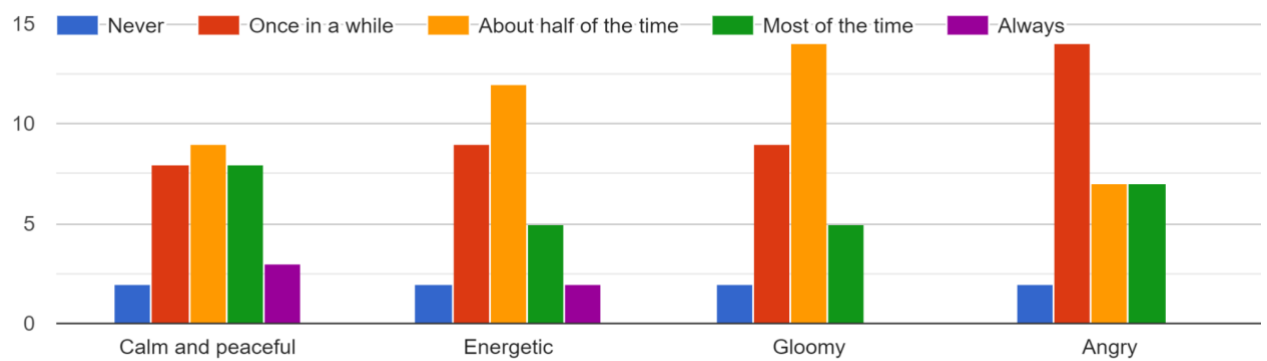


Figure 18 Mental health issue limit AMU students' ability to do daily activities

Table 18: Mental health issue limit AMU students' ability to do daily activities

Responses	Number of respondents	
Calm and peaceful	Never	2
	Once in a while	8
	About half the time	9
	Most of the time	8
	Always	3
Energetic	Never	2
	Once in a while	9
	About half the time	12
	Most of the time	5
	Always	2
Gloomy	Never	2
	Once in a while	9
	About half the time	14
	Most of the time	5
	Always	0
Angry	Never	2
	Once in a while	14
	About half the time	7
	Most of the time	7

Always	0
--------	---

From the findings, the highest number of respondents (9) rate about half of the time calm and peaceful will affect the daily activity, 12 respondents rate about half of the time being energetic and 14 respondents rate half of the time being gloomy can affect the daily activity. There are 14 respondents who rate once in a while that being angry can affect their daily activities. A person's emotional state can significantly impact their sensory perception, intellectual abilities, response time during emergencies, and various other bodily functions.

**15. Are you comfortable discussing your mental health problems with your friends or family members?**

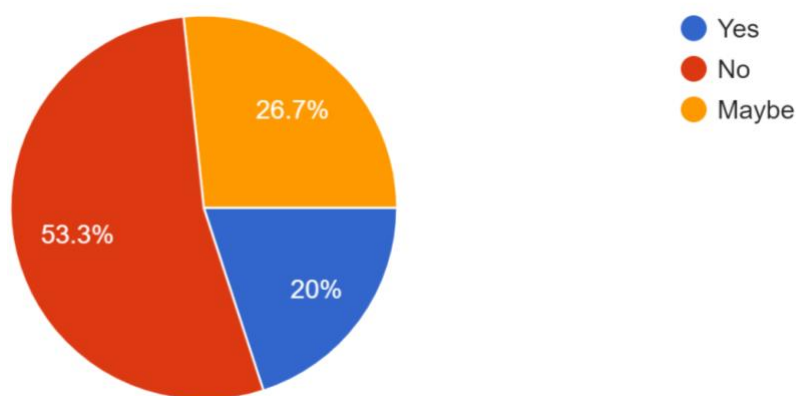


Figure 19 Comfortability of AMU students discuss mental health problem with friends or family member

Table 19: Comfortability of AMU students discuss mental health problem with friends or family member

Responses	Percentage (%)
Yes	20
No	53.3
Maybe	26.7

From the result, most of the respondents (53.3%) feel uncomfortable sharing their mental health problem with family and friends while the lowest percentage of respondents (20%) feel comfortable sharing their mental health problem with their family and friends. Most of the students feel uncomfortable sharing their personal problems with the close ones. This is due to some parents not understanding their son's or daughter's issues making them sad and stressed.

**16. What self-care activities or coping strategies do you engage in to support your mental well-being?**

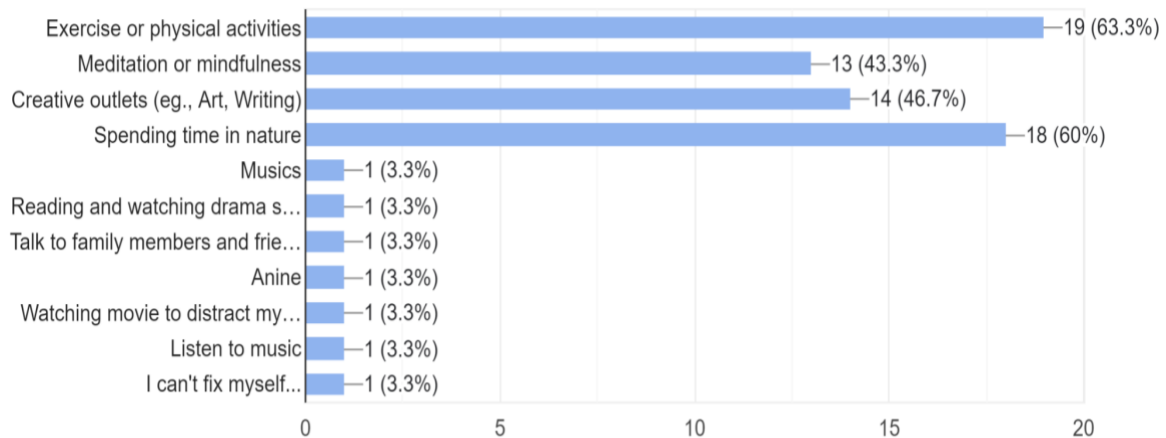


Figure 20 Self-care activities or coping strategies do AMU students engage to support mental well-being

Table 20: Self-care activities or coping strategies do AMU students engage to support mental well-being

Responses	Number of respondents
Exercise or physical activities	19
Meditation or mindfulness	13
Creative outlets (Art, Writing...)	14
Spending time in nature	15
Listening to Music	2
Reading and watching drama/movies/anime	3
Talk with friends and family	1
Watching Anime	1
I can't fix myself	1

From the findings above, the highest number of respondents (19) or 63.3% chose exercise or physical activities as coping strategies while the least number of respondents (1) or 3.3% felt that nothing can fix them. From here, almost every student can cope with their mental health problems by doing activities they like. Exercise improves mental health by reducing anxiety, depression, and negative mood and by improving self-esteem and cognitive function (Smith & Merwin, 2021)

## Conclusion

To conclude, this study sheds light on the correlation between the mental health of Asia Metropolitan University students and their cognitive patterns and behavioral adaptation on managing daily struggles of being an undergraduate student. Through a comprehensive analysis of the various factors influencing mental health, we have acknowledged valuable insights into the challenges faced by students in pursuit of finishing their tertiary studies.

Our findings demonstrate that the general well-being of students' mental health is on the lower side of the average, yet it is at a worrying edge as they are grappling with mental health complications, majorly anxiety, stress, and depression. As for the factors caused, we propose that it is



a complex interplay of personal issues of the student and their academic and social demand. Moreover, lack of awareness and societal pressure play a crucial part as well. Family, particularly parents, has further intensified the problem via underestimating the need for medical attention; yet students are constantly blamed by them for their actions which are mostly rooted in mental health complications.

Furthermore, we would like to address the stigma associated with seeking help for mental issues. As worrying as it may sound, many students deny the existence of mental health due to a lack of acknowledgement and judgement created by individuals surrounding them, as addressing issues regarding mental health is a form of weakness and something to be ashamed of. In contrast, our study underscores the importance of proactive interventions and alternatives aimed at promoting positive mental health. It is imperative that university officials prioritize mental health initiatives such as providing certified psychiatrists as therapists, and organizing awareness campaigns and programs to better support the students. By fostering openness, they encourage students to seek assistance without the fear of judgement.

In the long run, we would emphasize our study by widening our qualitative process of collecting data, as it limits the liberty of extracting crucial information from the subjects as this study is more prone to psychological aspects. We believe that by carrying out live surveys it would strengthen the depth of the study and widen the spectrum on types of mental health issues and ways to manage them. Moreover, validation from a qualified professional would aid in the process of research as well.

As we move forward, it is essential for students, university authorities, and parents to work collaboratively to form a safe and nurturing educational environment for the betterment of Asia Metropolitan University students.

The concluding sections of a thesis, dissertation, or research paper should incorporate recommendations from the literature. During the research process and analysis of gathered information, there may be instances where certain concepts or discoveries do not precisely align with the study's initial parameters. Alternatively, the findings might reveal implications or causal relationships between previously investigated variables that extend beyond what prior research has explored. It is essential to incorporate the precise wording from survey questions in the presentation of respondent interactions. To achieve this, the following recommendations are suggested.

Firstly, owning the questions allows us greater flexibility in terms of wording and layout. This method however presents concerns about objectivity, validity (to test whether it is measuring the needed part), and reliability (the repeatability of values of a variable when you assess the same people several times). Numerous assessment scales and questionnaires have been developed in an effort to enhance these three factors. It is thus advised to look for questions that gauge the information seeking, for instance at the library (Questionnaire Design Recommendations | 1KA, n.d.).

Secondly, don't make the respondents fill out necessary questions, for instance; instead, focus on making sure it provides the seeking data. For instance, limit the answer box to only four-digit integers if the birth year is questioned. While notifying the respondents that the information is inaccurate and requesting a correction, answering further questions shouldn't be a problem because this could lead them to lie or leave the survey.

Thirdly, the questions' substance should be straightforward and simple to comprehend. Do not use terms or phrases that are highly technical, slang, or jargon. Avert inquiries with several dimensions as well.

Fourth, the order in which the questions are asked is crucial. The sequence must make sense. For instance, questions regarding events should be in the same order as the events, and questions about evaluating experiences should come after questions describing those experiences. Questions on the same subject matter ought to be grouped together. Decrease the probability that the respondent's replies will be thoughtful by often shifting the subject. The responses can only concentrate on one issue at a time if questions are organized according to topics. The importance of the topics and questions should be ranked from highest to lowest for the responses. According to studies, surveys covering subjects that are significant to respondents have a greater response rate. Sensitive or tough questions should be placed at the conclusion of the survey since we do not want

the respondent to leave the survey right away due to this problem. Usually, the questionnaire's final section contains demographic questions. As an illustration, questions with the same scale should be grouped with other questions that have comparable scale components. So, we lessen the respondent's cognitive load.

Fifth, unless the first question is intended to establish the "suitability" of the respondent, it should be appropriate for everyone. Keep it straightforward so that people may quickly read, comprehend, and answer. Long queries with several possible replies or open-ended inquiries are inappropriate here. Make it engaging so that respondents are more likely to engage in the survey. Next, the survey's measurement scales have to be uniform. If you use a scale from 1 to 5, it should be constant throughout the survey, with 1 representing the lowest value and 5 representing the greatest. Next, when designing the questionnaire's initial and end pages, use caution. Do not provide instructions on the first page since it should serve the primary purpose of motivating the responses.

The final page needs to be brief and often contains a statement of gratitude. Next, decide which style of inquiry is most appropriate for each one. Next, since scrolling on a page is not advised, the survey should also be separated into numerous pages if it contains a lot of questions. In order to reduce completion time and the chance that respondents may leave the survey; we also advise that you include more than one question on each page. If required, use leaps and branching. Text such as "if you answered 'Yes' in Q1, answer Q2, otherwise proceed to Q3" should not be included. Lastly, when asking closed-ended questions, be sure to consider every response. Use the "other" option if you are unsure.

### **Acknowledgement**

Fore mostly, we would like to convey our heartiest gratitude and thanks to Assoc Prof. Dr Mohd Hayrie Bin Mohd Hatta, our lecturer who guided us throughout the preparation of each chapter of this research. It is his gentle and right-on-time concept which drove us to work diligently upon the completion of the report. Apart from that, we would also like to thank our respondents comprised of 30 students of Asia Metropolitan University (AMU) who were generous on sharing their experiences and knowledge, also on spending time to answer and to return our research questionnaires. Not forgetting, our dearest friends, the team members (Wong Sru Thi, Wong Kher Thi, Hee Ka Chun and Uwanraaj A/L Kuselan) who were tolerant, committed, cooperative and consistent in contributing every portion of the study on effect of mental health among AMU students. In addition, we are ought to a deep express appreciation for everyone who directly and indirectly gave a mind to produce this report. We hope that the findings of this study effect of mental health among AMU students will be beneficial and aid further research in future. We as well hope this study will provide required information for the readers. Till we pen again in another page, once again thank you.

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## Crystalline Carbon Nitride Materials as Potential Visible-Light-Driven Photocatalysts

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### Abstract

The use of photocatalysts has become crucial in addressing the current energy shortage and environmental pollution. In this context, graphitic carbon nitride (CN) stands out due to its better visible light response and more stable physicochemical properties compared with other traditional photocatalysts. However, the traditional CN thermally induced by polymerization of nitrogen-containing precursors produces the melon-based carbon nitride solids with an amorphous or semi-crystalline structure, resulting in low conductivity and moderate photocatalytic activity. Recently, crystalline CN has attracted more and more attention in improving photocatalytic performance. Some significant progress regarding crystalline carbon nitride for the preparation of solar-fuel and environmental purification has also been made. This review describes design and synthesis of crystalline carbon nitride photocatalysts. Then, the photocatalytic application of crystalline carbon nitride was discussed, mainly including photocatalytic H<sub>2</sub> production, and photocatalytic degradation of pollutants.

**Keywords:** Crystalline Carbon Nitride, Photocatalysts, Materials.

### Introduction

Crystalline graphitic carbon nitrides (crystalline g-CN) are classified into a new class of two-dimensional (2D) carbon nitrides network with highly ordered structure (Bojdys et al., 2008). It can also be acknowledged as an improved version of typical amorphous graphitic carbon nitride (g-C<sub>3</sub>N<sub>4</sub>/g-CN) (Figure 1A) with respect to its structural order (Thomas et al., 2008). Meanwhile, a typical synthesized g-CN has an amorphous phase. Crystalline g-CN (Figure 1B) was discovered by Bojdys and Wirnhier (2008) and specifically called as poly(triazine imide) (PTI) (detailed discussion in section 2). Since there are many versions of crystalline g-CN with certain stoichiometries of C and N that have been successfully synthesized, the term crystalline g-CN has been used for general naming. Similar to g-CN, crystalline g-CN consists of mainly elements of carbon C, nitrogen N, and some minor impurity hydrogen H (Zhu et al., 2014). The framework topology identified that crystalline graphitic CN comprises an infinite 2D networks of triazine units that are condensed by means of NH bridges (Wirnhier et al., 2011). The triazine structure and the high degree of condensation make this material thermally stable up to 600 °C and chemically stable from acid and base solution as well as in organic solvent (Wang et al., 2012). In term of electronic properties, it has a band gap energy of 2.7 eV (Thomas et al., 2008). Besides, its highly ordered structure has been proposed to led to an efficient electron charge transfer (Fettkenhaeur et al., 2015).

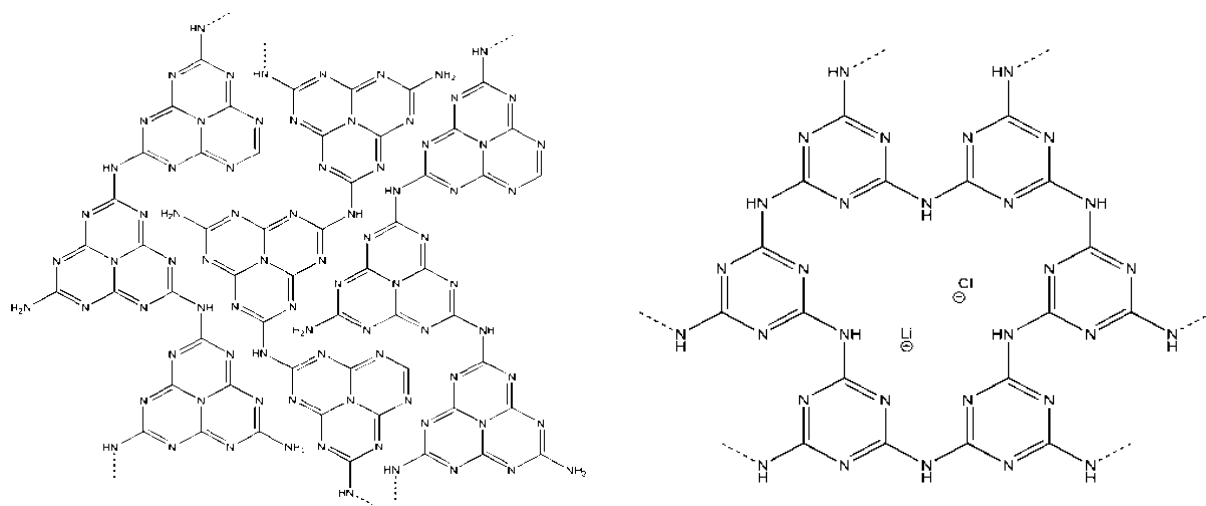


Figure 1 Schematic diagrams of graphitic CN (left) and poly(triazine) imide (PTI) (right) (Adapted from Schwinghammer *et al.*, 2013)

These unique properties have made crystalline g-CN as a promising material for application in photocatalysis. In addition, its polymeric nature allows it to be controlled over the surface chemistry via molecular level modification and surface engineering (Thomas *et al.*, 2008). As the photocatalytic properties are sensitively affected by the crystallinity of the photocatalyst, hence a highly crystalline photocatalyst can be one of the solutions in enhancement of the photocatalytic performance (Bhunia *et al.*, 2014).

In this chapter, crystalline carbon nitrides materials are reviewed. The methods and techniques deployed in preparation of crystalline CN material are discussed. It is noted that this present review focuses more on graphitic type of crystalline CN. Therefore, the physicochemical properties and photocatalytic performance of crystalline g-CN are presented. Besides, recent advancements on the modification of crystalline CN materials in enhancement its photocatalytic performance are discussed briefly.

### Synthesis of Crystalline Carbon Nitrides

To date, five different crystal structures of crystalline CN materials have been proposed: the hexagonal  $\alpha$ -CN and  $\beta$ -CN, the cubic and pseudocubic CN and crystalline graphitic CN (Lv *et al.*, 2003). Only graphitic type is in two-dimensional while the rest are three-dimensional (3D) (Teter and Hemley 1996). The  $\alpha$ -CN and  $\beta$ -CN can be prepared via various method such as laser-electrical discharge method. In laser-electrical discharge method as prepared by Burdina *et al* (2000), the material was prepared from amorphous nitrogen and carbon-containing material in the presence of seeds of crystalline CN thin films at ultra-high pressure and temperature by a laser electrical discharge method. The conversion of amorphous to crystalline phase was achieved using wafers and the films, under pressure of 70 kbar and heated to the temperature of 550 °C for 2 hours. The material was further characterized by X-ray diffraction (XRD) to confirm the crystalline properties. The authors concluded that parameters like temperature (350-1200 °C) and long exposure to high pressure (70 kBar) played an important role in crystallization of the samples.

Others methods reported in literatures for the preparation of  $\alpha$ -CN and  $\beta$ -CN are laser ablation method (Niu *et al.*, 1993), chemical vapour deposition (Zheng *et al.*, 1996) and electrolysis of methanol-urea solution (Kundoo *et al.*, 2003). Besides the difficulties in the preparation of  $\alpha$ -CN and  $\beta$ -CN, the hardness of the material which can challenge the hardness of diamond and the high band gap energy ( $E_g = 3.85$  eV for  $\alpha$ -CN and  $E_g = 3.25$  eV for  $\beta$ -CN) make this type of CN to be not preferable for the application of photocatalysis. Moreover, the reported cubic CN has the atomic density of 0.2957 mol atoms/cm<sup>3</sup>, which is equal to the atomic density of diamond (0.2957 mol atoms/cm<sup>3</sup>) (Chen *et al.*, 1997; Teter and Hemley, 1996; Yin *et al.*, 2003). Thus, many research and development works have been focused on improvement of the graphitic CN due to its physicochemical properties that give many advantages to various applications especially in catalysis and photocatalysis field.

The crystalline g-CN is much easier to be synthesized compared to the other four crystal types. As mentioned before, the crystalline g-CN is the graphitic CN which has increased crystallinity.

Usually, crystalline g-CN can be obtained with the assistance of related technique to facilitate the crystallization process. In fact, an amorphous g-CN can be simply prepared by condensation of cyanamide or diacyanamide (Thomas *et al.*, 2008) (Figure 2). The condensation or polymerization of diacyanamide at selected temperature with addition of appropriate solvents such as salt melts of lithium chloride (LiCl) and potassium chloride (KCl) favours the formation of crystalline CN (Bhunja *et al.*, 2014; Bojdys *et al.*, 2008; Schwinghammer *et al.*, 2013; Wirnhier *et al.*, 2010).

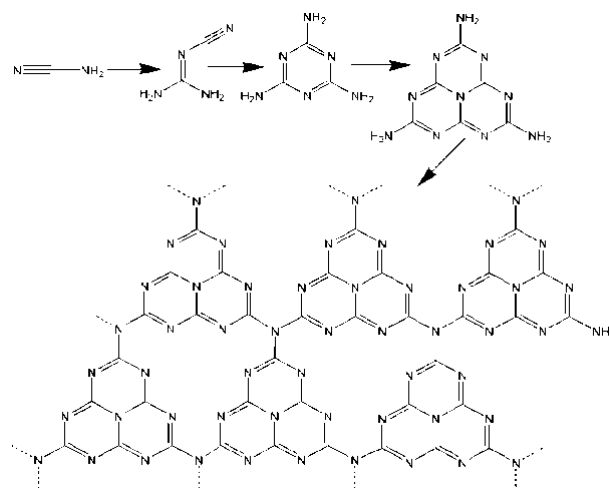


Figure 2 Condensation of cyanamide to give discrete oligomer, polymers and extended network. (Adapted from Thomas *et al.*, 2008)

The novel approach of preparation of crystalline g-CN using salt melts of LiCl-KCl (eutectic mixture) as solvents during condensation reaction was introduced by Bojdys *et al.* (2008). As discussed before, the conventional CN condensations not only produced an amorphous and non-stoichiometric product, but also led to some kinetic problems such as fast condensation process and the immobility of the condensation intermediates which inhibited a complete reaction. The kinetic problem could be overcome by introducing an appropriate solvent. However, as the polymerization or condensation process of s-heptazines derivatives occurred at 400 °C and above, most of standard solvents could not be used as they would be discarded at temperature higher than 350 °C. Therefore, in this process, the selection of solvents needs to be considered properly (Jürgens *et al.*, 2000).

The salts melt or eutectic mixture of LiCl-KCl ( $T_m = 352$  °C, 45.55 wt. %) has been used as a medium for electrochemical processes in high temperature galvanic cells (Laitinen *et al.*, 1960) and as a solvent for salts of lanthanides and actinides (Cassayre *et al.*, 2007). The high thermal stability and their good solvating properties in nitrides, carbides, cyanides, cyanates and thiocyanates have made the salts melt as a good solvent back in the 1960s. For CN condensation reactions, an eutectic mixture of LiCl-KCl with its melting point below the condensation temperature of melem shows the promising capability in the reactions. Moreover, good solvation of the small molecular precursor and subsequent aggregates of higher molecular weight facilitated the condensation of the CN network (Bojdys *et al.*, 2008; Wirnhier *et al.*, 2010).

The crystalline CN networks as described by Bojdys *et al.* (2008) and Wirnhier *et al.* (2010) showed a 2D network that intercalated with lithium ( $\text{Li}^+$ ) and chloride ( $\text{Cl}^-$ ) ions. Due to the presence of  $\text{Li}^+$  and  $\text{Cl}^-$  ions in the material, the structure is specifically named as poly (triazine amide) and has full chemical formula of  $[(\text{C}_3\text{N}_3)_2(\text{NH}_x\text{Li}_{1-x})_3.\text{LiCl}]$ . However, most reported literatures retain the name of crystalline carbon nitride for general naming. The  $\text{Li}^+$  and  $\text{Cl}^-$  ions are incorporated in triazine imide network resulted from the use of eutectic mixture of LiCl-KCl as solvent (McDermott *et al.*, 2013). The building blocks structure of crystalline CN is dissimilar with that of the amorphous one (triazine or tri-s-azine) (The differences in building block structure can be referred in Figure 1). Figure 3 shows the idealized structure of crystalline CN or poly (triazine amide) (PTI/ $\text{Li}^+\text{Cl}^-$ ) with intercalation of lithium and chloride ions as described by Bojdys.

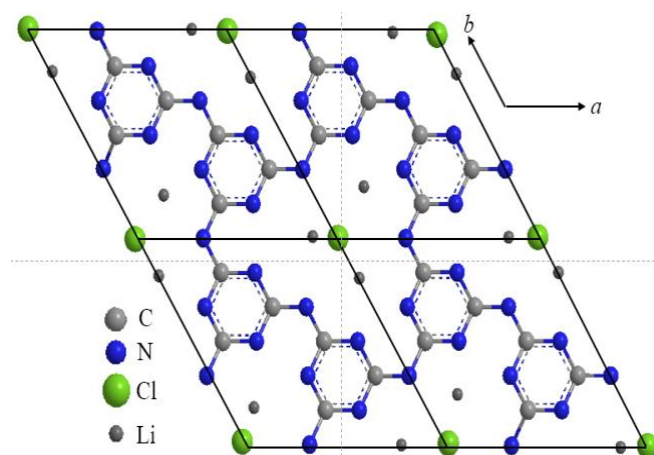


Figure 3 Parallel projection of the structure of PTI/Li<sup>+</sup>Cl<sup>-</sup> in ABA stacking. (Adapted from Wirnhier *et al.*, 2008)

The PTI has a stacking layers (graphitic-like structure) that made of imide-linked triazine unites and arranged stacked in an ABA-type, separated by weak van der Waals forces. The Li<sup>+</sup> and Cl<sup>-</sup> ions are situated in the channels running along the stacking direction (Wirnhier *et al.*, 2011). Due to its crystallinity structure, it is expected to be an excellent photocatalyst in photocatalysis field. It has been reported that the photocatalytic activity of the crystalline CN is comparable with that of the heptazine-based melon (Bojdys *et al.*, 2008 and Wirnhier *et al.*, 2011). In a typical synthesis of crystalline g-CN of PTI/Li<sup>+</sup>Cl<sup>-</sup>, a compound contains carbon and nitrogen-rich element such as dicyandiamine (Bojdys *et al.*, 2008; Schwinghammer, *et al.*, 2014; Wirnhier, *et al.*, 2010) or melamine (Bhunia *et al.*, 2015), was used as a precursor of CN. In one of the works done by Bojdys (2008), a 0.2 g of dicyandiamine (2.38 mmol) was mixed with the eutectic mixture of LiCl (59.2 mol%, 0.904 g, 21.33 mmol) and KCl (40.8 mol%, 1.096 g, 14.70 mmol) and ground together under vacuum condition. The mixture was transferred into a silica glass tube and placed in a vertical tube furnace. The sample was heated to 400 °C under the flow of argon gas for 12 hours. After the sample was cooled to room temperature, the sample was placed again in the same furnace and heated to 600 °C for 48 hours. The final product was washed twice with boiling water to remove residue and excessive salts.

The XRD analysis results showed that the prepared sample was in crystalline form while further characterization from solid-state nuclear magnetic resonance (NMR) and Fourier transform infra-red spectroscopy (FTIR) as well as high-resolution transmission electron microscopy (TEM) confirmed the prepared sample composed of imide-bridged triazine units with partly condensed 2D network (Wirnhier, *et al.*, 2010). However, the photocatalytic performance of the prepared sample is not available as the authors focused only on the development of crystalline CN network.

Another simpler method for synthesis of crystalline g-CN was reported by Bhunia *et al.*, (2014). Instead of cyanamide or dicyandiamine, melamine was used as CN precursor. The crystalline CN prepared by the authors required no pressure and involvement of gaseous during the production. In the study, melamine (7.93 mmol) was dissolved in 30 ml of ethanol and heated for overnight at a temperature of 100° C. The precursor was then mixed with eutectic mixture of LiCl-KCl (LiCl; 59.2 mol%, 2.26 g, 53.56 mmol and KCl; 40.8 mol%, 2.74 g, 39.88 mmol). The mixture was then placed in an open porcelain crucible followed by calcination process at 550 °C for 4 hours. After being cooled down to room temperature, the sample was ground to a powder and washed with boiling water to remove residual salts (Bhunia *et al.*, 2014). The uses of eutectic mixture of KCl-LiCl as ionic solvent in preparation of crystalline CN or PTI/Li<sup>+</sup>Cl<sup>-</sup> has many advantages. In fact, with their high thermal stability and their good solvating properties regarding nitrides, carbides, cyanides, cyanates, and thiocyanates, salt melts were already known as good solvents in the 1960. In particular, a eutectic mixture of LiCl-KCl with composition of 59.2 mol% LiCl and 40.2 mol % is used in the synthesis of crystalline CN because it has a melting point of ca. 350 °C, which is below the condensation temperature of melem. Thus, promising capability for CN condensation reactions is exhibited.



### Photocatalytic Activities of Crystalline Carbon Nitrides

The photocatalytic performance of the prepared crystalline g-CN of PTI/LiCl<sup>+</sup> was evaluated in hydrogen production and the photocatalytic activity was compared with amorphous type (g-CN) (Table 1.1). It was demonstrated that the crystalline g-CN showed a slight increase in hydrogen evolution rate (HER) compared to amorphous one with 22  $\mu\text{mol h}^{-1}$ . The photocatalytic improvement was about to 1.5 times higher than amorphous one. Another similar work reported by Schwinghammer *et al* (2013) claimed that crystalline g-CN showed an improved photocatalytic hydrogen evolution rate *ca* 1.2 times higher than amorphous CN. However, in photocatalytic degradation of organic pollutants, the degradation rate constant of Rhodamine B (RhB) was demonstrated to have 10 times higher than that of the amorphous CN.

Table 1: Effect of crystallinity on graphitic CN in photocatalytic applications under visible light irradiation

Phase	Photocatalytic Application	Rate	Photocatalytic Activity	Ref.
Amorphous	Hydrogen Production	Hydrogen evolution rate ( $\mu\text{mol h}^{-1}$ )	15 $\mu\text{mol h}^{-1}$	Bhunia <i>et al.</i> , (2014)
Crystalline			22 $\mu\text{mol h}^{-1}$	
Amorphous	Hydrogen Production	Hydrogen evolution rate ( $\mu\text{mol h}^{-1} \text{g}^{-1}$ )	722 $\mu\text{mol h}^{-1} \text{g}^{-1}$	Schwinghammer, <i>et al.</i> , (2013)
Crystalline			864 $\mu\text{mol h}^{-1} \text{g}^{-1}$	
Amorphous	Organic Pollutants Removal	Rate constant, k ( $\text{min}^{-1}$ )	$2.2 \times 10^{-3} \text{ min}^{-1}$	Fettkaunher <i>et al.</i> , (2015)
Crystalline			$21 \times 10^{-3} \text{ min}^{-1}$	

The highly improved photocatalytic activity was due to better transport of the photogenerated and transferred electrons to the surface of the material. The superior photocatalytic activity performed by crystalline g-CN in photocatalytic degradation of RhB have suggested the potential uses in removal of various common toxic organic pollutants such as phenol, salicylic acid, and 2,4-dichlorophenoxyacetic acid. Since there are only a few works that have been reported in the literature, further research and development of crystalline g-CN as photocatalyst for removal of highly toxic organic pollutant is expected to give benefit to the environment.

### Modifications of Crystalline Carbon Nitride and its Photocatalytic Activity

Although crystallinity was reported to improve the photocatalytic activity compared to amorphous g-CN, the photocatalytic performance is still considered low. To be an efficient photocatalyst, ability of light absorption light in longer wavelength (Zhang *et al.*, 2010) is necessary. Therefore, modifications on CN materials have been carried out in order to extend their absorption to longer wavelength. It was documented that modifications of g-CN and crystalline g-CN have improved the photocatalytic performance in hydrogen production (Bhunia *et al.*, 2014; Ho *et al.*, 2015; Takanabe *et al.*, 2010). Besides, modification on amorphous g-CN with metal and non-metal have long reported to improve the photocatalytic activity, but the effect of modification on the photocatalytic performance of g-CN is frequently affected by the preparation methods, thus making this method not accessible to all (Ho *et al.*, 2015; Takanabe *et al.*, 2010). Since sunlight consists of *ca.* 40% of visible spectrum, modifications using modifier that has a good light harvesting properties is highly recommended. Several literatures have reported the modification of crystalline g-CN and amorphous g-CN with 2,4,6-triaminopyrimidine

(TAP). The photocatalytic performance in hydrogen production of modified crystalline g-CN and unmodified crystalline g-CN is summarized in Table 1.2.

It can be shown that incorporation of TAP in crystalline g-CN improved the hydrogen production rate up to 13 times compared to unmodified crystalline g-CN. Meanwhile, Schwinghammer *et al.* (2013) reported that the hydrogen production rate was improved *ca.* 5.6 times after modification using 4-amino-2,6-dihydroxypyrimidine (4AP). The improvement on photocatalytic activity strongly indicated the importance of reducing the band gap energy of crystalline g-CN in order to be able to absorb in longer wavelength. The similar results were also observed when TAP/ 4AP were used as modifiers for both amorphous g-CN and crystalline g-CN. Table 1.3 demonstrates combination of the effect of crystallinity and modification improved remarkably the photocatalytic activity up to *ca.* 13 and 6 times, respectively.

Table 2: Effect of modification on crystalline g-CN in photocatalytic hydrogen production under visible light irradiation

Photocatalyst	Modifier	Photocatalytic Activity	Ref.
Crystalline g-CN	-	15 $\mu\text{mol h}^{-1}$	Bhunia <i>et al.</i> , (2014)
	TAP	204 $\mu\text{mol h}^{-1}$	
	-	864 $\text{mol h}^{-1} \text{g}^{-1}$	Schwinghammer, <i>et al.</i> , (2013)
	4AP	4907 $\text{mol h}^{-1} \text{g}^{-1}$	

Table 3: Effect of crystallinity on modified g-CN in photocatalytic hydrogen production under visible light irradiation

Phase	Modifier	Photocatalytic Activity	Ref.
Amorphous	TAP	4 $\mu\text{mol h}^{-1}$	Bhunia <i>et al.</i> , (2014)
Crystalline		204 $\mu\text{mol h}^{-1}$	
Amorphous	4AP	1080 $\mu\text{mol h}^{-1} \text{g}^{-1}$	Schwinghammer, <i>et al.</i> , (2013)
Crystalline		4907 $\mu\text{mol h}^{-1} \text{g}^{-1}$	

These results suggested that the presence of crystalline phase and lowering the band gap energy were key factors for enhancing the electron charge-transfer process during photocatalytic reaction. The modification of TAP and 4AP into the network of crystalline g-CN is developed to substitute one of the nitrogen atom with carbon atom in the triazine ring of polymeric CN in order to overcome the fast charge recombination and enhances the charge-carrier migration as well as to improve the light absorption. The incorporation of TAP and 4AP into crystalline g-CN effectively tunes its intrinsic electronic properties by narrowing the band gap energy of g-CN from 2.7 to 2.4 eV with a negative shift of valence band of the CN, thus, enhancing the charge-carrier migration as well as ability to work at longer wavelength. In addition, the reason behind the selection of TAP and 4AP as modifiers was due to their high carbon contents as well as their structure that is similar to that of melamine.

## **Conclusion**

The superior photocatalytic performance of crystalline g-CN in hydrogen production showed a very promising aspect to be widely expanded for future usage especially in photocatalytic removal of highly toxic organic pollutant. In this chapter, some examples of photocatalytic hydrogen production using crystalline g-CN and modifications on crystalline g-CN in improving the hydrogen production rate were outlined. It can be concluded that both crystallinity and low band gap energy (2.4-2.7 eV) gave significant contribution in hydrogen production under visible light irradiation. Therefore, it is very important to conduct further research to study and investigate the effectiveness of crystalline g-CN in photocatalytic removal of organic pollutant.

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## **Laissez-faire Leadership Style on Job Satisfaction: A Case Study on Pharmaceutical Salesperson**

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### **Abstract**

The effect of leadership style on job satisfaction is a topic that has been widely studied, however, laissez-faire leadership style tends to be less studied if compared to other style such as: transformational and transactional leadership style. Laissez-faire leadership style is mainly associated with null leadership and fared poorly in most metrics. The objective of this study is to investigate the effect of laissez-faire leadership style have on job satisfaction among pharmaceutical sales employee in Malaysia. Employee work experience was also taken into consideration. Job satisfaction and experience as measured in length of service is the two variables studied. The study relied on primary data using questionnaire polled on 200 pharmaceutical salespeople. Participants were split into two groups: those who have more than 5 years of sales experience and those who have less. Job satisfaction was measured using Job Satisfaction Survey (JSS) while data was captured online using Google Forms. The result was undergone statistical mean analysis and compared against the norms set by JSS author and to compare against each other. The finding showed that sales employees are happy with the laissez-faire leadership style. Employees who have longer sales experience have a higher level of job satisfaction than those who have less. The finding is inconsistent with other studies on job satisfaction in other professions. This may be due to different professions being studied and different moderating variables used. As a conclusion, it was found that laissez-faire leadership style is suitable for sales function employees whose role requires minimal supervision and guidance. It is the hope that the study can realize the untapped potential of laissez-faire leader and company can make use of this style on relevant departments. More study should be done on laissez-faire leadership style on different profession and settings.

**Keywords:** Leadership style, laissez-faire, job satisfaction, experience, length of service, sales employee

### **Introduction**

Job satisfaction has always been the goal of many employers because job satisfaction is thought to have a direct relationship with employee performance and retention (Jack et al., 2020). A satisfied employee tends to stay with the employer longer thus reducing the overall cost of hiring and training a new staff. On top of that, research also shown job satisfaction also affect employee productivity (Hee et al., 2019). A happy employee will be more than happy to take on longer hours compared to peers who are not.

Laissez-faire leadership is a style of management that discourages micromanagement. It is a sort of hands-off management style that put the steering wheel squarely at the hand of employee. This type of management style encourage employee to do their own resource management like time and energy. Leader that adopts this style tends to provide minimal guidance and supervision and expect their employee to practice self-discipline. This of course require a certain degree of trust between the management and employees (Yang, 2015).

Compared to transformational and transactional leadership style, laissez-faire leadership style tends to appear under appreciated. This is because the leadership style is often associated with destructiveness and eagerness to avoid responsibility (Lundmark, 2021). Transformational leadership on the other hand focuses on coaching and training employees to realize their maximum potential. Staff under such leaders is expected to learn from him or her then grew to become the next leaders.

On the other hand, Transactional leadership uses reward vs punishment mechanism to incentivize the employees to perform. Each job is merely a transaction to receive a reward, much like a contractual worker.

Sales jobs tend to have a high workload and stress which affects employees' job satisfaction. This is because the industry is highly competitive and fast paced. The effect of low job satisfaction may translate to good staff leaving and the cost of training new staff will fall to the shoulder of the employers (Abbas, 2020). Since its employee satisfaction play a direct effect on job performance, it is very important that management find way to make their salesperson happy.

One of the factors that determine the effectiveness of any leadership style is work experience of the employees. Experience in this case is defined as the length of time for doing related work. Work experience is very important because when employee is familiar with the job requirement, he or she tends to be more relaxed. On the contrary when worker is given unfamiliar task, anxiety and confusion tends to follow first. Therefore, work experience is seen as a mediating factor for job satisfaction.

Different leadership style tends to thrive under different environments. There is no perfect style that befit every situation or organization. Much of these depend on the employee's characteristic. Since there is already plenty of studies on the benefit of transformational leadership style, it requires no further elaboration. The current study intends to shed light on the potential benefits of laissez-faire leadership style on job satisfaction among salesperson with sales work experience as the mediating variable.

The purpose of this study is to investigate the relationship between leadership style and job satisfaction in sales function especially when experience is considered. The objective is listed below:

1. To investigate the laissez-faire leadership style on job satisfaction for pharmaceutical sales employees of multinational company (MNC).
2. To investigate the effect of experience as a moderator on job satisfaction for sales function.

## **Literature Review**

### **Laissez-faire leadership**

Laissez-faire, as the name suggests, is a hand off leadership style that encourages employees to trust their own instinct and learn from trial and error. The style provides minimal supervision, a leader who adopts this style will observe and only make intervention, when necessary, a direct stark opposite to micromanagement. In this leadership style, staff were expected to assume responsibility and solve problems on their own (Sharma, 2013). The common belief of Laissez-faire leadership style is that it is type of null-leadership and destructive in nature. According to a study on Norwegian employees, it was confirmed that the leader who practice the style tends to lead a team that have higher rate of bullying, conflicts and high degree of stress among the employees. The finding of the paper is unsurprising considering the study did not take variables such as length of service and type of profession into consideration (Skogstad et al., 2007).

### **Importance of job satisfaction**

The study on job satisfaction is perhaps one of the oldest and most investigated area due to its importance and significance. The origin of job satisfaction can be traced back as early as 1920 (Judge et al., 2020). There are many definitions of job satisfaction, but according to Spector, job satisfaction is defined as how people feel about their job along with everything related to how one performs it and the people involved (Spector, 1997). In recent times, job satisfaction has been identified as a complex multifaceted concept that different people define differently. Nevertheless, it is an internal state that has a strong relationship with personal motivation, feeling of either qualitative or quantitative (Mullins, 2005). The effect of job satisfaction has been well documented in multiple studies, it has been attributed to affect employee performance, absenteeism, turnover, organizational citizenship and even organizational profitability (Judge et al., 2020). Sales experience in this study is defined as the number of years in history that the person had in doing sales in related field (Indeed Editorial Team, 2023). in this case, pharmaceutical industry. Sales experience is used as a moderator in this study its

effect on job satisfaction which will be discussed later in the chapter. There are several factors that influence job satisfaction, according to an article, the nature of work, salary, employment advancement opportunities, management, work groups and work conditions. Combinations of the abovementioned factors will affect job satisfaction. Job satisfaction can be measured using several methods. For example, Minnesota satisfaction questionnaire and job description index. Both methods measure job satisfaction using the six factors mentioned earlier (Aziri, 2011)..

### **Leadership theory**

Leadership theory is the clarification on the process of how certain individual can be leaders. It focused on their personality, traits, behaviors that can or cannot be adopted to increase their effectiveness (WGU. 2020). There are several theories that tries to explain the concept of leadership and its criticism along with the change of time. The theory that has been covered in the following sections are: Great Man Theory, Traits Theory, Contingency Theory, Behavioral Theory, Servant Theory, Transactional Theory and finally Transformational Theory.

### **Effect of Leadership style on salesperson**

The job sales function requires the person to practice a lot of self-discipline and be able to carry themselves with dignity in front of potential customers. The most widely studied traits for salesperson are extraversion, conscientiousness and agreeableness. The former two have been shown to be the most crucial personality for any salesperson (Barrick, et al., 2002). According to a report, another important trait for salesperson is independence (James, 2010). Two things that affect a salesperson's stress and job satisfaction are: social loneliness and willingness to cooperate. Both are heavily influenced by the leader's personality and leadership traits (Guenzi, 2019). It is interesting to study the effect of leadership on salespeople as the job scope itself is unique. Conforming to previous study on other professions, salesperson also thrive more under transformational leadership even though salesperson is rewarded based on commission. According to an article by Peesker, he founds that salesperson performance is very much related to leadership quality especially in term of coaching (Peesker et al., 2019). Another study found that insurance agents under transformational leader are more willing to go beyond the call of duty to achieve their goals (MacKenzie et al., 2001). One of the most important tasks for any salesperson is the implementation of sales strategies. In a paper published in 2018 showed that the type of leadership style can have a direct effect on how employees implement their sales strategies. The paper found that in normal environments, transformational leadership is the most effective way forward. However, when the environment becomes hostile and too competitive, transactional leadership thrived. The paper was able to demonstrate when dealing with salesperson, the leader should be agile in adopting the suitable leadership style depending on the environment the firm is in. Sometimes, salespersons just want the reward to push that extra mile (Inyang et al., 2018).

### **Relationship between laissez-faire leadership style and job satisfaction**

The significance effect between leadership and job satisfaction can never be overestimated. A leader along with the style have a direct effect on how an employee perceive his or her work experience. A study has shown that leadership characteristic plays an important predictor role in determining an employee's job satisfaction level. Most of the studies tends to agree that participative leadership style like transformational leadership will result on a positive effect on job satisfaction among employees (Judge et al., 2004). In a highly technical and task specific job, it is seen that laissez-faire leadership style resulted in negative job satisfaction among employees. In a study among Magnetic Resonance department staff, they prefer transformational and transactional leadership style over laissez-faire management style (DeLay et al., 2020). The reason could be that MRI departments leave little room for error and employees will be punished harshly if they make any mistake, something which laissez-faire leadership style doesn't provide. The more technical the position or role is, the more supervision is needed, until the staff is capable of handling the task by themselves confidently, they will often seek assurance from their supervisors. Laissez-faire management style is not suitable during times of crisis and major change. The author Robert Lundmark finds that employees are confused on their job roles during organizational restructuring (Lundmark, 2021). A study noted that laissez-faire style may be

sufficient during time of calm, however in time of crisis, manager need to be firm and be assertive (Day et al., 2017). During such periods, it can be the main source of employee stress and might negatively affect their job satisfaction. This is because during uncertain periods, employees look for guidance and reassurance from their leader, having none, they started to feel isolated, and panic ensued. Thus, it is recommended that during the time when employees actively seek guidance and reassurance, the manager needs to transition to a different style to inspire their employees (Neves & Schyns, 2018).

H1: there is a positive relationship between laissez-faire leadership style and job satisfaction.

### **Relationship between experience and job satisfaction**

The idea that the more someone does a job, the more fluence he or she is at the job. The better someone is at the job therefore, the more satisfied the person becomes. This idea was put to test in a study among schoolteachers that measure teaching experience against the teacher's job satisfaction. Contrary to popular belief, the study found that teaching experience plays a negligible role in job satisfaction among teachers (Topchyan, 2020). Another study that focusses on academic workers also reported similar results that there is no significant distinction between length of service with job satisfaction (Oshagbemi, 2000). These two studies seem to suggest that job satisfaction doesn't increase with years of work experience, however, the studies did not study underlying issue. In a study among nurses working in medical institutions, it was found that length of service plays a pivotal role in determining turnover and job satisfaction. The author found that factor that affect turnover is very different if length of service was considered. Less experienced nurse's turnover is influenced by job satisfaction, organizational commitment and stress. While experienced nurse was only influenced by work commitment alone (Ji & Kim, 2018). This study demonstrated the relatability of work experience as a factor influencing job satisfaction and retention.

H2: There is a significant relationship between experience and job satisfaction.

### **Methodology**

This is a cross-sectional study on job satisfaction, and relationship with work experience at the current time, thus no time-based analysis will be done. Primary data collection is employed. Main source of data collection is done using questionnaire. Employees' job satisfaction was gauged using Spector's job satisfaction survey (JSS) questionnaire. It is to be accessed digitally via weblink: <https://paulspector.com/?cff-form=8>. After that, the participants are requested to input their score into a Google Forms and answer two more question to identify their eligibility and years of sales experience. The result of the questionnaire was to undergo quantitative statistical mean analysis to determine overall employee satisfaction. The result was tested against the hypothesis. Participation was entirely voluntary, and care was taken to ensure data anonymity. Convenience sampling was conducted due to accessibility. Convenience sampling is a survey on whoever is available (Acharya, 2013). Questionnaires were distributed to 200 participants who major in sales function in pharmaceutical MNC firms. Willing participants were requested to do the JSS survey and input their score into the Google Forms, however, the number who are eligible or able to finish the questionnaire survey is expected to be much lower.

### **Research Framework**

The framework that shows the relationship between laissez-faire leadership style and job satisfaction with experience as the moderator variable.



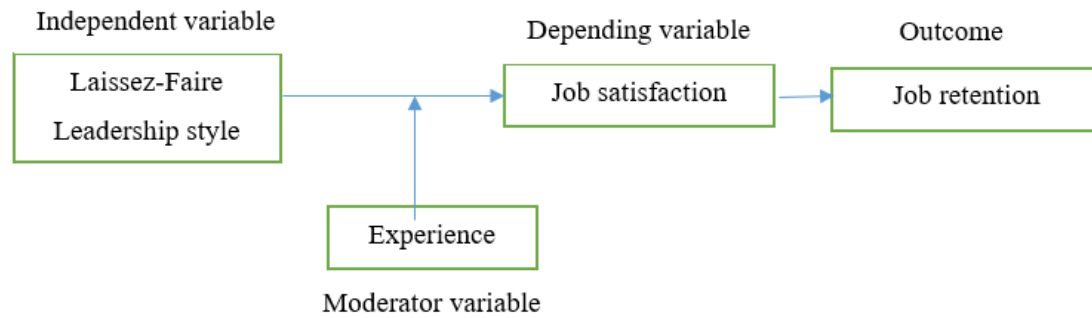


Figure 1 Research Framework

**H<sub>1</sub>:** Laissez-faire leadership style improved job satisfaction in sales employees

**H<sub>2</sub>:** Experienced as the moderator for sales employees under laissez-faire leadership style have higher job satisfaction.

### Data Analysis

The satisfaction score collected from eligible participants will be analyzed using the normative approach as suggested by the author of the JSS (Spector, n.d.). The results will be split into 2 groups: participants that have less than 5 years of sales experience and those with more than 5 years of sales experience. The score of each group is to undergone mean analysis to determine the average score. The mean satisfactory score of the two groups will be compared and analyzed to establish the relationship between experience and job satisfaction. The score of the participants will be measured and compared against the collective norm range of (105 – 161). Anything less than 105 is considered low job satisfaction. If within the norm range, they would be considered neutral. While a value higher than 161 will be considered high job satisfaction (Spector, n.d.).

### Findings

#### Results/ Findings/ Output

A total of 200 populations enrolled into the study, but only 82 of them finished the JSS survey, several participants were not able to continue due to ineligibility. In the end, only 74 completed the survey study. For the participants that finished the JSS survey but unable to continue, the main reason is ineligibility due to their leader not practicing laissez-faire leadership style. Aside from that, some participants voluntarily withdrew from the study due to personal reasons. The result of participants who completed the study was shown in Table 4.1. The normative range of satisfactory score is between 105 – 161 according to the JSS website. Anything less than 105 indicates low job satisfaction, while value higher than 161 indicates high job satisfaction.

Table 1: Result of satisfaction score

Length of experience	Size (n)	Satisfaction score (mean)
Less than 5 years	35	164.0
More than 5 years	39	173.6
Total	74	169.1

Participants that have less than 5 years of sales experience yielded a mean satisfactory score of 164. This showed that they are generally satisfied with their job. On the other hand, those that have more than 5 years of experience scored mean satisfactory of 173.6. This signifies they are also satisfied in

term of job satisfaction. The total mean score for all participants is 169.1, which means overall pharmaceutical salespersons are satisfied in job satisfaction level.

## 4.2 Discussions

Laissez-faire leadership style is a unique method of leading a team because instead of leading, it encourages employees to roam free and try to do things in their own ways with minimal supervision. It is perhaps the most direct antagonistic to micro-management. As had been mentioned in the literature review, this type of leadership style is often associated with confusion and destructiveness (Lundmark, 2021). However, most of the study was done on technical position or function that need a lot of guidance. Hence, not enough research was done on role that encourage self-discipline and self-initiative like in sales industry. Even less study takes into consideration the role of experience played in the effectiveness of laissez-faire leadership style.

Paul Spector's JSS questionnaire was used to measure job satisfaction of the participants because of the high adoption rate among similar studies (Nortje, 2021). In a way, other studies which use JSS can be used as benchmark to be compare against the current result. It will be able to give a more thorough understanding of how sales function differs from other positions and whether the data from our study conforms to their findings. Future studies may also make use of the result in this study to act as comparison should they opted to use the JSS questionnaire to measure job satisfaction.

The findings of this study confirm the H1 hypothesis, salespersons were satisfied under laissez-faire leadership style. This may be due to the nature of sales function where they valued independence and proactiveness (James, 2010). Often, the performance of a salesperson is reflected in his confidence level, thus employees who can make their own decision are more confident. The achievement of H1 hypothesis showed that laissez-faire leadership style is effective in sales function.

The difference degree in job satisfaction between the group where sales experience more than 5 years and less than 5 years showed experience as a moderator for sales satisfaction among salesperson, confirming H2 hypothesis. The longer sales experience an employee has, the higher is his or her job satisfaction. This may be explained by the fact that, the more effective someone at doing the job, the easier the job becomes. On the contrary, the less experienced person will be stressed by an unfamiliar function or role expected of him or her. Therefore, having a lower satisfaction derived from work.

The finding showed that employees who have more experience were happier than those who have fewer experience. One possibility that might explain why those work have longer sales experience tends to have higher satisfaction score is that those who are unsatisfied with the work environment would have long left the industry or even changed field. Leaving those who are satisfied only.

Since the close relationship between job satisfaction and job retention, as job satisfaction is high, job retention will also improve. A high job retention among salespeople is important because it can save firms a lot of time and resources recruiting and training new members. The leadership style of the supervisor has always been one of the highest factors affecting job retention (Rahman et al., 2020). Laissez-faire leadership style has been shown to positively affect job satisfaction in sales role, the outcome will be salesperson staying longer with the company. A study by Skiba confirmed that managerial characteristic has a high impact on sales force retention. The author noted that one of the most obvious traits that cause sales personnel to leave is being micromanaged by their supervisor (Skiba, 2016). Although the current study does not study the direct relationship between Laissez-faire leadership style with job retention, there has been many studies that demonstrated job retention as outcome to job satisfaction.

The result of this study contradicted other leadership style studies, most study tends to show laissez-faire as a negative and destructive in nature (Day et al., 2017). Laissez-faire leadership style has been portrayed as lazy and irresponsible in many settings. However, the sales industry is very different as demonstrated by this study. When zoomed to sales industry, the findings conform to an earlier study by Domingues, where salesperson that are given autonomy tends to feel happier and grow more than those under constant supervision (Domingues et al, 2017).

The importance of work experience as defined by length of service in the field as moderator cannot be overstated. Most study tends to agree that experience length tends to affect job satisfaction in some way (Choi, 2019 & Oshagbemi, 2003). The current study showed that the more experienced an employee is at sales, the higher the job satisfaction he or she will be. This finding is in conformation with a previous study that showed laissez-faire leadership style is very effective in managing salesperson that are qualified and rich in experience (Purohit, 2018).

### **Weakness of the study**

Due to the research being done by one person, the study relied on convenience sampling instead of random sampling and the total population is not many. As a result, the data collected may not be representative of the whole pharma sales industry in Malaysia.

The study relies on participants to self-identify whether their leader is practicing Laissez-Faire Leadership style instead of polling the leader with the more popular Multifactorial Leadership Questionnaires (Antonakis et al., 2003).

The participants drop off in this study is relatively high, although that is to be expected because the current study is only interested in Laissez-Faire Leadership style. Aside from that, some participants expressed concern on anonymity and privacy even though assurance was given that the study is strictly confidential and for academic purposes only.

### **Implication of the study**

The study showed that Laissez-Faire leadership style managed to demonstrate the effectiveness of Laissez-Faire Leadership style in the pharmaceutical sales industry. Contrary to negative feedback of the leadership style as shown in literature review, laissez-faire Leadership style can yield positive job satisfaction. Hopefully, more leaders are willing to embrace this leadership style and allow their employees the freedom to make their own decision and take responsibilities.

While most of the study tends to sing praise on transformational leadership since it was coined, very few study made mention of the benefit of laissez-faire leadership. It is the opinion of the author that laissez-faire Leadership style has gone underappreciated and underutilized. The study hopefully managed to shed some light and fill in the gap of answering which industry is suited for this leadership style. It may be worth investigating other industries which share similar characteristics with sales role that can benefit with such leadership style.

As firm understand more on the way to manage their salesperson, management can devise and even make use of laissez-faire leadership style to improve salesperson morale. Salesperson appreciate the chance to be proactive and independent, thus it fits very well with laissez-faire style. When salesperson have high job satisfaction, they will likely perform better thereby contributing to company bottom line. However, caution should be applied when trying to apply these management style on other job functions.

As a summary, the study only investigates one leadership style on pharma sales industry among multinational companies therefore, caution should be applied when attempting to apply the result of this study to the whole industry. The study nevertheless confirmed laissez-faire leadership style can give positive job satisfaction.

### **Conclusion**

This is the final chapter of the article; it will cover on how to findings of the whole study answer the research question along with recommendation and conclusion to the whole paper.

### **Does laissez-faire leadership style affect job satisfaction among employees in pharmaceutical company?**

According to the findings, sales employee under laissez-faire leadership recorded 169.1 in Job Satisfaction Survey (JSS) score. According to Paul Specter, the author of JSS questionnaire, scores that are higher than 161 signifies that employees are satisfied with their job. The current score of 169.1 means employees are happy with their leader. Therefore, it can be said that laissez-faire leadership style positively affects job satisfaction of pharmaceutical sales employees.

### **Does experience play a role in affecting job satisfaction?**

Salesperson who has less than 5 years of sales experience recorded satisfaction score of 164 while those who have more than 5 years sales experience recorded a score of 173.6. Gauging from differences of the two data, it can be said that experience seems to play a role in affecting the satisfaction score outcome. Employees who worked longer tends to be happier and have a higher job satisfaction than those who are lower.

Based on the result of the study, it is recommended that management be more willing to adopt a more liberal leadership style such as laissez-faire. Laissez-faire leadership style has been shown to yield positive job satisfaction for sales employees in this study. A positive job satisfaction may cause the employee to perform better, which increases revenue for the firms. On the other hand, employees who are happy are less willing to quit, thereby increasing job retention. Less job turnover may translate to reducing recruitment and training costs for the firm.

The study has also shown that experience as a moderator for job satisfaction for sales employees. This mean that supervisors may need to be more flexible when applying leadership style to their staff. A less experience staff may appreciate more handholding as opposed to an experienced staff. The expectations and demand of senior and junior employees on the leader is very different. Junior staff wants more supervision while senior staff appreciate being given the freedom to do the jobs. Therefore, it is recommended that leader to be adaptable when interacting with them.

While the study was conducted on pharmaceutical salesperson only, it is believed that the result may be applied to other sales industry. In fact, it is believed any profession that encourage proactiveness and independence will appreciate a more relaxed leadership style like the one afforded by laissez-faire. The precursor for laissez-faire leadership style is that the employees must have the trust of the management and has demonstrated his or her ability to take on responsibility. However, more study is recommended before applying the idea.

### **Recommendations for future study**

The current study has demonstrated a positive aspect of laissez-faire leadership on job satisfaction for pharmaceutical sales jobs. Therefore, it is recommended that more study investigate the other roles which laissez-faire leadership style may yield positive effect on employee's job satisfaction.

It is recommended that a more thorough study with a wider population and wider industry field be done to confirm the result of this study. A better method of identifying Laissez-Faire leadership style should be employed such as utilizing MLQ.

It appears that experience played a certain role in affecting job satisfaction among employees according to this study. It is therefore recommended that more study include experience or length of service as one of the mediating variables when measuring job satisfaction.

Another subject of interest that arose from this study is that the author observed the conflicting identification of leadership style from different employees on one leader. It might be worth further investigation that leadership style professed by one versus being experienced by the different employees under him or her. The leader themselves might be practicing Laissez-Faire as shown via questionnaire like MLQ, however, those under him might disagree among themselves. This in part might be due to a difference in supervision or the relationship between the leader and the staff.

As a conclusion, the study was able to accomplish its objectives. The study was able to show the beneficial effect of laissez-faire leadership style on job satisfaction among salespeople with experience as a moderator. Both H1 and H2 hypothesis was achieved. Salespeople under laissez-faire leadership style experienced positive good job satisfaction and salespeople who have longer sales work experience have a higher job satisfaction than those who have shorter experience. Overall, laissez-faire leadership style is a good fit for sales function job as the characteristic of the job require them to be impromptu and minimal guidance while on field.

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## Appendix A

Paul Spector's Job Satisfaction Survey Link and picture screenshot:

Link: <https://paulspector.com/?cff-form=8>

### Job Satisfaction Survey Self-Assessment

Make your choices for all the items and get your scores at the end. To get an accurate score, complete every item.

**1. I feel I am being paid a fair amount for the work I do.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**2. There is really too little chance for promotion on my job.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**3. My supervisor is quite competent in doing his/her job.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**4. I am not satisfied with the benefits I receive.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**5. When I do a good job, I receive the recognition for it that I should receive.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**6. Many of our rules and procedures make doing a good job difficult.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**7. I like the people I work with.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**8. I sometimes feel my job is meaningless.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**9. Communications seem good within this organization.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**10. Raises are too few and far between.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**11. Those who do well on the job stand a fair chance of being promoted.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**12. My supervisor is unfair to me.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**13. The benefits we receive are as good as most other organizations offer.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**14. I do not feel that the work I do is appreciated.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**15. My efforts to do a good job are seldom blocked by red tape.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**16. I find I have to work harder at my job because of the incompetence of people I work with.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**17. I like doing the things I do at work.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**18. The goals of this organization are not clear to me.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**19. I feel unappreciated by the organization when I think about what they pay me.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**20. People get ahead as fast here as they do in other places.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**21. My supervisor shows too little interest in the feelings of subordinates.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**22. The benefit package we have is equitable.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**23. There are few rewards for those who work here.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**24. I have too much to do at work.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**25. I enjoy my coworkers.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**26. I often feel that I do not know what is going on with the organization.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**27. I feel a sense of pride in doing my job.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**28. I feel satisfied with my chances for salary increases.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**29. There are benefits we do not have which we should have.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**30. I like my supervisor.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**31. I have too much paperwork.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**32. I don't feel my efforts are rewarded the way they should be.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**33. I am satisfied with my chances for promotion.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**34. There is too much bickering and fighting at work.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**35. My job is enjoyable.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**36. Work assignments are not fully explained.**

☐ Disagree very much ☐ Disagree moderately ☐ Disagree slightly ☐ Agree slightly ☐ Agree moderately ☐ Agree very much

**Pay Satisfaction**

Most people score between 7 and 17: Your score is 14

**Promotion Opportunity Satisfaction**

Most people score between 7 and 17: Your score is 7

**Supervision Satisfaction**

Most people score between 14 and 23: Your score is 14

**Fringe Benefits Satisfaction**

Most people score between 10 and 20: Your score is 14

**Contingent Rewards Satisfaction**

Most people score between 9 and 19: Your score is 21

**Operating Conditions Satisfaction**

Most people score between 9 and 18: Your score is 21

**Coworker Satisfaction**

Most people score between 14 and 22: Your score is 14

**Nature of work Satisfaction**

Most people score between 15 and 23: Your score is 7

**Communication Satisfaction**

Most people score between 10 and 20: Your score is 21

**Total Satisfaction**

Most people score between 105 and 161: Your score is 133

## Appendix B

Google Form Questionnaire Link and screenshot:

Link: [https://docs.google.com/forms/d/1fRWneMuzNc\\_9GPKfdVMC3a9FlvFAnTVy-IGvhh6XQak/viewform?pli=1&pli=1&edit\\_requested=true#responses](https://docs.google.com/forms/d/1fRWneMuzNc_9GPKfdVMC3a9FlvFAnTVy-IGvhh6XQak/viewform?pli=1&pli=1&edit_requested=true#responses)

**Job satisfaction in Sales role**

This is a survey to measure job satisfaction for MBA project. The survey will take 15 minutes of your time. All information is collected anonymously. Thank you for participating.

[Sign in to Google](#) to save your progress. [Learn more](#)

Is your immediate supervisor practicing Laissez-Faire Leadership style (minimal supervision, expect you to take charge and solve problem) ?

☐ Yes

☐ No

How many years of sales experience do you have?

☐ Less than 5 years

☐ More than 5 years

Assess Job Satisfaction using this link: [Paul Spector's Job Satisfaction Survey \(JSS\)](#). Answer the survey, then fill in your Total Satisfaction Score here.

Communication Satisfaction

Most people score between 10 and 20: Your score is 23

Total Satisfaction

Most people score between 105 and 161: Your score is 189

When you are done, [click here](#) to return to JSS page.

Above is an example

Your answer



## The Adoption of Cloud Auditing System among Auditing Professionals in Klang Valley, Malaysia

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### Abstract

The unprecedented upheavals that caused by Covid-19 has impacted many negatively including various professions with auditing being no exception. Government measures with mandatory lockdowns to curb and exterminate the spread of virus had somehow forced many to opt for working from home. No audits were done at the clients' premises but remotely. Despite the disastrous impacts towards country and world, many has embraced digital solutions to remain resilience socio-economically. Consequently, cloud auditing system started to gain popularity although there were some practical challenges which is not the aim of this study. The aim of this study is to determine the adoption of cloud auditing systems among auditors in Klang Valley, Malaysia from the respective factors, i.e., confidentiality, processing integrity, availability, and security. This study employed quantitative research approach where a total of 200 valid datasets were collected using questionnaire from auditors using simple random sampling technique. The collected data were analysed using IBM SPSS (Version 27) statistical software for relevant tests. The findings revealed that all the variables are significantly related to the adoption of the cloud auditing systems. These findings further affirm that confidentiality, processing integrity, availability, and security factors play pertinent roles when adopting the cloud auditing systems and future research can investigate on challenges of the audit processes during this remote audit working arrangements.

**Keywords:** Cloud auditing, information security, digital solutions, data privacy and

### Introduction

The Covid-19 has impacted many in many ways including various professions with auditing being no exception. The strict standard operating procedures due to the pandemic have many organizations opted to manage work from home. No audits were done at the clients' premises but remotely through digital solutions. Now, it is a way forward to embrace cloud solutions for professional services. Cloud auditing system is not something new but the need to engage with it gaining popularity among audit practitioners. Many organizations too opt for outsourcing, which means that a company buys one or more business processes from a cloud audit provider, so all operational processes may depend on a single information technology (IT) infrastructure and perform their audit engagement through a cloud audit environment (Zhu & Lee, 2016). A cloud audit system can be an internal audit or an external audit. Internal audit is performed by internal auditors who analyse and evaluate data as well as processes to improve the effectiveness and efficiency of the organization. External audit is conducted by audit firms or professional auditors (ICAEW, 2020<sup>ab</sup>). In addition, cloud auditing system is as well helps organizations' boards of directors and management identify risks and is an assessment function (Mousavi & Fazekas, 2017). Therefore, the study revolves around four individual variables are confidentiality, processing integrity, availability, and security that impacting on auditor choice of cloud auditing system (Hu, Chen, & Tzeng, 2018). The adoption rate of cloud services in Malaysia remains low (Moghavvemi, et.al, 2012) and expected to grow in future, especially during this Covid-19 and (The Star, 2020). Thus, this study seeks insight behind the tremendous adoption in cloud audit services during covid-19. Without good cloud auditing system during Covid-19, auditors cannot work efficiently (Remolina, 2020). In addition, this can lead to transparency issues for audit firms, as cumbersome connections and slow servers make it impossible for auditors to keep up with backups



and disaster recovery (Castka, et.al, 2020). Hence, this research is focused on the significant use of cloud auditing system by Malaysian auditors during the pandemic, focusing on confidentiality, processing integrity, availability, and security.

This part introduces the issues involved in this research and explain the purpose of this study. This is followed by a literature review, description, and discussion, as well as theories surrounding the issues to be studied in this study. Next is the research method and later introduces the results obtained in the study. Moreover, these results are discussed and then compared with those of past literature as well as concluded with implications and recommendation for future studies.

### **Literature Review**

This part describes the relevant literature review, summarizes, and analyses similar relevant studies, and provides a basic theoretical background for the research through the discussion of relevant issues.

### **Cloud Auditing System**

An audit is a systematic process of objectively obtaining and evaluating the evidence of assertions about economic actions and events to determine whether the records accurately and fully reflect the transactions concerned. (Hyytinen & Kallunki, 2014). Cloud computing is a model for remotely operating, configuring, and accessing hardware and software resources (Buyya, et. al, 2010). It also provides online data storage, infrastructure, and applications that can be quickly provisioned and published with minimal administrative effort or service provider interaction (Mell & Grance, 2011). Based on the definition of ISACA (2010), cloud auditing system objectives include, for stakeholders to provide cloud audit service provider's internal security strategy and the control process of success, and the development of productivity, provide the interface between service provider and the organization's customers, in order to identify the internal control deficiencies and shortcomings and to provide audit stakeholder assessment criteria and ability and quality report, to ensure that the service provider and its internal control certification have confidence and recognition. In addition, auditors must consider controlled access, authorization and trusted control frameworks, communication delays, data breach notification, and international law. A move to cloud or IT services supports and enhances business functions that must be considered and considered by cloud auditors (Halpert, 2011; Hyytinen & Kallunki, 2014). The impact of the outbreak has led to many people being subjected to travel restrictions and requests to stay at home, which presents a real challenge to the engagement process (Arnold, 2020). However, 62 percent of more than 1,100 accounting professionals from 18 different countries reported that they had successfully responded to COVID-19, according to the survey, and companies were more likely to use cloud-based technologies, particularly cloud-based document management and online client portals (CPA Practice Advisor, 2020). The reason many people choose cloud audit system in the wake of the outbreak is because it allows auditors to work anywhere in the world, which means geographically dispersed teams can work on the same project in real time (ACCA, 2017). Moreover, the COVID-19 epidemic creates a unique operating and business environment that makes cloud auditing system critical because of its flexibility and scalability, the ability and efficiency to support data dynamics (Deloitte, 2020), where it was not case previously. The impact of the epidemic requires people to work from home, so good cloud audit services will ensure that auditors can be able to work as normal as possible.

### **Confidentiality**

Confidentiality refers to the protection of information deemed confidential to meet the entity's objective of confidentiality (AICPA, 2020). The principle of confidentiality requires the auditor shall keep confidential the information obtained from clients during the audit process and shall not disclose confidential information to any third party without the prior written consent of the client, except as otherwise provided in the terms of the engagement or by law (Assertum Audit, n.d.). Typically, the data is outsourced to a Cloud Service Provider (CSP) and the data owner delegate's control of the data to the CSP (Yang, et.al, 2019). However, audits often involve customer trade secrets and core

tasks, there are several touch points for internal information related to human resources, financial capabilities, material availability, and audit assessments. The use of cloud auditing by CPA firms involves audit confidentiality risks and any negligence, which may lead to many data leakages and cause huge losses and incalculable consequences for the company (Liu, et.al, 2015). Therefore, maintaining data confidentiality in a cloud environment is even more important. Ensuring confidentiality helps all types of cloud users securely store and maintain their data in the cloud (Arockiam, et.al, 2013). Moreover, a CSP should provide a robust mechanism for maintaining the confidentiality of the information of audit clients and certified public accountants (Dong, et.al, 2015). The confidentiality of data does affect cloud auditing system, because failure to protect the information of audit clients and CPA firms will bring them huge losses and immeasurable consequences, and CSP may leak confidential information to competitors to protect its reputation.

### **Processing integrity**

AICPA (2020) defines process integrity as a 'system process that is complete, effective, accurate, timely, and authorized to meet the company's objectives'. Therefore, there are no errors in the handling of the integrity standard test handling, and if there are errors, they will be detected and corrected (Rady, et.al, 2019). According to Zhu, et.al. (2016), data stored in the cloud can be compromised when transferred to the cloud data store. To prevent malware, internal personnel from changing program execution and resulting in incorrect results, data integrity should be maintained and checked continuously to demonstrate that data and calculations are intact. Ren, et.al. (2011) pointed out that the cloud audit provider should guarantee the privacy and integrity of the outsourced files in the process of uploading and downloading. However, there are many suspicious behaviours and incidents, so cloud storage users are more dependent on third-party auditors (TPA). TPA is an auditor who has the experience and skills to perform all audit processes, checking data integrity (Wang, et.al, 2013). First, TPA uses a regular audit process. As soon as any changes to the data are discovered, all users are notified of those changes. If the owner suspects abnormal behaviour in his data, he may examine his data either by himself or by sending an auditor. Therefore, the owner can always track any changes to his or her data to ensure data integrity (Balusamy, et.al, 2015). Data integrity does affect cloud auditing system, which often involves customer trade secrets, so malware and internal changes to programs can cause huge losses for audit firms. However, to improve audit quality and reduce audit risk, auditors also require electronic validation from third parties to ensure data integrity, thus increasing the number of users of cloud storage.

### **Availability**

Availability refers to the information used by an entity system and the availability of products or services provided to its customers (AICPA, 2020). However, it can resolve whether the system contains controls to support the accessibility of operations, monitoring, and maintenance (Mehak, et.al, 2014). According to Pan & Hu (2014) analysis, because the services provided by cloud auditing system are delivered over the network, ensuring the availability, reliability, and integrity of data is critical to the continuity and quality of the audit. In fact, once audit firms and audit clients decide to outsource their data to a cloud audit provider, they no longer own the data. Cloud auditing system puts companies at greater risk if data is lost or corrupted (Yavuz & Ning, 2009). Therefore, it is critical that cloud audit vendors ensure the integrity and availability of outsourced data, as well as the forensics and credibility of data on the cloud (Zhu, et. al, 2012). However, the essence of cloud computing is that vendors cannot provide 100% security. For example, amazon's EC2 outage in April 2011 was one of the biggest cloud disasters. The unavailability of Amazon's cloud service has led to data loss of some high-margin websites and serious business problems of hundreds of IT managers (Ranjithprabhu & Sasirega, 2014). The availability of data does affect cloud auditing system because of the impact of data loss on the revenue of audit firms. Therefore, CCIF (Cloud Computing Interoperability Forum), initiated by ITU-T (Telecommunications standardization division of the International Telecommunication Union), aims to create a unified cloud interface (UCI) and develop an open and standardized cloud interface for API integration (Lee, Park, & Yang, 2013). As a result,

the operability of cloud auditing system will improve the audit efficiency of the platform due to the availability, continuity, and professionalism of resources.

### Security

Security means that information and systems are protected against unauthorized access, unauthorized disclosure of information, and system damage that may affect an entity's ability to achieve its goals (Pearson & Yee, 2013). As cloud auditing system requires users to share data and resources with service providers, security issues arise, which may limit the development of cloud computing (Tu, et.al, 2016). However, a CSP should protect data from security threats while allowing clients to access anywhere via an Internet service, which otherwise will lead to destructive consequences (Shin, 2013). The security of the cloud auditing system environment is the primary consideration for auditing companies to adopt cloud auditing system. Most people believe that data confidentiality and security risks are the main obstacles for CPA firms to move data to the cloud (Yigitbasioglu, 2015). Because the data needs to be transferred over the network to the cloud, the problem of data loss occurs (Sood, 2012). Therefore, cloud audit service providers must provide data security protection features such as authorization, access control, and encryption technology and security management (Mackay, et.al, 2012). The security of the data does affect cloud auditing system, which auditors must disclose details to clients. Transparency of data privacy, data security, anonymity, telecommunication capacity, responsibility, reliability and government monitoring ensure the strong security of customer data (Pauley, 2010).

### Proposed Conceptual Framework

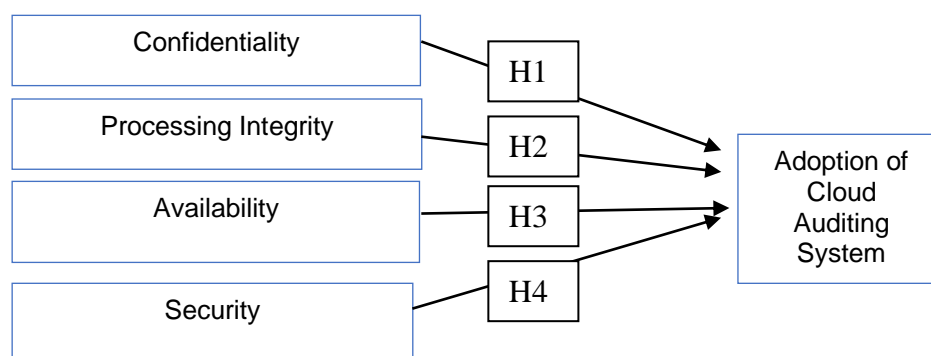


Figure 1 Conceptual Framework (Source: Hu, Chen, & Tzeng (2018))

The relationship between independent variables and dependent variable are shown Figure 1. The independent variables are confidentiality, processing integrity, availability, and security. Moreover, the dependent variable is cloud auditing system in Malaysia. The section is a review of relevant literature, discussing previous studies on similar topics, underpinning theories and construction of conceptual frameworks.

The following research hypothesis are suggestion from previous research on factors affecting the cloud auditing system in Malaysia during current pandemic situation:

*H1:* There is a significant relationship between confidentiality and the cloud auditing system during current pandemic situation in Malaysia.

*H2:* There is a significant relationship between processing integrity and the cloud auditing system during current pandemic situation in Malaysia.

*H3:* There is a significant relationship between availability and the cloud auditing system during current pandemic situation in Malaysia.

*H4:* There is a significant relationship between security and the cloud auditing system during current pandemic situation in Malaysia.

## Methodology

This study employed quantitative research approach where a total of 200 valid datasets were collected using questionnaire from auditors using simple random sampling technique. The collected data were analysed using IBM SPSS (Version 27) statistical software for relevant tests. The purpose of this study is to analyse and measure the main results after interpretation, such as descriptive analysis, correlation analysis, regression analysis, etc., to determine the relationship between dependent variables and independent variables.

## Findings and Discussion

### Pilot Test

In the pilot study, reliability analysis was conducted on the 30 respondents to demonstrate the efficiency and consistency of the data from the questionnaires. According to Cho & Kim (2015), Cronbach's alpha is often quoted within the acceptable range of 0.70 to 1. The reliability tests were carried out for each dependent and independent variable. The results showed that the Cronbach's Alpha value of all variable where Cloud Auditing System is 0.606, Confidentiality is 0.520, Processing integrity is 0.879, Availability is 0.687, and Security is 0.817. Hinton, et al (2004) suggests that a value as low as 0.50 is appropriate for exploratory studies. Hair, et al. (2010) point out that while a value of 0.70 is generally considered an acceptable value, a value greater than 0.70 is considered reliable. In addition, a value of 0.60 is acceptable for exploratory studies (George, & Mallery, 2003). The Cronbach's Alpha value of all dependent variables and independent variables is 0.904, which proves that these variables have good internal consistency and validity. When greater than 0.7, it indicates the scale reliability of data.

### Reliability Test

Table 1: Reliability Test for Each Variable

Variables	Cronbach's Alpha	N of Items
Adoption of Cloud Auditing System	0.571	5
Confidentiality	0.608	5
Processing integrity	0.696	5
Availability	0.623	5
Security	0.644	5

As shown in Table 1, reliability tests were carried out for each variable. The results showed that the Cronbach's Alpha value of all variable where Cloud Auditing System is 0.571, Confidentiality is 0.608, Processing integrity is 0.696, Availability is 0.623, and Security is 0.644. Hair et al. (2010) point out that while a value of 0.70 is generally considered an acceptable value, a value greater than 0.70 is considered reliable. However, Hulin, Netemeyer, and Cudeck, 2001 argued that a value of 0.60 is acceptable. Table 2 reveals that Cronbach's Alpha value of all the variable is 0.804, which proves that these variables have good internal consistency, because when Cronbach's Alpha is greater than 0.70, it is considered reliable (Tavakol & Dennick, 2011).

Table 2: Reliability Test for All Variable

Reliability Statistics	
Cronbach's Alpha	N of Items
0.804	5

### Normality Test

The normality test command performs a hypothesis test to check if the observations follow a normal distribution (Laerd Statistics, n.d.). From the normality tests conducted, there are no missing responses, and out of the 200 responses, all the responses are valid results.

Table 3: Kolmogorov - Smirnov and Shapiro - Wilk Normality Test

Tests of Normality						
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Adoption of Cloud Auditing System	.193	200	.000	.928	200	.000
a. Lilliefors Significance Correction						

In testing the normality, the most used hypothesis tests are Kolmogorov-Smirnov (Lilliefors) and Shapiro-Wilk W (Laerd Statistics, n.d.). The Shapiro-Wilk test is more suitable for small sample sizes, <50, although it can also handle large sample sizes, while the Kolmogorov-Smirnov test is used for n ≥50. For both tests, the null hypothesis means that the data is taken from a normally distributed population. When P > 0.05, the null hypothesis is accepted and the data is called normal distribution (Mishra et al., 2019). Table 3 explains the normality test shows that the significance value of both Kolmogorov-Smirnov and Shapiro-Wilk is 0.000, less than 0.05, thus H0 is not rejected, that is, the data distribution is not normal. Thus, the Z-score is used to test and calculate the normality of data distribution in this study. Z-score value confirms that the data of -2.593 indicates normal distribution (refer Table 4).

Table 4: Score Test for Skewness and Kurtosis

			Statistic	Std. Error
Adoption of Cloud Auditing System	Mean		3.933	.0301
	95% Confidence Interval for Mean	Lower Bound	3.874	
		Upper Bound	3.992	
	5% Trimmed Mean		3.940	
	Median		4.000	
	Variance		.181	
	Std. Deviation		.4255	
	Minimum		2.6	
	Maximum		5.0	
	Range		2.4	
	Interquartile Range		.4	
	Skewness		-.446	.172
	Kurtosis		1.220	.342

In this study, there were 200 respondents, so the Z-score should be between -3.29 and +3.29. The formula of Z-Score value as shown below:

$$Z - Score = \frac{Statistic}{Standard Error}$$

$$Z - Score = \frac{-0.446}{0.172}$$

$$Z - Score = -2.593$$

### Descriptive Analysis

Descriptive analysis, also known as descriptive statistics. It is the process of using statistical techniques to describe or summarize a set of data (Bush, 2020). Descriptive analysis requires the demographic information of the respondents. These are discussed further in this section. In addition, therefore, there are 200 respondents who are analysed and assigned who are living and working within the Klang Valley. Based on the descriptive statistics, the results showed that all respondents were considered valid in terms of demographics.

Table 5: Demographics

Statistical Results		Frequency	Percent	Valid Percent	Cumulative Percent
Gender	Female	80	40.0	40.0	40.0
	Male	120	60.0	60.0	100.0
	Total	200	100.0	100.0	

Age	18-21	3	1.5	1.5	1.5
	22-25	15	7.5	7.5	9.0
	26-30	101	50.5	50.5	59.5
	30-35	64	32.0	32.0	91.5
	35 and above	17	8.5	8.5	100.0
	Total	200	100.0	100.0	
Marital Status	Single	102	51.0	51.0	51.0
	Married	98	49.0	49.0	49.0
	Others	0	0.0	0.0	100.0
	Total	200	100.0	100.0	
Education	Undergraduate	122	61.0	61.0	61.0
	Postgraduate	71	35.5	35.5	96.5
	Other	7	3.5	3.5	100.0
	Total	200	100.0	100.0	
Level of Income	Below RM2,000	7	3.5	3.5	3.5
	RM2,001-RM4,000	9	4.5	4.5	8.0
	RM4,001- RM6,000	73	36.5	36.5	44.5
	RM6,001 and above	111	55.5	55.5	100.0
	Total	200	100.0	100.0	
Job Position	Auditors at Big 4 audit firms	100	50.0	50.0	50.0
	Internal auditors	50	25.0	25.0	75.0
	External auditors	50	25.0	25.0	100.0
	Total	200	100.0	100.0	
The organization adopts a cloud audit system	Non- Cloud Companies	27	13.5	13.5	13.5
	Cloud Companies	157	78.5	78.5	92.0
	Pre-Cloud Adoption	16	8.0	8.0	100.0
	Total	200	100.0	100.0	
The time-period during which the company has adopted a cloud audit system	Less than a year	51	25.5	25.5	25.5
	1-5 years	104	52.0	52.0	77.5
	6-10 years	37	18.5	18.5	96.0
	Other	8	4.0	4.0	100.0
	Total	200	100.0	100.0	

Table 5 shows that the number of male respondents is more than female respondents. The number of male respondents is 120 (60%) and the number of females is 80 (40%). The respondents aged between 26 -30 take the largest part in this survey, with a total of 101 respondents (50.5%). On the other hand, the age group of 30-35 total have 64 respondents (32%), and the age group of 35 and above total have 17 respondents (8.5%). The age group of 22-25 total have 15 respondents (7.5%) while the 18-21 age group had the lowest percentage with 3 respondents (1.5%). The marital status survey results of 200 interviewees. The number of singles accounted for the highest percentage, with the total number of 102 (51%) respondents, while married status accounted for 98 (49%) respondents. As per the education level, there have 122 (61%) respondents that have been studied in undergraduate and it shows the highest among other education level. Moreover, postgraduate have 71 (35.5%) respondents, while only 7 respondents (3.5%) studied through other education qualifications. The income level of respondents is divided into four categories, namely below RM2, 000, RM2, 001-RM4, 000, RM4, 001- RM6, 000, and RM6, 001 and above. According to the table, there are 111 respondents having income between RM6, 001 and above which represented 55.5%. There are 73 respondents with income levels were RM4, 001- RM6, 000 with a percentage of 36.5%. Besides, nine respondents had an income level between RM2, 001 and RM4, 000, accounting for 4.5% of the total. Lastly, there are 7 respondents with income levels were below RM2, 000 with a percentage of 3.5%. The job position of respondents, there are 100 respondents of auditors worked at Big 4 audit firms which represented 50%. Besides, there are 50 respondents of internal auditors with a percentage of 50%. Lastly, there also have 50 respondents of external auditors, accounting for 50% of the total. The respondents whose organizations adopt cloud audit systems are divided into three

categories, namely, non-cloud companies, cloud companies, and pre-cloud adoption. As can be seen from the table, 157 of the respondents from cloud companies, accounting for 78.5%. In addition, there are 27 respondents from non-cloud companies, accounting for 13.5%. Lastly, there have 16 respondents of organization been using the pre-cloud adoption, accounting for 8% of the total. The time-period for companies to adopt cloud audit system is divided into four categories: less than one year, 1-5 years, 6-10 years and others. The table above shown, 104 respondents, accounting for 52%, companies have used cloud audit system for 1-5 years. In addition, 51 respondents' companies have used cloud audit systems for less than a year, accounting for 25.5 %. In addition, 37 respondents, accounting for 18.5%, companies have used cloud auditing system in 6-10 years. Finally, eight of the respondents, 4% of the total, companies did not adopt cloud auditing systems.

### Pearson Correlation

Table 6 shows that the value of all variables obtained are less than 0.05 which indicated that there is a significant relationship between each independent variables (confidentiality, processing integrity, availability, and security) and dependent variable (Cloud Auditing System).

Table 6: Correlation of Values

		Confidentiality	Processing integrity	Availability	Security	Adoption of Cloud Auditing System
Confidentiality	Pearson Correlation Sig. (2-tailed) N	1 200	.275** .000 200	.299** .000 200	.251** .000 200	.297** .000 200
Processing integrity	Pearson Correlation Sig. (2-tailed) N	.275** .000 200	1 200	.617** .000 200	.594** .000 200	.493** .000 200
Availability	Pearson Correlation Sig. (2-tailed) N	.299** .000 200	.617** .000 200	1 200	.705** .000 200	.574** .000 200
Security	Pearson Correlation Sig. (2-tailed) N	.251** .000 200	.594** .000 200	.705** .000 200	1 200	.668** .000 200
Adoption of Cloud Auditing System	Pearson Correlation Sig. (2-tailed) N	.297** .000 200	.493** .000 200	.574** .000 200	.668** .000 200	1
**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).						

Table 6 affirms that confidentiality and cloud auditing system have a significant value of 0.000 which indicates that there is a positive significant relationship between confidentiality and cloud auditing system. Besides, the correlation value between these variables is 0.297. According to correlation coefficient scale, this value represents that confidentiality and cloud auditing system have a low correlation. Next, processing integrity and cloud auditing system have a significant value of 0.000 which indicates that there is a positive significant relationship between processing integrity and cloud auditing system. Besides, the correlation value between these variables is 0.493 and this value represents that confidentiality and cloud auditing system have a moderate correlation. As for availability and cloud auditing system have a significant value of 0.000 which indicates that there is a positive significant relationship between availability and cloud auditing system. Besides, the correlation value between these variables is 0.574 and this value represents that availability and cloud auditing system have a moderate correlation. Not the least is security and cloud auditing system have a significant value of 0.000 which indicates that there is a positive significant relationship

between security and cloud auditing system. Besides, the correlation value between these variables is 0.668 and this value represents that security and cloud auditing system have a high correlation.

### Multiple Regression Analysis

#### Model Summary

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin - Watson
1	.695 <sup>b</sup>	.483	.473	.3090	2.045

- a. Predictors: (Constant), Security, Confidentiality, Processing integrity, Availability  
b. Dependent Variable: Adoption of Cloud Auditing System

In this research, Durbin - Watson (DW) statistics are a test for autocorrelation residuals from statistical regression analysis (Ali, 1987). According to the Table 7, the Durbin Watson value is 2.045, which is an ideal range because the perfect Durbin Watson value is between 1 to 3. Therefore, it indicates that there is no autocorrelation problem among the residuals in this independent error term. Besides, Ahmad, et.al (2015), Durbin Watson values from 2.0 to 4.0 indicate negative autocorrelation. Moreover, according to the table above shown that the value of R-square is 0.483, which means that is also 48.3%. 48.3% are the variation of dependent variables which are cloud auditing system that can be explained by the independent variables such as Security, Confidentiality, Processing integrity, and Availability. Besides, the other 51.7% of variation may be explained by other factors.

#### ANOVA Model

Table 8: ANOVA Model

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.403	4	4.351	45.56	.000 <sup>b</sup>
	Residual	18.619	195	.095	8	
	Total	36.022	199			

- a. Dependent Variable: Cloud Auditing System  
b. Predictors: (Constant), Security, Confidentiality, Processing integrity, Availability

Referring to the Table 8, the significant value is to determine whether the model is suitable for further analysis (Dhakal, 2018). The result show that the significant value is 0.000. since the significant value is less than 0.5, it shows that the model is suitable for further analysis. Moreover, in the table above show that the 4 independent variables (Security, Confidentiality, Processing integrity, Availability) in the regression result have an impact on the dependent variable (Adoption of Cloud Auditing System).



## Multiple Regression Coefficient

Table 9: Coefficients

<b>Coefficients<sup>a</sup></b>							
<b>Model</b>	<b>Unstandardized Coefficients</b>		<b>Standardized Coefficients</b>	<b>t</b>	<b>Sig.</b>	<b>Collinearity Statistics</b>	
	<b>B</b>	<b>Std. Error</b>	<b>Beta</b>			<b>Tolerance</b>	<b>VIF</b>
1 (Constant)	.877	.236	.108	3.71	.000	.897	1.115
Confidentiality	.082	.042	.083	3	.049	.562	1.778
Processing integrity	.075	.062	.146	1.98	.030	.435	2.301
Availability	.144	.077	.489	3	.043	.462	2.163
Security	.485	.075		1.20	.000		
				4			
				1.87			
				2			
				6.45			
				6			

a. Dependent Variable: Adoption of Cloud Auditing System

According to Table 9, all independent variables are having significant value. B is value also known as unstandardized coefficients and for primary data. The first independent variable is confidentiality. There is a positive sign because the significant value is less than 0.05 (0.049), which means that it would accept the proposed hypothesis. The positive sign means that when the confidentiality increases then the adoption of cloud auditing system will increase too. VIFs between 1 and 5 (1.115), the predictors are moderately correlated, and tolerance is below 10 (0.897), so there is no multicollinearity problem. Besides, the second independent variable is processing integrity. There is a positive sign because the significant value is less than 0.05 (0.030), which means that it would accept the proposed hypothesis. The positive sign means that when the processing integrity increases then the adoption of cloud auditing system will increase too. VIFs between 1 and 5 (1.778), the predictors are moderately correlated, and tolerance is below 10 (0.562), so there is no multicollinearity problem. Furthermore, the third independent variable is availability. There is a positive sign because the significant value is less than 0.05 (0.043), which means that it would accept the proposed hypothesis. The positive sign means that when the availability increases then the adoption of cloud auditing system will increase too. VIFs between 1 and 5 (2.301), the predictors are moderately correlated, and tolerance is below 10 (0.435), so there is no multicollinearity problem. Moreover, the last independent variable is security. There is a positive sign because the significant value is less than 0.05 (0.000), which means that it would accept the proposed hypothesis. The positive sign means that when the security increases then the adoption of cloud auditing system will increase too. VIFs between 1 and 5 (2.163), the predictors are moderately correlated, and tolerance is below 10 (0.462), so there is no multicollinearity problem.

## Multiple Regression Equation

$$CA = c + \beta_1 C + \beta_2 PI + \beta_3 A + \beta_4 S + e$$

Where:

c= constant

e= error

C= confidentiality

PI =processing integrity.

A= availability

S= security

CA= cloud auditing system

The calculation of the research equation can be derived as followed:

$$CA = 0.877 + 0.082 (C) + 0.075 (PI) + 0.144 (A) + 0.485 (S)$$

The research equation above shown that every unit of cloud auditing system, confidentiality increases by 0.082 and an increase in processing integrity in 0.075. Similarly, there will increase in availability by 0.144 as well as for every unit of cloud auditing system, the security increase by 0.485. Besides, the security has a greater influence in the cloud auditing system.

## Hypothesis Results

Table 10: Hypothesis Results

	Hypothesis	Significant Value	Beta Value	Results
H1	There is a significant positive relationship between confidentiality and the cloud auditing system during current pandemic in Malaysia	0.049	0.082	accepted
H2	There is a significant positive relationship between processing integrity and the cloud auditing system during current pandemic in Malaysia	0.030	0.075	accepted
H3	There is a significant positive relationship between availability and the cloud auditing system during current pandemic in Malaysia	0.043	0.144	accepted
H4	There is a significant positive relationship between security and the cloud auditing system during current pandemic in Malaysia	0.000	0.485	accepted

According to the table 10, H1 to H4 are accepted because the significant value is less than 0.05.

## Conclusion

The results show that the R-square coefficient is 0.483, indicating that 48.3% of factors influencing cloud computing system are confidentiality, processing integrity, availability, and security. Thus, this suggests that there are other factors that could explain the influence on the adoption of cloud computing systems around Klang Valley, Malaysia. In addition, the Durbin-Watson result is 2.045, which can be considered an ideal value according to the Durbin-Watson standard (refer Table 7). On the other hand, further discussion of the summary findings will be described below.

There is a significant positive correlation between the adoption of cloud audit systems and confidentiality. The adoption of cloud audit systems was accepted by the auditor in Klang Valley because there was a significant positive correlation between the adoption of cloud audit systems and confidentiality. This is where the significant value of adopting a cloud audit system is 0.049. Similarly, the beta value is 0.082, which indicates that there is a positive correlation between adoption of cloud audit system and confidentiality (refer Table 10). This study is supported by Wang, et. al (2013), Wang, et. al (2010) and Butoi & Tomai (2014.). It shows that confidentiality has a significant impact on the adoption of cloud audit systems, because private clouds and public clouds are used to store data, which ensures the confidentiality and correctness of the data. There is a significant positive correlation between the adoption of cloud audit systems and processing integrity. From the Table 10, the adoption of cloud audit systems was accepted by the auditor because there was a significant positive correlation between the adoption of cloud audit systems and processing integrity. This is where the significant value of adopting a cloud audit system is 0.030. Similarly, the beta value is 0.075, which indicates that there is a positive correlation between cloud audit system and processing integrity. This study is supported by Mykletun et.al, (2006), it shows that processing integrity has a significant impact on the adoption of cloud audit systems. There is a significant positive correlation between the adoption of cloud audit systems and availability. According to Table 10, the adoption of cloud audit systems was accepted by the auditor because there was a significant positive correlation between the adoption of cloud audit systems and availability. This is where the significant value of adopting a cloud audit system is 0.043. Similarly, the beta value is 0.144, which indicates that there is a positive correlation between cloud audit system and availability. According to previous studies, product knowledge has a significant impact on investors' willingness to invest. With a value of 0.625(62.5%) and a significance value of 0.000, this means that the availability of cloud audit systems is important and can have a significant impact on the adoption of cloud audit systems by auditors (Axelsen, et. al, 2017). There is a significant positive correlation between the adoption of cloud audit

systems and security in Malaysia. Referring to Table 10, the adoption of cloud audit systems was accepted by the auditor because there was a significant positive correlation between the adoption of cloud audit systems and security. This is where the significant value of adopting a cloud audit system is 0.000. Similarly, the beta value is 0.485, which indicates that there is a positive correlation between cloud audit system and security. This study was supported by Armbrust, et.al (2010), the hypothesis about safety. Security is positively influencing the adoption of cloud audit systems by auditors.

### **Implications and Limitations**

The results of this study can shed light on the factors that contributed to the increasing adoption of cloud audit systems during the epidemic. The findings of this study can help audit clients analyse and identify the factors that influence the adoption of cloud audit systems by auditors during an outbreak. In addition, the study found no significant differences in perceptions of participants between the Big Four and mid-level accounting firms. This may be attributed to the similarities between the two companies in terms of the services they offer, their "IT maturity" and the high level of education and experience of the participants. In addition, Audit clients will benefit from this study because it helps audit clients understand cloud audit systems when they are being audited. This can lead audit clients to avoid infection and quickly send information to auditors for inspection during the outbreak, such as audit client information can be safe, reliable, integrity and confidentiality of the existing cloud audit system. Therefore, this study will benefit audit clients, as consumers will seriously consider the value of their paid services and cloud audit systems, especially in times of epidemic which can work remotely, so that audit clients can complete their audit reports in a timely manner in financial statements. In addition, the various advantages of cloud computing influence the willingness of audit firms to adopt cloud audit systems, for example, in the areas of IT cost management and improving IT agility. Some cloud audit system solutions are also considered to have higher levels of availability, indicating that they are more acceptable to users. This acceptance is important because usability is associated with usefulness and user satisfaction and may lead to higher productivity. Thus, when effectively integrated with an organization's internal capabilities, cloud audit systems may potentially contribute to the development of competitive resources.

There are several limitations to this study. This study was conducted with a limited number of questionnaire respondents. The study was based on just 200 respondents and more samples will generate better outcomes. While the auditor's opinions provide valuable insight, their statements do not represent the firm's official position. This limitation provides an opportunity for future research. In addition, some respondents may not understand the questionnaire and cannot answer the questions correctly or possible that they didn't take the questionnaire seriously. On the other hand, this study only emphasizes four factors, namely confidentiality, processing integrity, availability, and security. Therefore, there are many factors that influence the adoption of cloud audit system by audit firms, but these factors are not involved in this study.

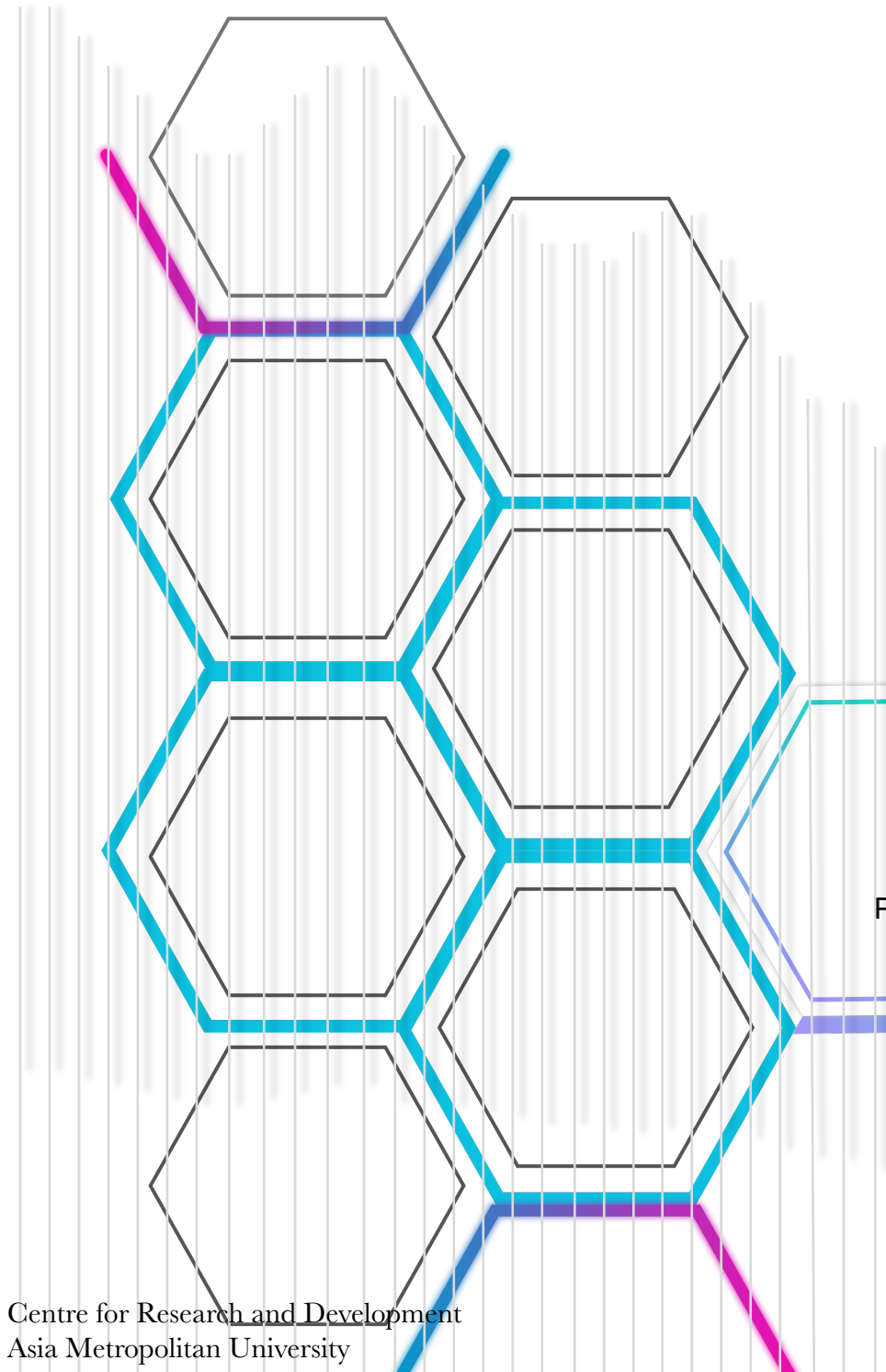
Several suggestions are put forward for future researchers. Firstly, future researchers can maximize the number of respondents to improve the reliability and accuracy of the results. The results are more reliable when the number of participants in this study questionnaire is larger. In addition, the study did not include any small accounting firms. Their situation could be very different from that of the big accounting firms, as public cloud computing services seem to be better suited to smaller firms that lack economies of scale. Therefore, future research may want to focus on smaller accounting firms to see if the findings are comparable. In addition, some suggestions are made for future researchers to study more independent variables than those already included in this study. The four independent variables in this study explained only 48.3% of the factors that led to the adoption of cloud audit systems by auditors in Klang Valley due to the R squared results. Therefore, there are other factors that can explain the adoption of cloud audit systems by auditors.

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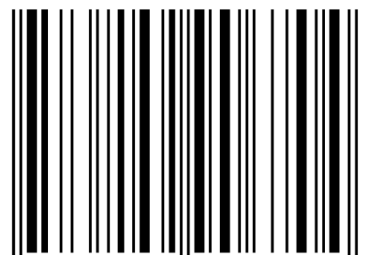
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